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DESIGN PROFESSIONALS OF RECORD

Architect: Stantec Architecture Inc. [STN].

License #_.

Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

Civil Engineer: Huitt-Zollars [HZ]

Responsible for those Sections appended with "[HZ]" on Table of Contents.

Landscape Architect: Stantec Architecture Inc. [STN]

License #_.

Responsible for those Sections appended with "[STN]" on Table of Contents.
Structural Engineer: Monroe & Newell Engineers Inc. [MN]
License #_
Responsible for those Sections appended with "[MN]" on Table of Contents.

Fire-Protection Engineer: MEP Engineering Inc. [MEP]
License #_
Responsible for those Sections appended with "[MEP]" on Table of Contents.

Plumbing Engineer: MEP Engineering Inc. [MEP]
License #_
Responsible for those Sections appended with "[MEP]" on Table of Contents.

HVAC Engineer: MEP Engineering Inc. [MEP]
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Responsible for those Sections appended with "[MEP]" on Table of Contents.
Electrical Engineer: MEP Engineering Inc. [MEP]
License #_.
Responsible for those Sections appended with "[MEP]"
on Table of Contents.

Lighting Designer: Stantec Architecture Inc. [STN]
License #_.
Responsible for those Sections appended with "[STN]"
on Table of Contents.

Vehicle Maintenance Equipment Consultant:
Maintenance Design Group now HDR Inc. [HDR]
License #_.
Responsible for those Sections appended with "[HDR]"
on Table of Contents.
Roofing Consultant: RoofTech Consultants Inc. [RC]

License #.

Responsible for those Sections appended with "[RC]" on Table of Contents.

END OF SECTION 00 01 07
PART 1 - HIDDEN LINE - DO NOT REMOVE

1.01 PROJECT TEAM

A. Owner:

1. Adams County [AC].
2. 4430 S. Adams County Parkway.
3. 1st Floor, Suite C1700.
5. Primary Contact(s):
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6. Phone: 720-331-2403.
7. Email: rcarlson@adcogov.org.

B. Architect:

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E. Structural Engineer:
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PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Demolition and removal of buildings and site improvements.
   2. Removing below-grade construction.
   3. Disconnecting, capping or sealing, and removing site utilities.

B. Related Requirements:
   1. Section 01 10 00 "Summary" for use of the premises and phasing requirements.
   2. Section 01 32 00 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
   3. Section 02 41 19 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
   4. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.02 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

1.03 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

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

1.04 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.
C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
   1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.
D. Schedule of Building Demolition Activities: Indicate the following:
   1. Detailed sequence of demolition work, with starting and ending dates for each activity.
   2. Temporary interruption of utility services.
   3. Shutoff and capping or re-routing of utility services.
E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before the Work begins.
F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.06 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.
1.07 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.08 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
   1. Provide not less than 72 hours’ notice of activities that will affect operations of adjacent occupied buildings.
   2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
      a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials & Regulated Building Material: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. Regulated Building Materials will be removed by Contractor but disposed of by Owner.
   3. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. On-site storage or sale of removed items or materials is not permitted.

1.09 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner’s on-site operations.
PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.02 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 31 20 00 "Earth Moving."

PART 3 - EXECUTION

3.01 DEMOLITION CONTRACTOR

A. Demolition Contractor:

3.02 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations. Comply with Section 01 32 33 "Photographic Documentation.

3.03 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.
B. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
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 storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.04 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. Arrange to shut off utilities with utility companies.
2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

3.05 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
   a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

C. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.06 DEMOLITION, GENERAL

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 3 hours after flame-cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.07 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

3.08 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

END OF SECTION 02 41 16
SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.03 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. Contractor’s superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete Subcontractor.
   e. Special concrete finish Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

E. Samples: For waterstops vapor retarder.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
10. Vapor retarders.
11. Semirigid joint filler.

D. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

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

F. Field quality-control reports.
G. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, 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.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M.

E. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.
1.08 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.09 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.

2. ACI 117.
2.02 FORM-FACING MATERIALS

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. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
   a. High-density overlay, Class 1 or better.
   b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
   c. Structural 1, B-B or better; mill oiled and edge sealed.
   d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.


D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.


F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or 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.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.03 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 or ASTM A 706/A 706M, deformed bars, assembled with clips.

D. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn or galvanized.

E. Deformed-Steel Wire: ASTM A 1064/A 1064M.

F. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.


2.04 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.05 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. 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.

C. Cementitious Materials:

2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag Type IP, portland-pozzolan Type IT, ternary blended cement.
D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

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/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

G. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

H. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.


2.06 WATERSTOPS

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

B. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.07 VAPOR RETARDERS

A. Sheet Vapor Retarder: See "Section 07 26 16 "Below-Grade Vapor Retarders"."
2.08 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: See Section "Emery-Aggregate Concrete Topping."

B. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.

C. Emery Dry-Shake Floor Hardener: Pigmented Unpigmented, factory-packaged, dry combination of portland cement, graded emery aggregate, and plasticizing admixture; with emery aggregate consisting of no less than 60 percent of total aggregate content.
   1. Color: As selected by Architect from manufacturer's full range.

D. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.

E. Mineral Dry-Shake Floor Hardener: See Section 03 35 53.13 "Quartz-Aggregate Concrete Finishing - Light Reflective".

2.09 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Liquid floor treatments 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."

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

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, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Curing and sealing compounds 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."

I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Curing and sealing compounds 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."

2.11 RELATED MATERIALS


B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II for nonload bearing and Types IV and V for load bearing for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.13 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated at 28 days.
   2. Maximum W/C Ratio: 0.50.
   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 for 3/4-inch nominal maximum aggregate size.

   1. Minimum Compressive Strength: As indicated at 28 days.
   2. Maximum W/C Ratio: 0.50.
   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 for 3/4-inch nominal maximum aggregate size.

C. Slabs-on-Grade: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated at 28 days.
   2. Maximum W/C Ratio: 0.45.
   3. Minimum Cementitious Materials Content: 520 lb/cu. yd..
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

D. Suspended Slabs: Normal-weight concrete.
1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum W/C Ratio: 0.50.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

E. Building Walls: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

2.15 FABRICATING REINFORCEMENT

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

2.16 CONCRETE MIXING

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

3.01 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.

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:

2. Class B, 1/4 inch for rough-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 area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 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. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.
3.03 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 72 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 beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength and a minimum of 14 days.

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 Architect.

3.04 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 with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.05 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.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.06 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.07 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
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.
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.

3.09 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
   a. Specified overall values of flatness, \( F(F) \) 25; and of levelness, \( F(L) \) 20; with minimum local values of flatness, \( F(F) \) 17; and of levelness, \( F(L) \) 15.
   b. Specified overall values of flatness, \( F(F) \) 35; and of levelness, \( F(L) \) 25; with minimum local values of flatness, \( F(F) \) 24; and of levelness, \( F(L) \) 17; for slabs-on-grade.
   c. Specified overall values of flatness, \( F(F) \) 30; and of levelness, \( F(L) \) 20; with minimum local values of flatness, \( F(F) \) 24; and of levelness, \( F(L) \) 15; for suspended slabs.
   d. Specified overall values of flatness, \( F(F) \) 45; and of levelness, \( F(L) \) 35; with minimum local values of flatness, \( F(F) \) 30; and of levelness, \( F(L) \) 24.

3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated or where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.

   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistant aggregate aluminum granule finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

   1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistant aggregate aluminum granules over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
   2. After broadcasting and tamping, apply float finish.
   3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistant aggregate aluminum granules.

H. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:

   1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.

3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

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. Construct concrete bases 6 inches 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: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
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 anchorage devices. 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 PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h 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.

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. 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 curing compound does not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENT APPLICATION

A. Penetrating Liquid Floor Treatment: 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 three, seven, 14, or 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.

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.

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 one to six month(s). 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 Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 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 1/2 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, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar 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 Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:
   1. Steel reinforcement placement.
   2. Steel reinforcement welding.
   3. Headed bolts and studs.
   4. Verification of use of required design mixture.
   5. Concrete placement, including conveying and depositing.
   6. Curing procedures and maintenance of curing temperature.
   7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
   1. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   2. Concrete Temperature: ASTM C 1064/C 1064M; 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.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.
3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. 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.

END OF SECTION 03 30 00
SECTION 03 33 00 - ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place architectural concrete for site monument sign, including form facings, reinforcement and accessories, concrete materials, concrete mixture design, placement procedures, and finishes.

1. Requirements in Section 03 30 00 "Cast-in-Place Concrete" apply to architectural concrete.

1.02 DEFINITIONS

A. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.

B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

C. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.

D. W/C Ratio: The ratio by weight of water to cementitious materials.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Formwork Shop Drawings: Show formwork construction, including form-facing joints, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.
1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "NRMCA Quality Control Manual - Section 3, Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, 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-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be an 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.

1.05 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.06 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
4. Do not use chemical accelerators unless otherwise specified and approved in design mixtures.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor’s option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301.
   2. ACI 303.1.

2.02 FORM-FACING MATERIALS

A. General: Comply with Section 03 30 00 "Cast-in-Place Concrete" for formwork and other form-facing material requirements.

B. Source Limitations: Obtain each type form-facing material from single source from single manufacturer.

C. Form-Facing Panels for As-Cast Finishes: Furnish panels that will provide continuous, true, and smooth architectural concrete surfaces.
   1. Steel- and glass-fiber-reinforced plastic, or other approved nonabsorptive panel materials. Furnish in largest practicable sizes to minimize number of joints.
   2. Exterior-grade plywood panels, nonabsorptive. One of the following:
      a. High-density overlay, Class 1, or better, complying with DOC PS 1.
      b. Finnish phenolic overlaid birch plywood.
      c. Medium-density overlay, Class 1, or better, mill-applied release agent and edge sealed, complying with DOC PS 1.

D. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.

E. Chamfer Strips: Fabricated from the following material(s), 3/4 by 3/4 inch, minimum; in longest practicable lengths:
   1. Nonstaining Metal.
   2. Nonstaining dressed wood.
   3. Rigid plastic.
   4. Elastomeric rubber.

F. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800; minimum 1/4 inch thick.
G. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or Type S, Grade NS, that adheres to form joint substrates.

H. Wood Form Sealer: Penetrating, clear, polyurethane sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood.

I. Form-Release Agent: Commercially formulated, colorless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.

J. Form Ties: Factory-fabricated, ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
   1. Removable Ties: Metal ties with tapered tie cone spreaders that, when removed, will leave holes 3/4 inch in diameter on concrete surface. Furnish stainless steel ties for walls exposed to exterior.

2.03 STEEL REINFORCEMENT AND ACCESSORIES

A. General: Comply with Section 03 30 00 "Cast-in-Place Concrete" for steel reinforcement and other requirements for reinforcement accessories.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufactured according to CRSI's "Manual of Standard Practice."
   1. Where legs of wire bar supports contact forms, use one of the following:
      a. Gray, all-plastic bar supports.
      b. CRSI Class 1, gray, plastic-protected bar supports.
      c. CRSI Class 2, stainless-steel bar supports.

2.04 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/C 150M, Type and color as follows:
      a. Type I or Type I/II, unless indicated otherwise.
      b. Type II or Type I/II, use where moderate sulfate resistance is desired.
      c. Type III, use where high early strength is desired.
      d. Gray color.
e. White color.

2. Supplementary Cementing Materials: Fly ash, slag cement, silica fume will not be accepted.
   a. Fly Ash: ASTM C 618, Class C or Class F.
   b. Slag Cement: ASTM C 989/C 989M, Grade 100 or Grade 120.
   c. Silica Fume: ASTM C 1240 amorphous silica.


C. Normal-Weight Aggregates: ASTM C 33/C 33M. Provide aggregates from 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. Class 5S coarse aggregate or better, graded.

D. Normal-Weight Fine Aggregate: ASTM C 33/C 33M or ASTM C 144, manufactured or natural sand, from same source for entire Project.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that does not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

G. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
   1. Color: As selected by Architect from manufacturer's full range.

H. Water: Potable, complying with ASTM C 94/C 94M, except free of wash water from mixer washout operations.
2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
   1. For integrally colored concrete, curing compound shall be pigmented type approved by color pigment manufacturer.
   2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

2.06 REPAIR MATERIALS

A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene. Suitable for use with the following as an admixture or as a bond coat applied directly from container:
   1. Cement slurries.
   2. Sand-cement slurries.
   3. Rubbing grouts.
   4. For bonding hardened or freshly mixed nonload bearing concrete to hardened nonload bearing concrete at dry building interiors.

B. Epoxy Bonding Adhesive: ASTM C 881/C 881M two-component epoxy resin, for application to portland-cement concrete, capable of humid curing and bonding to damp surfaces.
   1. Class: Suitable for application temperature and of grade to suit requirements.
   2. Type:
      a. For Nonload Bearing Service Loading:
         1) Type I for bonding hardened concrete to hardened concrete.
         2) Type II for bonding freshly mixed concrete to hardened concrete.
      b. For Load Bearing Service Loading:
         1) Types IV for for bonding hardened concrete to hardened concrete.
         2) Types V for bonding freshly mixed concrete to hardened concrete.
2.07 CONCRETE MIXTURES

A. Obtain each color, size, type, and variety of concrete mixture from single manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.

B. Prepare design mixtures for each type and strength of cast-in-place architectural concrete proportioned on 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 design mixtures based on laboratory trial mixtures.

C. Cementitious Materials: For cast-in-place architectural concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements. Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

D. Limit water-soluble, chloride-ion content in hardened concrete to following limits measured by weight of cement:
   1. 0.06 percent for prestressed (post-tensioned) concrete
   2. 0.15 percent for reinforced concrete exposed to chloride
   3. 0.30 percent for reinforced concrete that will not be dry or protected from moisture
   4. 1.00 percent for reinforced concrete that will be dry or protected from moisture.

E. Admixtures: Use admixtures according to manufacturer's written instructions.

F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

G. Concrete Mixtures:
   2. Maximum W/C Ratio: 0.46.
   3. Slump Limit: 4 inches, plus or minus 1 inch.
   4. Air Content:
      a. 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
      b. 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
      c. 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
2.08 CONCRETE MIXING

A. Ready-Mixed Architectural Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information. Concrete may be mixed and batched remotely or on-site.

1. Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.
2. 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

3.01 FORMWORK INSTALLATION

A. General: Comply with Section 03 30 00 "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.

B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.

C. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for surfaces prominently exposed to public view, for smooth formed finishes, and where indicated.
2. Class B, 1/4 inch for surfaces not exposed to public view, for smooth formed finishes, and where indicated.
3. Class C, 1/2 inch for rough formed finishes.

D. Construct forms to result in cast-in-place architectural concrete that complies with ACI 117 (ASI 117M).

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood keyways, reglets, recesses, and the like, for easy removal.

1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
2. Do not use rust-stained steel form-facing material.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
G. Corner and Edge Profiles: For cast-in-place architectural concrete:

1. Chamfer exterior corners and edges unless indicated otherwise on Drawings.

H. Coat contact surfaces of the following with sealer before placing reinforcement, anchoring devices, and embedded items:

1. Chamfer strips.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Release Agent: Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting. Prevent form liners from sagging and stretching in hot weather. Seal joints of form liners and form-liner accessories to prevent mortar leaks. Coat form liner with form-release agent.

3.02 REINFORCEMENT AND INSERT INSTALLATION

A. General: Comply with Section 03 30 00 "Cast-in-Place Concrete" for fabricating and installing steel reinforcement. Securely fasten steel reinforcement and wire ties against shifting during concrete placement.

B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.03 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved 28-day design compressive strength. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
C. Clean and repair surfaces of forms to be reused in the Work. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. Apply new form-release agent.

D. 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 cast-in-place architectural concrete surfaces.

3.04 JOINTS

A. Construction Joints: Install construction joints true to line, with faces perpendicular to surface plane of cast-in-place architectural concrete, so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
2. Form keyed joints as indicated.
   a. Unless indicated otherwise on Drawings, embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated on Drawings. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces, unless indicated otherwise on Drawings.
   a. Bonding agent may be used at non-structural concrete at dry interior locations.

B. Contraction Joints: Form weakened-plane contraction joints true to line, with faces perpendicular to surface plane of cast-in-place architectural concrete, so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.05 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
   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. Do not permit vibrators to contact forms.

3.06 FINISHES, GENERAL

A. 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.
   1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

B. Maintain uniformity of special finishes over construction joints unless otherwise indicated.

3.07 AS-CAST FORMED FINISHES

A. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

3.08 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Cure cast-in-place architectural concrete according to ACI 308.1.
   1. As-Cast Formed Finishes: Begin curing immediately after removing forms from concrete.
2. Cure by one or a combination of the following methods that will not mottle, discolor, or stain concrete:
   
a. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      1) Water.
      2) Continuous water-fog spray.
      3) Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

   b. 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.

   c. Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer’s written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.09 FIELD QUALITY CONTROL

A. General: Comply with field quality-control requirements in Section 03 30 00 "Cast-in-Place Concrete."

3.10 REPAIR, PROTECTION, AND CLEANING

A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.

   1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.

B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.

C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.

D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.

E. Wash and rinse surfaces according to concrete finish applicator's written instructions. Protect other Work from staining or damage due to cleaning operations.
1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

END OF SECTION 03 33 00
PART 1 - GENERAL

1.01 SUMMARY
   A. Section includes clear, sealing-hardening-densifying compounds for horizontal traffic bearing, cured concrete surfaces.
      1. Contractor's Discretion: Compound may be applied to fresh concrete as a curing agent if such application is approved in writing by compound manufacturer.

1.02 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.
      2. Confirm if compound is to be applied to fresh or cured concrete.
      3. If applied in locations receiving joints sealants, confirm that joint sealant adhesion and compatibility with compound has been verified.

1.03 ACTION SUBMITTALS
   A. Product Data: For sealing-hardening-densifying compound.

1.04 QUALITY ASSURANCE
   A. Field Sample: Produce field sample to demonstrate the expected range of finish, color, and appearance variations of applied compound.
      1. Locate field sample as indicated or, if not indicated, as directed by Architect.
      2. Size: 25 sq. ft.
      3. Maintain field sample during construction in an undisturbed condition as a standard for judging the completed Work.
      4. Subject to compliance with requirements, approved field sample may become part of the completed Work if undisturbed at time of Substantial Completion.
      5. Final approval by Architect of coating application will be from test applications.
1.05 PROJECT CONDITIONS

A. Protect concrete surfaces receiving sealing-hardening-densifying compounds in a manner acceptable compound manufacturer and applicator, that ensures that surface of concrete is maintained in condition without damage, deterioration, discoloring, or other surface imperfections that would impair aesthetic effect of final finish.

B. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit compounds to be applied according to manufacturers' written instructions:

1. Ambient temperature is above 40 deg F.
2. Rain or snow is not predicted within 24 hours.
3. Application proceeds more than 24 hours after surfaces have been wet.
4. Substrate is not frozen, or surface temperature is above 40 deg F.
5. Windy conditions do not exist that may cause sealing-hardening-densifying compound to be blown onto vegetation or surfaces not intended to be treated.

PART 2 - PRODUCTS

2.01 SEALING-HARDENING-DENSIFYING COMPOUNDS

A. Compound: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces. Comply with the following:

1. Compounds applied to fresh concrete as a curing agent:
   a. Shall contain no silicones or components that produce silicone resins.
   b. Shall not be applied to concrete containing Type K shrinkage compensating cement or shrinkage reducing admixtures with hydrophobic properties.

2. VOC Content: For field applications that are inside the weatherproofing system, compounds shall comply with VOC content limits of authorities having jurisdiction and shall not exceed 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Wear Index per ASTM D 4060: Not greater than 0.6 when 500 cycles of abrasion with abrasive wheel number C-18 are recorded on coated concrete surface.

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

2. Curecrete Distribution Inc.; Ashford Formula.
4. US SPEC, Division of US MIX Company; Permalith.
5. V-Seal Concrete Sealers & Specialty Coatings; Industra-Seal 117A or Industra-Seal 117pLS.

PART 3 - EXECUTION

3.01 PREPARATION AND APPLICATION

A. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of compounds. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of compound being deposited on surfaces. Cover live plants and grass.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of compounds and to instruct Applicator on the product and application method to be used.

C. Proceed with application only after unsatisfactory conditions have been corrected.

D. Apply sealing-hardening-densifying compounds according to manufacturer's written instructions.

1. Cured Concrete Application:
   a. Do not apply to concrete that is less than 28 days' old unless approved otherwise by compound manufacturer in writing.
   b. Coordination with Sealants: Do not apply compounds until sealants for joints adjacent to surfaces receiving compound have been installed and cured.

   1) Compound application work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, compound, and sealant materials identical to those used in the work.

   c. Clean substrate of substances that might interfere with penetration or performance of compounds. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants.
   d. Complete surface repairs prior to compound application.
   e. Ensure that concrete surface is sufficiently dry; test for moisture content, according to compound manufacturer's written instructions.
   f. Apply compound until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
   g. Rinse with water; remove excess material until surface is dry.
   h. Apply a second coat in a similar manner if surface is rough or porous.

2. Fresh Concrete Application (Contractor's Discretion): Apply compound to fresh concrete only when approved in writing by manufacturer.

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CONCRETE FLOOR
SEALING-HARDENING-DENSIFYING COMPOUNDS
Adams County Fleet & Public Works 4166-01
a. Apply only after concrete has received final finish.
b. Apply as soon as feasible after concrete has hardened sufficiently to walk on and support compound application operations.
c. Apply compound until surface is wetted, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
d. Rinse with water; remove excess material until surface is dry.
e. Apply a second coat in a similar manner if surface is rough or porous.

3. Minimum Application Rate: Not less than recommended by compound manufacturer.

3.02 CLEANING

A. Immediately clean compound from adjoining surfaces and surfaces soiled or damaged by compound application as work progresses. Repair damage caused by compound application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 03 35 16.13
SECTION 03 35 16.16 - CONCRETE FLOOR SALT-RESISTANT, WATER REPELLENT TREATMENT CS-5

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes clear (non-pigmented), silane based, penetrating water-repellent coatings for horizontal concrete (unpainted) traffic bearing surfaces and adjacent vertical surfaces, formulated to provide the following features:

1. Low reduction in water-vapor transmission.
2. Increased resistance to water absorption.
3. Increased resistance to chloride-ion intrusion.

B. Related Sections include the following:

1. Section 03 30 00 "Cast-in-Place Concrete" for curing compounds.
2. Section 07 92 00 "Joint Sealants."

1.02 ACTION SUBMITTALS

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

1. Include manufacturer's printed statement of VOC content.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Test Application: Apply a finish sample for water repellent and substrate required.

1. Locate each test application as directed by Architect.
2. Size: 25 sq. ft.
3. Final approval by Architect of water-repellent application will be from test applications.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination."
1.05 PROJECT CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:

1. Ambient temperature is above 40 deg F.
2. Concrete surfaces have cured for more than 28 days.
3. Rain or snow is not predicted within 24 hours.
4. Application proceeds more than 24 hours after surfaces have been wet.
5. Substrate is not frozen, or surface temperature is above 40 deg F.
6. Windy conditions do not exist that may cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

B. Coordinate the following with Section 03 30 00 "Cast-In-Place Concrete" for surfaces receiving water repellents:

1. Trowel Finish: Minimize troweling to prevent finished surface of concrete from becoming hard and impenetrable to the absorption of water repellent.
2. Curing Compound: Moist curing is preferred. Where curing compound is used, use only clear, waterborne, membrane-forming curing compound complying with ASTM C 309, Type 1, Class B, dissipating; only with water repellent manufacturer approval; and only when adequate time is allowed for compound to dissipate.

PART 2 - PRODUCTS

2.01 PENETRATING WATER REPELLENTS

A. Silane, Penetrating Water Repellent: Clear, monomeric compound containing 40 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 3.3 lb./gal. or less of VOCs.

1. Products: Subject to compliance with the requirements provide one of the following:
   a. Advanced Chemical Technologies, Inc.; Sil-ACT ATS-100.
   b. BASF; Master Builders, MasterProtect H 400.
   c. ProSoCo, Inc.; Consolideck, Saltguard WB.

B. Chloride-Ion Intrusion in Concrete Performance: NCHRP Report 244, Series II tests.

1. Reduction of Water Absorption: Not less than 79 percent.
2. Reduction in Chloride Content: Not less than 87 percent.
PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to water-repellent manufacturer's written instructions, to ensure that surface is dry enough.

   1. Cast-in-Place Concrete: Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of water repellents.

B. Test for pH level, according to water-repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.

C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.

D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

   1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.

C. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.
3.03 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 03 35 16.16
SECTION 03 35 43 - POLISHED CONCRETE FINISHING - CS-2

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes polished concrete finishing.

1. Concrete for polished concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 03 30 00 “Cast-in-Place Concrete.”

1.02 DEFINITIONS


1.03 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 polished concrete to attend, including the following:

a. Contractor’s superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Cast-in-place concrete subcontractor.
e. Polished concrete finishing Subcontractor.

2. Review cold- and hot-weather concreting procedures, curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.

C. Samples for Verification: For each type of exposed color.
1.05 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:
   1. Repair materials.
   2. Liquid floor treatments.

1.06 QUALITY ASSURANCE

A. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Demonstrate curing, finishing, and protecting of polished concrete.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicone materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.

PART 3 - EXECUTION

3.01 POLISHING

A. Polish: Level 3: High sheen, 800 grit.

B. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
   1. Machine grind floor surfaces to receive polished finishes level and smooth.
2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
6. Control and dispose of waste products produced by grinding and polishing operations.
7. Neutralize and clean polished floor surfaces.

END OF SECTION 03 35 43
SECTION 03 35 53.13 - QUARTZ-AGGREGATE CONCRETE FINISHING - LIGHT REFLECTIVE - CS-1

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes the following for application to traffic bearing, monolithic concrete slabs:

1. Light-reflective, mineral dry-shake floor hardener for application to freshly floated concrete.
2. Curing compound.
4. Penetrating liquid floor sealer.

1.02 REFERENCES


1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference at Project site.

B. Sequencing and Scheduling:

2. Semi-Rigid Joint Filler:
   a. Defer installation until after concrete slabs have cured and contracted for not less than 3 months, building enclosure is completed, and HVAC system is operating.
   b. Install filler in sawcut contraction joints prior to applying penetrating liquid floor sealer.
3. Defer application of penetrating liquid floor sealer until major construction operations are completed in areas above concrete slabs and just before Substantial Completion.
1.04 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.

1.05 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.
   B. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
   C. Field quality-control test reports.

1.06 QUALITY ASSURANCE
   A. Source Limitations: Obtain concrete floor toppings and curing materials through one source from a single manufacturer.
   B. Mockups: Place concrete floor topping mockups to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
      1. Build mockups approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.
      2. If Architect determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.
      3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.
   B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.08 PROJECT CONDITIONS
   A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.
      1. Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F.
B. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.01 LIGHT REFLECTIVE MINERAL DRY-SHAKE FLOOR HARDENER

A. Factory-prepared and dry-packaged mixture of finely graded quartz aggregate; portland cement or blended hydraulic cement; light reflective pigments; plasticizers; and other admixtures; ready for shake-on application. Use light reflective pigments that are finely ground, nonfading mineral oxides interground with cement.

1. Light Reflectance: When tested according to ASTM E 1347, hardener shall increase by more than 60 percent the light reflective properties of a similarly finished floor surface using concrete base slab mix provided

a. Reflectance values for light reflective type hardener shall be submitted in accordance with this Section's Article "Submittals" and shall be determined using the "Known Sample" method. "Known Sample" finish sample shall have a 60 percent light reflective value and shall be used as the basis for determining light reflective value of reflective type surface hardener specified to comply with the reflective value requirements. Luminance shall be measured using an accurate laboratory type instrument.

2. Compressive Strength (28 Days): 10,000 psi; ASTM C 109/C 109M.

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

a. Dayton Superior Corporation; Quartz Tuff Light Reflective.

b. Euclid Chemical Company (The); Surflex Light Reflective.

c. L&M Construction Chemicals, Inc.; Quartz Plate FF Light Reflective.

d. US Mix; US SPEC Densetop LR.

2.02 CURING COMPOUND

A. Clear, Waterborne, Membrane-Forming Curing Compound: Manufacturer's recommended formulation complying with ASTM C 309, Type 1, Class B.

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

a. Dayton Superior Corporation; Clear Cure VOC J7WB.

b. Euclid Chemical Company; Super Aquacare VOX, except provide Kurez DR if recommended by manufacturer for use with penetrating liquid floor sealer specified below.

c. L & M Construction Chemicals, Inc.; Dress & Seal WB/#30, except provide L&M Cure DR if recommended by manufacturer for use with penetrating liquid floor sealer specified below.
2.03 SEMIRIGID JOINT FILLER

A. Two-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of 80 minimum per ASTM D 2240.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dayton Superior Corporation; Sure Fil J52.
   b. Euclid Chemical Company; Euco 700.
   c. L&M Construction Chemicals, Inc.; Epoflex SL.
   d. US Mix; US SPEC SR 50-EJF.

B. VOC Content: Semi-rigid joint filler (sealant) shall have a VOC content of 250 g/L or less.

2.04 PENETRATING LIQUID FLOOR SEALER

A. Penetrating Sealer: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
   b. Euclid Chemical Company; Euco Diamond Hard.
   c. L&M Construction Chemicals, Inc.; Seal Hard.
   d. US Mix; US SPEC Industraseal.

B. VOC Content: Liquid floor sealer shall comply with VOC content limits of authorities having jurisdiction and VOC content limit shall not exceed 200 g/L.
3.02 FLOOR TOPPING APPLICATION

A. Start floor topping application in presence of manufacturer’s technical representative.

B. Float surface of base slab concrete in accordance with Section 03 30 00 “Cast-In-Place Concrete.”

C. After float finish is applied to fresh base slab concrete, and while concrete is still plastic, shake apply concrete floor topping by evenly distributing a minimum total of 1-1/2 lbs. of aggregate per sq. ft. in not less than 2 applications.
   1. Control concrete moisture as recommended by topping manufacturer when floated finish is subject to rapid surface drying by wind, by sunlight, and by abutting construction dry enough to draw moisture from the plastic concrete. Apply topping in these areas first.

D. First Topping Application:
   1. Apply not less than 1 lb. of topping to each sq. ft. surface of fresh concrete.
   2. Distribute evenly.
   3. If topping material breaks through floated surface of concrete, then it is too plastic for topping application.
   4. Float topping after it has darkened slightly from moisture absorption. Use only wood floats (do not use metal floats, or combinations of wood and metal floats). Continue floating until moisture from underlying concrete has been worked completely through topping. (If moisture from underlying concrete does not work through first application of topping, second application will delaminate.) Restraighten, cut down high spots, and fill low spots.

E. Second Topping Application: Apply immediately after first application of topping has been floated.
   1. Precautions: If any of the following finish blemishes occur during second topping application, obtain immediate instruction from manufacturer’s technical representative.
      a. Premature surface drying.
      b. Trowel-burn.
      c. Blistering and bubbling.
   2. Apply not less than 1/2 lb. of topping to each sq. ft. of concrete surface.
   3. Distribute evenly and at right angles to first topping application.
   4. In same manner as first topping, float topping after it has darkened slightly. Continue floating until moisture from underlying surface has been worked completely through topping. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture. Do not add water to aid finishing operations.
5. Hard Trowel Finish: After floating surface, apply trowel finish. Use only stainless steel finishing tools and trowel blades (do not use magnesium metal tools). Continue troweling passes and restraighten until surface is smooth and uniform in texture.

   a. Finish and measure surface so gap at any point between surface and an unlevelled freestanding 10-foot-long straightedge, resting on 2 high spots placed anywhere on the surface, does not exceed 1/4 inch.

F. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.

G. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.

   1. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.

3.03 PROTECTING AND CURING

   A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

   B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing. Evaporation retarders are specified in Section 03 30 00 "Cast-In-Place Concrete."

   C. Begin curing immediately after finishing concrete floor topping. Cure by the following method, according to concrete floor topping manufacturer's written instructions:

      1. Curing Compound: Apply uniformly in continuous operations by power spray or roller according to manufacturer's written instructions. Maintain continuity of coating and repair damage during curing period.

3.04 JOINT FILLING

   A. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.

   B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

   C. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.
3.05 PENETRATING LIQUID FLOOR SEALER

A. Prepare, apply, and finish penetrating liquid floor sealer according to manufacturer’s written instructions.

1. Remove curing compounds, 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.

3.06 REPAIRS

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

3.07 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of completed applications of concrete floor toppings shall take place in successive stages, in areas of extent and using methods as follows:

1. Concrete floor topping shall be tested for delamination by dragging a steel chain over the surface.
2. Concrete floor topping shall be tested for compliance with surface flatness using straight edge.

C. Remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 03 35 53.13
SECTION 03 35 63 - CONCRETE FLOOR CURING-SEALING-DUSTPROOFING COMPOUNDS - CS -4

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes clear, curing-sealing-dustproofing compound for horizontal traffic bearing concrete surfaces receiving no other applied finish. Compound may be applied to either freshly finished or cured concrete surfaces at Contractor's discretion.

1. Apply curing-sealing-dustproofing compound to concrete surfaces receiving incidental applied paint coatings (e.g. for way finding, warning striping, and other graphic content) only after those coatings have been applied.

1.02 ACTION SUBMITTALS

A. Product Data: For curing-sealing-dustproofing compound.

1.03 PROJECT CONDITIONS

A. Protect concrete surfaces receiving curing-sealing-dustproofing compound in a manner acceptable compound manufacturer and applicator, that ensures that surface of concrete is maintained in condition without damage, deterioration, discoloring, or other surface imperfections that would impair aesthetic effect of final finish.

B. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit curing-sealing-dustproofing compound to be applied according to manufacturers' written instructions:

1. Ambient temperature is above 40 deg F.
2. Rain or snow is not predicted within 24 hours.
3. Application proceeds more than 24 hours after surfaces have been wet.
4. Substrate is not frozen, or surface temperature is above 40 deg F.
5. Windy conditions do not exist that may cause curing-sealing-dustproofing compound to be blown onto vegetation or surfaces not intended to be treated.

PART 2 - PRODUCTS

2.01 CURING-SEALING-DUSTPROOFING COMPOUND

A. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating.
1. VOC Content of Curing-Sealing-Dustproofing Compounds: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

PART 3 - EXECUTION

3.01 PREPARATION

A. When applied to cured concrete surfaces, clean substrate of substances that might interfere with penetration or performance of curing-sealing-dustproofing compound.

B. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of curing-sealing-dustproofing compound. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of compound being deposited on surfaces. Cover live plants and grass.

C. Coordination with Joint Sealants: Do not apply curing-sealing-dustproofing compound until sealants for joints adjacent to surfaces receiving curing-sealing-dustproofing compound treatment have been installed and cured.

1. Curing-sealing-dustproofing compound application may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, curing-sealing-dustproofing compound, and sealant materials identical to those used in the Work.

D. Coordination with Applied Paint Coatings: Do not apply curing-sealing-dustproofing compound until paint for way finding, warning striping, and other graphics have been applied and cured.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATION

A. Apply curing-sealing-dustproofing compound according to manufacturer's written instructions.

1. Apply compound to fresh concrete or cured concrete at Contractor's option.
2. 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 compound application and repair damage during curing period.

a. Fresh Concrete Application: Apply sealer after concrete has received final finish, and as soon as feasible after bleed water has disappeared and concrete has hardened sufficiently to support compound application operations.
b. Cured Concrete Application: Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs prior to compound application

3. Minimum Application Rate: Apply at no less than the manufacturer's recommended application rate.

3.03 CLEANING

A. Immediately clean curing-sealing-dustproofing compound from adjoining surfaces and surfaces soiled or damaged by compound application as work progresses. Repair damage caused by compound application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 03 35 63
SECTION 03 45 00 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Architectural precast concrete cladding units.
   3. Insulated, architectural precast concrete units.

1.02 DEFINITIONS

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

B. Structurally Composite Wythe Connectors: Structurally composite wythe connectors designed to transfer high shear forces that are generated due to longitudinal bending from one concrete wythe to the other, thus providing composite action. Composite action is achieved by transferring forces from one wythe to the other by using wythe tie connectors. The wythe tie should be solely responsible for transferring forces.

C. Structurally Non-Composite Wythe Connectors: Structurally non-composite wythe connectors have sufficient shear capacity to transfer the dead load of a typical fascia wythe. They are not capable of transferring shear forces due to the longitudinal bending of the panel. Typically, a non-composite wythe connector is flexible and will bend due to temperature induced forces.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings:
   1. Detail fabrication and installation of architectural precast concrete units.
   2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate details at building corners.
5. Indicate separate face and backup mixture locations and thicknesses.
6. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
8. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
9. Include plans and elevations showing unit location and sequence of erection for special conditions.
10. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
11. Indicate relationship of architectural precast concrete units to adjacent materials.
12. Indicate locations, dimensions, and details of thin-brick units, including corner units and special shapes, and joint treatment.
13. Indicate locations, dimensions, and details of stone facings, anchors, and joint widths.
14. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

E. Delegated-Design Submittal: For architectural precast concrete 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. Show governing panel types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

1.05 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Source quality-control test reports.

C. Field Quality-Control Reports:
1. For special inspections.
2. For testing and inspection of field welds and bolted connections.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:

1. A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for non-load Category S2 (Complex Structural Systems) for load-bearing members.

2. A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project and who can produce an Erectors' Post-Audit Declaration.

B. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units at time of bidding or designated as an APA-certified plant for production of architectural precast concrete products.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."


G. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1. Locate panels where indicated or, if not indicated, as directed by Architect.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.

3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.

4. Demolish and remove sample panels when directed.

H. Range Samples: After sample panel approval and before fabricating architectural precast concrete units, produce a minimum of three sets of samples, approximately 16 sq. ft. in area, representing anticipated range of each color and texture on Project's units. Maintain one set of range samples at Project site and remaining range sample sets at manufacturer's plant as color and texture approval reference.

I. Mockups: After sample panel and range sample approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup as indicated on Drawings including the following:

   a. Architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
   b. Aluminum framing, glass, sealants.

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 undamaged at time of Substantial Completion.

1.07 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design the following:

1. Architectural precast concrete units.

B. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

C. Calculated Fire-Test-Response Characteristics: Provide architectural precast concrete units with fire-resistance rating indicated as calculated according to either of the following and acceptable to authorities having jurisdiction:

1. ACI 216.1.
2. PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete."

D. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Loads: As indicated on Structural Drawings.
2. Design precast concrete units and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements.
   a. Upward and downward movement of 1/2 inch.
   b. Floors: L/300.
3. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.
4. Fire-Resistance Rating: Select material and minimum thicknesses to provide fire rating indicated on Drawings.
   a. Wall(s): 1 hour fire rating.
2.02 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that
provides continuous and true precast concrete surfaces within fabrication tolerances
indicated; nonreactive with concrete and suitable for producing required finishes.

  1. Mold-Release Agent: Commercially produced form-release agent that does not
bond with, stain or adversely affect precast concrete surfaces and does not
impair subsequent surface or joint treatments of precast concrete.

2.03 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60
or ASTM A 706/A 706M, deformed bars, assembled with clips.
D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from
galvanized-steel wire into flat sheets.
F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers,
and other devices for spacing, supporting, and fastening reinforcing bars and welded
wire reinforcement in place according to PCI MNL 117.

2.04 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416/A 416M, Grade 270, uncoated, seven-wire,
low-relaxation strand.

  1. Coat unbonded post-tensioning strand with post-tensioning coating complying
with ACI 423.7 and sheath with polypropylene tendon sheathing complying with
ACI 423.7. Include anchorage devices and coupler assemblies.

2.05 CONCRETE MATERIALS

A. Cementitious Materials:

  1. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless
otherwise indicated.

    a. For surfaces exposed to view in finished structure, use gray or white
cement, of same type, brand, and mill source.
2. **Supplementary Cementitious Materials:** Fly ash, slag cement, silica fume, metakaolin will not be accepted.

   a. **Fly Ash:** ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
   
   b. **Ground Granulated Blast-Furnace Slag:** ASTM C 989, Grade 100 or 120.
   
   c. **Silica Fume:** ASTM C 1240, with optional chemical and physical requirement.
   
   d. **Metakaolin:** ASTM C 618, Class N.

3. **Blended Hydraulic Cement:** ASTM C 595, of following type(s):

   a. **Type IS**, portland blast-furnace slag cement.
   
   b. **Type IP**, portland-pozzolan cement.
   
   c. **Type I (PM)**, pozzolan-modified portland cement.
   
   d. **Type I (SM)**, slag-modified portland cement.

B. **Normal-Weight Aggregates:** Except as modified by PCI MNL 117, ASTM C 33/C 33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. **Face-Mixture-Coarse Aggregates:** Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

   a. **Gradation:** To match design reference sample.

2. **Face-Mixture-Fine Aggregates:** Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.

C. **Coloring Admixture:** ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

D. **Water:** Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

E. **Air-Entraining Admixture:** ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

F. **Chemical Admixtures:** Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. **Water-Reducing Admixtures:** ASTM C 494/C 494M, Type A.
2. **Retarding Admixture:** ASTM C 494/C 494M, Type B.
3. **Water-Reducing and Retarding Admixture:** ASTM C 494/C 494M, Type D.
4. **Water-Reducing and Accelerating Admixture:** ASTM C 494/C 494M, Type E.
5. **High-Range, Water-Reducing Admixture:** ASTM C 494/C 494M, Type F.
6. **High-Range, Water-Reducing and Retarding Admixture:** ASTM C 494/C 494M, Type G.
7. **Plasticizing Admixture:** ASTM C 1017/C 1017M, Type I.
2.06 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283/A 283M, Grade C.

D. Malleable Iron Castings: ASTM A 47/A 47M, Grade 32510 or Grade 35028.


F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65.

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496/A 496M or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A or ASTM F 1554, Grade 36; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M, Grade A325 Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers.

L. Welding Electrodes: Comply with AWS standards.

2.07 STAINLESS STEEL CONNECTION MATERIALS

A. Provide stainless steel connections where exposed in the following locations:

1. Wash bays.

B. Stainless Steel Plate: ASTM A 666, Type 304, Type 316, or Type 201.

C. Stainless Steel Bolts and Studs: ASTM F 593, Alloy Group 1 or 2 hex-head bolts and studs; ASTM F 594, Alloy Group 1 or 2 stainless steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers.

1. Lubricate threaded parts of stainless steel bolts with an antiseize thread lubricant during assembly.
D. Stainless Steel-Headed Studs: ASTM A 276, Alloy 304 or Alloy 316, with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

2.08 BEARING PADS

A. Provide one of the following bearing pads for architectural precast concrete units as recommended by precast fabricator for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, Type A durometer hardness of 50 to 70, ASTM D 2240, minimum tensile strength 2250 psi, ASTM D 412.

2. Random-Oriented-Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Type A durometer hardness of 70 to 90, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.

3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; Type A durometer hardness of 80 to 100, ASTM D 2240; complying with AASHTO's "AASHTO LRFD Bridge Design Specifications," Division II, Section 18.10.2; or with MIL-C-882E.

4. Frictionless Pads: PTFE, glass-fiber reinforced, bonded to stainless or mild-steel plate, or random-oriented-fiber-reinforced elastomeric pads; of type required for in-service stress.


2.09 ACCESSORIES

A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.10 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150/C 150M, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.
C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.11 INSULATED PANEL ACCESSORIES

A. Extruded-Polystyrene (XPS) Board Insulation:

1. Type, Compressive Resistance, Thermal Resistance, Density, and Water Vapor Permeance:
   a. ASTM C 578, Type X, 15.0 psi, R-5.0/inch @ 75 deg F, 1.30 lb/cu. ft., 1.5 perm/inch.
   b. ASTM C 578, Type IV, 25.0 psi, R-5.0/inch @ 75 deg F, 1.45 lb/cu. ft., 1.5 perm/inch.

   1) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a) Dow Chemical Company (The); STYROFOAM Brand.
      b) Owens Corning; FOAMULAR 250.
   c. ASTM C 578, Type VI, 40.0 psi, R-5.0/inch @ 75 deg F, 1.80 lb/cu. ft., 1.1 perm/inch.
   d. ASTM C 578, Type VII, 60.0 psi, R-5.0/inch @ 75 deg F, 2.20 lb/cu. ft., 1.1 perm/inch.
   e. ASTM C 578, Type V, 100.0 psi, R-5.0/inch @ 75 deg F, 3.00 lb/cu. ft., 1.1 perm/inch.

2. Edges: Square.
3. Thickness: As indicated on Drawings.

B. Wythe Connectors: Units manufactured to connect wythes of precast concrete panels.

1. Fiber-Polymer Composite Wythe Connectors: Manufactured composite glass-fiber and vinyl-ester polymer connector rods, notched, with polymer collars injection molded around shaft of connector rod; alkaline resistant.
   a. Structural Action: Composite.
   b. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Composite Technologies Corporation; Thermomass MC/MS Series.

2.12 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.
1. Use a single design mixture for units with more than one major face or edge exposed.
2. Where only one face of unit is exposed use either a single design mixture or separate mixtures for face and backup.

B. Limit use of fly ash and ground granulated blast-furnace slag to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.

C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

D. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

E. Concrete Mixtures: Proportion concrete by either laboratory trial batch or field test data methods according to ACI 211.1 for normal weight concrete, with materials to be used on Project, to provide concrete with the following properties:

1. Proportion mixtures as normal weight concrete, separately for architectural face and structural backup, or singularly as full-depth, at fabricator's option.
   1) Compressive Strength (28 Days): 5000 psi minimum.
   2) Maximum Water-Cementitious Materials Ratio: 0.45.

2. Proportion mixture with normal weight concrete for both architectural face and structural backup:
   1) Compressive Strength (28 Days): 5000 psi minimum.
   2) Maximum Water-Cementitious Materials Ratio: 0.45.

3. Proportion mixture with normal weight concrete for full-depth of unit:
   1) Compressive Strength (28 Days): 5000 psi minimum.
   2) Maximum Water-Cementitious Materials Ratio: 0.45.

F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
2.13 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
   1. Form joints are not permitted on faces exposed to view in the finished work.
   2. Edge and Corner Treatment: Uniformly chamfered.

2.14 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
   1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect’s approval.

E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
   1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
   2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcing steel and prestressing strands to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

G. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.

   1. Delay detensioning or post-tensioning of precast, prestressed architectural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete unit.
   2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
   3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
   4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.

H. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

J. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

   1. Place backup concrete mixture to ensure bond with face-mixture concrete.

K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.

   1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.
L. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

M. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

O. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.15 INSULATED PANEL CASTING

A. Cast, screed, and consolidate bottom concrete wythe supported by mold.

B. Place insulation boards abutting edges and ends of adjacent boards. Insert wythe connectors through insulation holes, and consolidate concrete around connectors according to connector manufacturer's written instructions.

C. Ensure bottom wythe and insulation layer are not disturbed after bottom wythe reaches initial set.

D. Cast, screed, and consolidate top wythe to meet required finish.

E. Maintain temperature below 150 deg F in bottom concrete wythe.

2.16 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with the following product tolerances:

1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:
   a. 10 feet or under, plus or minus 1/8 inch.
   b. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch.
   c. 20 to 40 feet, plus or minus 1/4 inch.
   d. Each additional 10 feet, plus or minus 1/16 inch.

2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:
   a. 10 feet or under, plus or minus 1/4 inch.
   b. 10 to 20 feet, plus 1/4 inch, minus 3/8 inch.
c. 20 to 40 feet, plus or minus 3/8 inch.
d. Each additional 10 feet, plus or minus 1/8 inch.

3. Total Thickness or Flange Thickness: Plus 1/4 inch, minus 1/8 inch.
4. Rib Thickness: Plus or minus 1/8 inch.
5. Rib to Edge of Flange: Plus or minus 1/8 inch.
6. Distance between Ribs: Plus or minus 1/8 inch.
7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch/72 inches or 1/2 inch total, whichever is greater.
8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch.
9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch.
11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch.
13. Bowing: Plus or minus L/360, maximum 1 inch.
14. Local Smoothness: 1/4 inch/10 feet.
15. Warping: 1/16 inch/12 inches of distance from nearest adjacent corner.
16. Tipping and Flushness of Plates: Plus or minus 1/4 inch.

B. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch.
2. Inserts: Plus or minus 1/2 inch.
3. Handling Devices: Plus or minus 3 inches.
4. Reinforcing Steel and Welded Wire Reinforcement: Plus or minus 1/4 inch where position has structural implications or affects concrete cover; otherwise, plus or minus 1/2 inch.
5. Reinforcing Steel Extending out of Member: Plus or minus 1/2 inch of plan dimensions.
6. Tendons: Plus or minus 1/4 inch, vertical; plus or minus 1 inch, horizontal.
7. Location of Rustication Joints: Plus or minus 1/8 inch.
8. Location of Opening within Panel: Plus or minus 1/4 inch.
9. Location of Flashing Reglets: Plus or minus 1/4 inch.
10. Location of Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch.
12. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch.
13. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch.
14. Allowable Rotation of Plate, Channel Inserts, and Electrical Boxes: 2-degree rotation or 1/4 inch maximum over the full dimension of unit.
15. Position of Sleeve: Plus or minus 1/2 inch.
16. Location of Window Washer Track or Buttons: Plus or minus 1/8 inch.
2.17 FINISHES

A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units as follows:

1. Match approved design reference sample.
   a. Description, Fabricator and Code No.: EnCon Companies Stresscon CO-119 gray, acid etch.
   b. Description, Fabricator and Code No.: EnCon Companies Streecon CO-419 Brown/Red, acid etch.

2. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.

3. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attach.

B. Finish exterior exposed top and back surfaces of architectural precast concrete units to match face-surface finish.

C. Finish interior exposed top and back surfaces of architectural precast concrete units with smooth, steel-trowel finish.

D. Finish unexposed surfaces of architectural precast concrete units as follows:

   1. As cast finish.

2.18 SOURCE QUALITY CONTROL


B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

   1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

C. Strength of precast concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.
D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M and ACI 318.

1. A minimum of three representative cores shall be taken from units of suspect strength, from locations directed by Architect.
2. Test cores in an air-dry condition.
3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:
   a. Project identification name and number.
   b. Date when tests were performed.
   c. Name of precast concrete fabricator.
   d. Name of concrete testing agency.
   e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.
B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.

2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.

4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.

2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.

3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and recoat metal as follows:

   a. Galvanized Metal: Apply a minimum 4.0 mil thick coat of galvanized repair paint to surfaces according to ASTM A 780/A 780M.

   b. Painted Metal: Reprime damaged painted surfaces using same primer applied in shop.

4. Visually inspect welds and remove, rework, or repair incomplete and defective welds.
E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:
   c. Twist-off Tension Control Bolt: ASTM F3125/F 3125M, Grade 1852.
   d. Direct-Tension Control Bolt: ASTM F3125/F 3125M, Grade 1852.
3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

F. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.03 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and in alignment, without exceeding the following noncumulative erection tolerances:

1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch.
2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch.
3. Top Elevation from Nominal Top Elevation: As follows:
   a. Exposed Individual Panel: Plus or minus 1/4 inch.
   b. Non-Exposed Individual Panel: Plus or minus 1/2 inch.
   c. Exposed Panel Relative to Adjacent Panel: 1/4 inch.
   d. Non-Exposed Panel Relative to Adjacent Panel: 1/2 inch.

4. Support Elevation from Nominal Support Elevation: As follows:
   a. Maximum Low: 1/2 inch.
   b. Maximum High: 1/4 inch.

5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet: 1 inch.
8. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch.
12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch.
13. Opening Height between Spandrels: Plus or minus 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform special inspections.
   1. Special inspections are indicated on Structural Drawings.
   2. Special inspections include the following:
      a. Erection of loadbearing precast concrete members.
   3. Contractor's testing agency shall report test results promptly and in writing to Contractor and Architect.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
   1. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.
   2. Contractor's testing agency shall report test results promptly and in writing to Contractor and Architect.

C. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

3.05 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Touch-up metal anchors, connections, and other items as follows:
1. Galvanized Metal: Prepare and repair damaged galvanized coatings with a minimum of 4.0 mil thick coat of galvanized repair paint according to ASTM A 780/A 780M.

2. Prime-Painted Metal: Wire brush, clean, and paint damaged components using same primer applied in shop.

D. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.06 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 45 00
SECTION 03 53 19 - EMERY-AGGREGATE CONCRETE TOPPING CS-7

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes emery-aggregate concrete floor topping.

B. Topping Application Method: Either of following at Contractor’s discretion:

1. Method 2 - Deferred Floor Topping: Topping is applied to hardened (partially cured) concrete base slab within 72 hours of pour.

2. Method 3 - Floor Topping Applied Over Existing Aged Concrete: Topping is applied to existing (fully cured) concrete base slab.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each concrete floor topping, for tests performed by a qualified testing agency.

1.05 QUALITY ASSURANCE

A. Field Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer’s labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer’s written instructions to prevent deterioration from moisture or other detrimental effects.
1.07 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.

1. Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F.

B. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.01 CONCRETE FLOOR TOPPINGS

A. Emery-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of microemery aggregate; portland cement or blended hydraulic cement; latex modifiers; corrosion inhibitors; and other admixtures to which only water needs to be added at Project site.

1. Basis-of-Design Product: Subject to compliance with requirements, provide:
   a. L&M Construction Chemicals, Inc. (L&M); Emerytop 400.

2. Compressive Strength (28 Days): Not less than 10,000 psi; ASTM C 109/C 109M.

2.02 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Water: Potable.

2.03 RELATED MATERIALS

1. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids aromatic polyurea with a Type A Shore durometer hardness range of 90 to 95 according to ASTM D 2240.

B. Joint-Filler Strips: Either of following:
1. ASTM D 1751, asphalt-saturated cellulosic fiber.
2. ASTM D 1752, cork or self-expanding cork.

C. Portland Cement: ASTM C 150/C 150M, Type I or II.

D. Water: Potable.

E. Acrylic-Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

F. Epoxy Bonding Adhesive: ASTM C 881/C 881M, Type V or equivalent, multi-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

2.04 MIXING

A. Bonding Slurry:
   1. Mix portland cement and an acrylic-bonding agent according to manufacturer's written instructions to a thick paint consistency.

B. Floor Topping: Mix concrete floor topping materials and water in appropriate drum-type batch machine mixer or truck mixer according to manufacturer's written instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. For Deferred Floor Topping (Method 2): Verify that base concrete slabs comply with scratch finish requirements specified in Section 03 30 00 "Cast-in-Place Concrete."

C. For Floor Topping Applied Over Existing Aged Concrete (Method 3): Verify that base slabs are visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D 4263. Other moisture testing methods may be submitted for review and approval by Architect.

D. Proceed with application only after unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. For Method 3 - Floor Topping Applied Over Existing Aged Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch.

1. Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
2. Mechanically remove contaminants from existing concrete that might impair bond of floor topping.
3. Joints:
   a. Existing Contraction and Construction Joints: Remove existing joint filler (if any) from joints, clean joints, and fill with semirigid joint filler. Where existing joint spacings exceed spacings indicated below for new joints provide additional contraction joints.
   b. New Contraction Joints: Saw cut joints in existing concrete to a depth of 1/2 inch and fill with semirigid joint filler. Space joints as indicated on Drawings to produce panels; where not indicated space joints as follows:
      1) For 4 inch nominal slab depth space joints 8 feet o.c. maximum.
      2) For 6 inch nominal slab depth space joints 12 feet o.c. maximum.
      3) For 8 inch nominal slab depth space joints 16 feet o.c. maximum.
      4) Locate joints to produce panels square or nearly square; length shall not exceed 1.5 times width.

4. Edge Curling and Delamination Control:
   a. Mechanically remove a 4-inch-wide and 0- to 1-inch-deep, tapered wedge of concrete and retexture surface at both sides of joint edges and at perimeter of existing base slab.

B. Install joint-filler strips where topping abuts vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Where sealed joints are indicated on Drawings, terminate full-width joint-filler strips 1/2 inch below topping surface. Joint sealants are specified in Section 07 92 00 "Joint Sealants" for interior applications and Section 32 13 73 "Concrete Paving Joint Sealants" for exterior applications.
2. If sealed joints are not indicated on Drawings, extend joint-filler strips full width and depth of joint, terminating flush with topping surface.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.03 FLOOR TOPPING APPLICATION

A. Start floor topping application in presence of manufacturer's technical representative.
B. For Method 2 - Deferred Floor Topping: Within 72 hours of placing base slabs, mix and scrub bonding slurry into dampened concrete to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while slurry is still tacky.

C. For Method 3 - Floor Topping Applied Over Existing Aged Concrete: Prime existing concrete substrate using either of following methods:

1. Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while adhesive is still tacky.
2. Saturate concrete substrate with water to form a damp surface with no puddling. Immediately apply a scrub coat of concrete topping mix and place floor topping before scrub coat dries out.

D. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.

1. Screed surface with a straightedge and strike off to correct elevations.
2. Slope surfaces uniformly where indicated.
3. Begin initial floating, using bull floats or darbies to form a uniform and open-textured surface plane free of humps or hollows.

E. Hard Trowel Finish:

1. Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator or by hand using floats or darbies if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
2. After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel or by hand using floats or darbies, and without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.

   a. Finish and measure surface, so gap at any point between surface and an unleveled freestanding 10-foot-long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:

      1) 1/8 inch (3 mm).

F. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.

1. Coat face of construction joint with epoxy adhesive at locations where concrete floor topping is placed against hardened or partially hardened concrete floor topping.
G. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.

1. For Method 2 - Deferred Floor Topping:
   a. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch deep.

2. For Method 3 - Floor Topping Applied Over Existing Aged Concrete:
   a. Form joints in concrete floor topping over contraction joints in base slabs unless otherwise indicated.
   b. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch deep.

3.04 PROTECTING AND CURING

A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.

C. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, according to concrete floor topping manufacturer's written instructions:

   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days using one of the following:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover topping surfaces and edges with 12-inch lap over adjacent absorptive covers.

3.05 JOINT FILLING

A. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.

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 of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.06 REPAIR

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

3.07 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of completed applications of concrete floor toppings shall take place in successive stages, in areas of extent and using methods as follows:

1. Sample Sets: At point of placement, a set of three molded-cube samples shall be taken from the topping mix for the first 1000 sq. ft., plus one set of samples for each subsequent 5000 sq. ft. of topping, or fraction thereof, but not less than six samples for each day’s placement. Samples shall be tested according to ASTM C 109/C 109M for compliance with compressive-strength requirements.

2. Concrete floor topping shall be tested for delamination by dragging a steel chain over the surface.

3. Concrete floor topping shall be tested for compliance with surface flatness and levelness tolerances.

C. Remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 03 53 19
SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.02 SUMMARY
   A. Section Includes:
      1. Concrete masonry units including the following:
         a. Concrete masonry units nonloadbearing.
      2. Mortar and grout.

1.03 DEFINITIONS
   A. CMU(s): Concrete masonry unit(s).

1.04 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: For the following:
      1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

1.05 INFORMATIONAL SUBMITTALS
   A. Material Certificates: For each type and size of the following:
      1. Masonry units.
         a. Include material test reports substantiating compliance with requirements.
         b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
      2. Integral water repellant used in CMUs.
      3. Cementitious materials. Include name of manufacturer, brand name, and type.
      4. Grout mixes. Include description of type and proportions of ingredients.
   B. 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 TMS 602/ACI 530.1/ASCE 6.
1.06 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. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

B. Do not apply uniform floor 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 TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.


PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. 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.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.02 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 TMS 602/ACI 530.1/ASCE 6.

2.03 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.
2.04 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs Nonloadbearing: ASTM C 129.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as indicated on Structural Drawings.
2. Density Classification: Normal weight.
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.
5. Faces To Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.05 MORTAR AND GROUT MATERIALS

A. Water: Potable.

2.06 MORTAR 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.
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.

2.07 GROUT MIXES

A. General: Do not use admixtures, including air-entraining agents, accelerators, retarders, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in grout.

B. 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 TMS 602/ACI 530.1/ASCE 6 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 3000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.03 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.
3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet 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 nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
   3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 "Joint Firestopping."

3.05 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:
1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
   1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.06 FLASHING, WEEP HOLES, AND CAVITY 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 cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

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

C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
   1. Space weep holes 24 inches o.c. unless otherwise indicated.
   2. Space weep holes formed from plastic tubing 16 inches o.c.
   3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in “Miscellaneous Masonry Accessories” Article.

E. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products or open-head joints to form cavity vents.
   1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.
3.07 FIELD QUALITY CONTROL

A. Testing and Inspecting:
   1. Engage a qualified testing and inspecting agency to perform tests and inspections and to prepare and submit reports.
   2. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections.
   3. Retesting of materials that fail to comply with specified requirements shall be done at Contractor’s expense.

B. Testing Prior to Construction: One set of tests.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.08 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 concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
3.09 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 Section 31 20 00 "Earth Moving."
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00
SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 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."

1.02 COORDINATION

A. 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.

1.03 QUALITY ASSURANCE

A. 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 ASTM A 325 or A 490 Bolts."

1.04 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. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.
PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use Allowable Stress Design; data are given at service-load level.

B. Moment Connections: Type PR, partially restrained.

C. Construction: Braced frame Shear wall system Combined system of braced frame and shear walls Combined system of braced frame, and shear walls.

2.02 PRIMER

A. Anti-Corrosive Shop Primer: Either of following, compatible with finish paints specified to be used over it; use primer containing pigments that make it easily distinguishable from zinc-rich primer:

1. Anti-Corrosive Alkyd Primer for Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
2. Rust-Inhibitive, Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

2.03 FABRICATION

A. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

B. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

C. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
2. Weld threaded nuts to framing and other specialty items indicated to receive other work.
PART 3 - EXECUTION

3.01 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.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.03 REPAIRS AND PROTECTION

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

END OF SECTION 05 12 00
SECTION 05 21 00 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   2. KCS-type K-series steel joists.
   4. LH- and DLH-series long-span steel joists.
   5. Joist accessories.

1.02 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.03 ACTION SUBMITTALS

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

B. Shop Drawings:
   1. Include layout, designation, number, type, location, and spacing of joists.
   2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
   3. Indicate locations and details of bearing plates to be embedded in other construction.

1.04 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Mill Certificates: For each type of bolt.

D. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
   and "Standard Specifications for Composite Steel Joists, CJ-Series" in "Standard
   Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of
   Standard Practice."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage,
   and handling.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of
   withstanding design loads indicated.

   1. Use LRFD; data are given at factored-load level.
   2. Design special joists to withstand design loads with live-load deflections no
      greater than the following:


2.02 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for
   Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and
   bottom-chord members, underslung ends, and parallel top chord.


B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open
   Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel
   members.

C. Provide holes in chord members for connecting and securing other construction to
   joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord
   extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where
   indicated, complying with SJI's "Specifications."

F. Do not camber joists.
G. Camber joists according to SJI's "Specifications."

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

2.03 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.

B. Provide holes in chord members for connecting and securing other construction to joists.

C. Camber long-span steel joists according to SJI's "Specifications."

D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.04 JOIST ACCESSORIES


B. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

   1. Finish: Plain, uncoated.

D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

   1. Finish: Plain.

E. Welding Electrodes: Comply with AWS standards.

F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.
2.05 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," "Standard Specifications for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709.

C. Visually inspect bolted connections.

D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.04 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 21 00
SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roof deck.
   2. Composite floor deck.

1.02 ACTION SUBMITTALS

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

B. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.03 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.

D. Evaluation Reports: For steel deck.

E. Field quality-control reports.

1.04 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."
C. **FM Global Listing:** Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

### 1.05 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

#### 2.01 ROOF DECK

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. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. Cordeck.
4. DACS, Inc.
5. Epic Metals Corporation.
6. Marlyn Steel Decks, Inc.
7. New Millennium Building Systems, LLC.
9. Roof Deck, Inc.
10. Valley Joist; Subsidiary of EBSCO Industries, Inc.
11. Verco Manufacturing Co.

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. **Prime-Painted Steel Sheet:** ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
   
   a. **Color:** Gray top surface with white underside.

2. **Galvanized and Shop-Primed Steel Sheet:** ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
   
   a. **Color:** Gray top surface with white underside.

3. **Deck Profile:** As indicated.
4. Profile Depth: As indicated.
5. Design Uncoated-Steel Thickness: As indicated.
6. Span Condition: Triple span or more.
7. Side Laps: Overlapped or interlocking seam at Contractor’s option.

2.02 COMPOSITE FLOOR DECK

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. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. Cordeck.
4. DACS, Inc.
5. Epic Metals Corporation.
6. Marlyn Steel Decks, Inc.
7. New Millennium Building Systems, LLC.
9. Roof Deck, Inc.
10. Verco Manufacturing Co.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers’ standard white baked-on, rust-inhibitive primer.
2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer’s standard white baked-on, rust-inhibitive primer.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated Simpl span.

2.03 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; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

K. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.03 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

2. Weld Spacing: Weld edge and interior ribs of deck units as indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.
E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. 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.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.04 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

2. Weld Spacing: Space and locate welds as indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

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 or butted at Contractor's option.

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.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.06 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
   1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
   2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00
SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior non-load-bearing wall framing.
   2. Roof rafter framing.
   3. Ceiling joist framing.
   4. Soffit framing.

1.02 ACTION SUBMITTALS

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

B. Shop Drawings:
   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. 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.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
   1. Steel sheet.
   2. Expansion anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Horizontal drift deflection clips
   7. Miscellaneous structural clips and accessories.

D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.
1.04 QUALITY ASSURANCE

A. 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-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

B. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.05 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

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AllSteel & Gypsum Products, Inc.
2. California Expanded Metal Products Company.
3. ClarkWestern Building Systems, Inc.
4. Consolidated Fabricators Corp.; Building Products Division.
5. Craco Mfg., Inc.
6. Custom Stud Inc.
7. Design Shapes in Steel.
8. Dietrich Metal Framing; a Worthington Industries Company.
10. MarinoWARE.
11. Nuconsteel; a Nucor Company.
12. Olmar Supply, Inc.
13. Quail Run Building Materials, Inc.
14. SCAFCO Corporation.
15. Southeastern Stud & Components, Inc.
16. State Building Products, Inc.
19. Steel Structural Systems.
20. Steeler, Inc.
22. Telling Industries, LLC.
23. United Metal Products, Inc.
24. United Steel Manufacturing.
2.02 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: As indicated.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height.
   b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
   c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.
   d. Floor Joist Framing: Vertical deflection of 1/360 for live loads and 1/240 for total loads of the span.
   e. Roof Rafter Framing: Vertical deflection of 1/120 of the horizontally projected span for live loads.
   f. Ceiling Joist Framing: Vertical deflection of 1/120 of the span for live loads and 1/240 for total loads of the span.

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 inch.

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:

2. Wall Studs: AISI S211.

D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
E. 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.

2.03 COLD-FORMED STEEL FRAMING, GENERAL

A. 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: G60.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: To match studs.
2. Coating: G60.

2.04 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 indicated.

B. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AllSteel & Gypsum Products, Inc.
b. ClarkWestern Building Systems, Inc.
c. Dietrich Metal Framing; a Worthington Industries company.
d. MarinoWARE.
e. SCAFCO Corporation.
f. Steel Network, Inc. (The).
g. Steeler, Inc.

C. 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 indicated:
2.05 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges.

2.06 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges.

2.07 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.
3. Anchor clips.
4. End clips.
5. Foundation clips.
7. Joist hangers and end closures.

2.08 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. 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.

C. Welding Electrodes: Comply with AWS standards.

2.09 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
2.10 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.

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

3.01 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.
3.02 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 AISI S200 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.

3.03 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: As indicated.

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 studs 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 12 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.
      a. Install solid blocking at 96-inch centers.
   2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

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.
3.04 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
   1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
   2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:
   1. Joist Spacing: As indicated.

D. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
   1. Install web stiffeners to transfer axial loads of walls above.

E. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
   1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
   2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

F. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

G. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.05 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.
SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel framing and supports for ceiling-hung toilet compartments.
2. Steel framing and supports for operable partitions.
3. Steel framing and supports for overhead doors.
4. Steel framing and supports for countertops.
5. Steel tube reinforcement for half-high partitions.
6. Steel framing and supports for mechanical and electrical equipment.
7. Steel framing and supports for applications where framing and supports are not specified in other Sections.
8. Steel ladders (not for elevator pits).
9. Steel ship's ladders.
10. Stainless steel floor plate.
11. Structural-steel door frames.
12. Steel edgings.
14. Steel pipe guards.
15. Steel downspout and duct guards.
17. Metal downspout boots.
18. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts indicated to be cast into concrete or built into unit masonry.

1.02 COORDINATION

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

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
1.03 ACTION SUBMITTALS

A. Product Data: For the following:

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

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

1. Steel framing and supports for ceiling-hung toilet compartments.
2. Steel framing and supports for operable partitions.
3. Steel framing and supports for overhead doors.
4. Steel framing and supports for countertops.
5. Steel tube reinforcement for half-high partitions.
6. Steel framing and supports for mechanical and electrical equipment.
7. Steel framing and supports for applications where framing and supports are not specified in other Sections.
8. Steel ladders (not for elevator pits).
9. Steel ship’s ladders.
10. Stainless steel floor plate.
11. Structural-steel door frames.
12. Steel edgings.
14. Steel pipe guards.
15. Steel downspout guards.
17. Metal downspout boots.
18. Loose bearing and leveling plates for applications where they are not specified in other Sections.
19. Anchor bolts indicated to be cast into concrete or built into unit masonry.

C. Delegated-Design Submittal: For each of the following, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Ladders.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.
D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.05 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

2.01 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.

2.02 METALS

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

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304 or Type 316L.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

G. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.

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. IKG Industries, a division of Harsco Corporation.
   b. SlipNOT Metal Safety Flooring.
H. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

I. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

J. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   1. Size of Channels: As indicated.
   2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.079-inch nominal thickness.
   3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33; 0.0528-inch minimum thickness; unfinished.

K. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.


O. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.


Q. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).


2.03 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.
   4. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
C. Steel Bolts and Nuts (Weathering): Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 2.

E. 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.

F. 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/E 488M, conducted by a qualified independent testing agency.

G. 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.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical 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.

2.04 MISCELLANEOUS MATERIALS

A. Anti-Corrosive Shop Primer: Either of following, compatible with finish paints specified to be used over it; use primer containing pigments that make it easily distinguishable from zinc-rich primer:
   1. Anti-Corrosive Alkyd Primer for Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   2. Rust-Inhibitive, Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

B. Zinc-Rich Primer: Either of following, compatible with finish paints specified to be used over it:
   1. Organic Zinc-Rich Primer: Solvent based, one component, anti-corrosive primer for complying the MPI#18.
3. Epoxy Zinc-Rich Primer: Solvent based, two or three component, epoxy type complying with MPI#20.

C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

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

G. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.05 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 are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, 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.

2.06 STEEL SUPPORT FRAMING FOR CEILING-HUNG TOILET COMPARTMENTS

A. Fabricate supports from continuous steel beams or channels of sizes recommended by toilet compartment manufacturer with attached bearing plates, anchors, and braces as recommended by compartment manufacturer. Drill or punch bottom flanges of beams or channels to receive compartment track hanger rods; locate holes where indicated on toilet compartment Shop Drawings.

B. Shop Finish:
   1. Anti-corrosive primer.
   2. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.

2.07 STEEL SUPPORT FRAMING FOR OPERABLE PARTITIONS

A. Fabricate supports from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

B. Shop Finish:
   1. Anti-corrosive primer.
   2. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.
2.08 STEEL SUPPORT FRAMING FOR OVERHEAD DOORS

A. Fabricate supports for overhead doors in metal framed partitions walls as follows:

1. Support Posts: 4 inch square by 1/4 inch wall minimum, steel tube post with base plate and slip joint assembly at top, detailed to support ends of overhead door units.
   a. Base Plate: 3/8 inch thick rectangular or square as indicated on Drawings, Drill baseplates at all 4 corners for 1/2 inch anchor bolts.
   b. Slip Joint Assembly: Weldment, as indicated on Drawings, comprised of steel tube receptor sized to accept post and allow for only vertical movement of post in receptor. Attach receptor to overhead steel support angles sized to span between steel joist and beam or other deck support members.
   c. Door Support Plates: Steel plates, angle, or other steel unit required to attach overhead door unit to steel post. Comply with door manufacturer's recommendations for support plate location and fastening details.

2. Furnish expansion anchors of type required for attachment to concrete floor slab or deck.

B. Shop Finish:

1. Zinc-rich primer or
2. Galvanized or
3. Galvanized and primed with shop primer for galvanized steel.
   4. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.

2.09 STEEL SUPPORT FRAMING FOR COUNTERTOPS

A. Fabricate "L" shaped steel tube weldments from two 24-inch lengths of 2-inch square, 3/16-inch wall steel tube. Attached tube, end to side, at 90-degree angle; butt weld joint all around.

1. Provide longer tube leg if indicated on Drawings.

B. Shop Finish:

1. Anti-corrosive primer.

2.10 STEEL TUBE SUPPORT FRAMING FOR HALF-HIGH PARTITIONS

A. Fabricate half-high wall support framing from square steel tubing 3-1/2 by 3-1/2 by 1/4 inch wall-thickness.

1. Cap wall supports with 1/4-inch-thick steel plate.
B. Fabricate support framing with 3/8-inch thick steel baseplates for bolting to concrete slab. Drill baseplates at all 4 corners for 1/4-inch anchor bolts.

1. Where wall supports are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of support tubes.
2. For thru-bolted wall supports, provide backing plate fabricated same as baseplate.

C. Shop Finish:

1. Anti-corrosive primer.
2. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.

2.11 STEEL FRAMING AND SUPPORTS FOR MECHANICAL AND ELECTRICAL EQUIPMENT

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Shop Finish:

1. For Interior Dry Environment Locations: Anti-corrosive primer.
2. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.

2.12 STEEL FRAMING AND SUPPORTS FOR APPLICATIONS WHERE FRAMING AND SUPPORTS NOT SPECIFIED IN OTHER SECTIONS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Shop Finish:

1. For Interior Dry Environment Locations: Anti-corrosive primer.
2. For Exterior and Interior Wet Environment Locations:
   a. Zinc-rich primer or
   b. Galvanized or
   c. Galvanized and primed with shop primer for galvanized steel.
3. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.

2.13 STEEL LADDERS (NOT FOR ELEVATOR PITS)

A. General: Comply with ANSI A14.3.

B. Space siderails 18 inches apart unless otherwise indicated.

C. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.

D. Rungs:
   1. Size: 3/4-inch-square steel bars.
   2. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   3. Provide nonslip surfaces on top of each rung, either of following methods:
      b. By using a type of manufactured rung filled with aluminum-oxide grout.
      c. By coating with abrasive material metallically bonded to rung.

E. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch in least dimension.

F. Support each ladder with welded or bolted steel brackets.

G. Provide minimum 72-inch-high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

H. Shop Finish: Include brackets and fasteners:
   1. Zinc-rich primer or
   2. Galvanized or
   3. Galvanized and primed with shop primer for galvanized steel.

2.14 STEEL SHIPS' LADDERS

A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
   1. Treads shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, and riser height shall be not more than 9-1/2 inches.
2. Fabricate railings from steel; Comply with applicable railing requirements in Section 05 52 13 "Pipe and Tube Railings."

3. Fabricate treads and platforms from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.

4. Fabricate treads and platforms from abrasive-surface floor plate.

B. Shop Finish:

1. Anti-corrosive primer.

2.15 STAINLESS STEEL FLOOR PLATE

A. Fabricate from rolled-stainless-steel floor plate.

1. Thickness: 1/4 inch.
2. Provide abrasive surfaced floor plate.

2.16 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.

1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

C. Shop Finish:

1. Zinc-rich primer or
2. Galvanized or
3. Galvanized and primed with shop primer for galvanized steel.

2.17 STEEL EDGINGS

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. Shop Finish:
   1. Zinc-rich primer or
   2. Galvanized or
   3. Galvanized and primed with shop primer for galvanized steel.

2.18 STEEL BOLLARDS, PERMANENTLY SET IN CONCRETE FOOTINGS
   A. Fabricate metal bollards from Schedule 40 steel pipe.
   B. Shop Finish:
      1. Zinc-rich primer or
      2. Galvanized or
      3. Galvanized and primed with shop primer for galvanized steel.

2.19 STEEL PIPE GUARDS
   A. Fabricate pipe guards from 3/8-inch- thick by 12-inch- wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.
   B. Shop Finish:
      1. Anti-corrosive primer.

2.20 STEEL DOWNSPOUT & DUCT GUARDS
   A. Fabricate downspout & duct guards from 3/8-inch- thick by 12-inch- wide steel plate or wider, bent to fit flat against the wall or column at both ends and to fit around pipe or duct with 2-inch clearance between pipe or duct and pipe or duct guard. Drill each end for two 3/4-inch anchor bolts.
   B. Shop Finish:
      1. Anti-corrosive primer.

2.21 ABRASIVE METAL NOSINGS
   A. Cast-Metal Units: Cast bronze (leaded red or semired brass), with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
      1. Nosings: Cross-hatched units, 4 inches wide with 1-inch lip, for casting into concrete.
      2. Nosings: Cross-hatched units, 1-1/2 by 1-1/2 inches, for casting into concrete.
B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

   1. Provide two rows of holes for units more than 5 inches wide, with two holes aligned at ends and intermediate holes staggered.

D. Apply bituminous paint to concealed surfaces of cast-metal units.

2.22 METAL DOWNSPOUT BOOTS

A. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.

   1. Outlet: At 35 degrees from horizontal, to discharge onto splash block or pavement.

B. Shop Finish:

   1. Zinc-rich primer or
   2. Galvanized or
   3. Galvanized and primed with shop primer for galvanized steel.

2.23 LOOSE BEARING AND LEVELING PLATES

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

B. Shop Finish:

   1. Anti-corrosive primer.

2.24 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
2.25 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. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean items of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. 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.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

3. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.26 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

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

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

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

1. Cast Aluminum: Heavy coat of bituminous paint.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

B. Framing for Ceiling Hung Toilet Partitions: Anchor supports securely to, and rigidly brace from, building structure.
C. Framing for Operable Partitions: Anchor supports securely to, and rigidly brace from, building structure.

D. Framing for Overhead Doors: Anchor supports securely to, and rigidly brace from, building structure.

3.03 INSTALLING METAL BOLLARDS PERMANENTLY SET IN CONCRETE FOOTINGS

A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

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

3.04 INSTALLING PIPE GUARDS

A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch bolts at each pipe guard. Mount pipe guards with top edge 26 inches above driving surface.

3.05 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

A. Center nosings on tread widths unless otherwise indicated.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 07 92 00 "Joint Sealants" to provide a watertight installation.

3.06 INSTALLING BEARING AND LEVELING PLATES


B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
3.07 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 Section 09 91 13 "Exterior Painting." and Section 09 91 23 "Interior Painting."

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

END OF SECTION 05 50 00
SECTION 05 51 13 - METAL PAN STAIRS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Preassembled steel stairs with abrasive-coating-finished, formed-metal treads.
   2. Steel tube railings attached to metal stairs and cane detection.
   3. Steel tube handrails attached to walls adjacent to metal stairs.

1.02 COORDINATION

A. Coordinate installation of anchorages for metal stairs. 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.

B. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.03 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:
   1. Paint products.

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

C. Samples for Verification: For each type and finish of nosing and tread.

D. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alfab, Inc.
2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design stairs and railings.

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 loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

C. Structural Performance of Railings and Cane Detection: Railings and Cane Detection 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.

2.03 METALS

A. Metal Surfaces, General: 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 A 36/A 36M.

C. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

D. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.
2.04 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for .

D. Post-Installed Anchors: Torque-controlled expansion 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/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.05 MISCELLANEOUS MATERIALS

A. Anti-Corrosive Shop Primer: Either of following, compatible with finish paints specified to be used over it; use primer containing pigments that make it easily distinguishable from zinc-rich primer:

1. Anti-Corrosive Alkyd Primer for Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

2. Rust-Inhibitive, Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

2.06 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, 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. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

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 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. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.07 STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Service Class, unless more stringent requirements are indicated.

B. Stair Framing:
   1. Fabricate stringers of steel plates channels.
      a. Provide closures for exposed ends of channel stringers.
   2. Construct platforms of steel plate channel headers and miscellaneous framing members as needed to comply with performance requirements.
   3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
   4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
C. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.097 inch.

1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

2.08 STAIR RAILINGS

A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-1/2-inch-square top and bottom rails and 1-1/2-inch-square posts.
2. Intermediate Rails Infill: 1-1/2-inch-square intermediate rails spaced less than 12 inches clear.

B. Welded Connections: Fabricate railings with 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. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter as shown in NAAMM AMP 521.

C. Form changes in direction of railings as follows:

1. By flush bends or by inserting prefabricated flush-elbow fittings.

D. 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.

E. Close exposed ends of railing members with prefabricated end fittings.

F. 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.

G. Connect posts to stair framing by direct welding unless otherwise indicated.
H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

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

2.09 FINISHES

A. Shop Finish:

1. Anti-corrosive primer.

B. Finish metal stairs after assembly.

C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:


E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.01 INSTALLING METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. 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.
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. 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.

F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.02 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

1. Anchor posts to steel by welding or bolting to steel supporting members.
2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with 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.
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Steel pipe and tube railings.

1.02 COORDINATION

A. 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.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Paint products.

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

C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
1.07 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

2.01 MANUFACTURERS
A. Steel Pipe and Tube Railings:
   1. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS
A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.
B. 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. 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.

2.03 METALS, GENERAL
A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.04 STEEL AND IRON
A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.05 MISCELLANEOUS MATERIALS

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

B. Anti-Corrosive Shop Primer: Either of the following, compatible with finish paints specified to be used over it; use primer containing pigments that make it easily distinguishable from zinc-rich primer.
   1. Anti-Corrosive Alkyd Primer for Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   2. Rust-Inhibitive, Water-Base Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

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

D. 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.

2.06 HARDWARE

A. Hinges: BHMA A156.1, Grade 1, suitable for interior use.
   2. Material: Wrought steel, forged steel, cast steel, or malleable iron.

B. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 1/2-inch-diameter, round steel bars. Finish to match gates. Provide steel pipe strikes to receive cane bolts in closed position.

C. Padlock Hasp & Stop: Fabricated from steel barstock; see Drawings.
2.07 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. 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.

H. Form Changes in Direction as Follows:
   1. As detailed.

I. 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.

J. Close exposed ends of railing members with prefabricated end fittings.

K. 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.
L. For railing posts set in concrete, provide sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

1. For steel railings provide steel sleeves.

M. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.08 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 requirements indicated below:


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.

PART 3 - EXECUTION

3.01 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.

3.02 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.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

3.03 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.04 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

1. Steel Railings: Finish anchorage joint as follows:
   a. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

3.05 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 05 52 13
SECTION 05 53 13 - BAR GRATINGS

PART 1 - GENERAL

1.01 SUMMARY
A. Section includes metal bar gratings and metal frames and supports for gratings.

1.02 COORDINATION
A. Coordinate installation of anchorages for gratings, grating frames, and supports.
Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.03 FIELD CONDITIONS
A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 METAL BAR GRATINGS
A. Metal Bar Grating Standards: Comply with NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."

B. Welded Steel Grating:
1. Bearing Bar Spacing: 1-3/16 inches o.c.
2. Bearing Bar Depth: 2 inches.
4. Crossbar Spacing: 4 inches o.c.
5. Traffic Surface: Plain.
6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.

2.02 FERROUS METALS
A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
B. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.

C. Wire Rod for Bar Grating Crossbars: ASTM A 510.

D. Uncoated Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30.

E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 33, with G90 coating.

2.03 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.04 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. 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 material 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 from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and 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.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

   1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
   2. Fabricate toeplates for attaching in the field.
   3. Toeplate Height: 4 inches unless otherwise indicated.
G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.

1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.
2. Furnish threaded bolts with nuts and washers for securing grating to supports.
3. Furnish self-drilling fasteners with washers for securing grating to supports.

H. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

I. Do not notch bearing bars at supports to maintain elevation.

2.05 GRATING FRAMES AND SUPPORTS

A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.

1. Unless otherwise indicated, fabricate from same basic metal as gratings.
2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

B. Galvanize steel frames and supports in the following locations:

1. Exterior.
2. Interior.

2.06 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. 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.
PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. 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 gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. 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. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with AWS recommendations and 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.

3.02 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.03 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.
SECTION 05 58 26 - METAL COUNTERTOPS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Stainless-steel countertops.

1.02 DEFINITIONS

A. Gage Equivalents: For reference only using Specified Thickness from Tables in ASTM A480; see Permitted Variation in Tables for acceptable tolerances.
   1. 18 gage = 0.047 inch.
   2. 16 gage = 0.059 inch.
   3. 14 gage = 0.079 inch.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal countertops only after casework has been completed in installation areas.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.05 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

B. Sealant for Countertops: Manufacturer’s standard sealant of characteristics indicated below that complies with applicable requirements in Section 07 92 00 "Joint Sealants."

1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
3. Color: As selected by Architect from manufacturer's full range.
4. Sealant shall have a VOC content of 250 g/L or less.

2.02 STAINLESS-STEEL COUNTERTOPS

A. Countertops: Fabricate from 0.059 inch 0.079 inch thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch (25 mm) over the base cabinets.

2. Weld shop-made joints.
3. Sound deaden the undersurface with heavy-build mastic coating.
4. Extend the top down to provide a 1-inch thick edge with a 1/2-inch return flange.

2.03 STAINLESS-STEEL FINISH

A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 INSTALLATION

A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.

B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

3.03 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 05 58 26
SECTION 05 70 01 - ALUMINIUM PLATE WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Aluminum diamond plate wall panel.
   2. Aluminum smooth plate panel.

1.02 ACTION SUBMITTALS
A. Product Data: For each type of product, including finishing materials.
B. Shop Drawings: Show fabrication and installation details for decorative metal.
   1. Include plans, elevations, component details, and attachment details.
   2. Indicate materials and profiles of each decorative metal member, finishes, and fasteners.

1.03 QUALITY ASSURANCE
A. Fabricator Qualifications: A firm experienced in producing decorative metal similar to that indicated for this Project and with a record of successful in-service performance.
B. Installer Qualifications: Fabricator of products.

1.04 DELIVERY, STORAGE, AND HANDLING
A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.05 FIELD CONDITIONS
A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.
PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: Use materials with smooth, flat surfaces unless otherwise indicated. Use materials without stains, discolorations, or blemishes.

2.02 ALUMINUM PLATE WALL PANELS

A. Fabricate products from alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.


   1. Aluminum diamond plate:
      a. Size: As indicated on Drawings.
      b. Thickness: 0.125 inch.
      c. Finish: Mill.
   2. Aluminum smooth plate.
      a. Size: As indicated on Drawings.
      b. Thickness: 0.125 inch.
      c. Finish: Mill.

2.03 FASTENERS

A. Fasteners: Provide the following:
   1. Type 304 stainless-steel Phillips head fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to anchor indicated items to other types of construction indicated.

2.04 FABRICATION, GENERAL

A. Cut 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.
2.05 FINISHES, GENERAL

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

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.

B. Perform drilling and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels.

C. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

D. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.

END OF SECTION 05 70 01
SECTION 05 75 00 - DECORATIVE FORMED METAL SIGN PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior formed-metal-shaped sign panels, perforated.

1.02 COORDINATION

A. Coordinate installation of anchorages for decorative formed metal items. 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 items to Project site in time for installation.

B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes of deterioration.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

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

1. Include plans, elevations, component details, and attachment details.

2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

C. Samples for Verification: For each type of exposed finish required, prepared on 6-inch-square Samples of metal of same thickness and material indicated for the Work.

D. 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.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.
1.05 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.01 SHEET METAL

A. General: Fabricate products from sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Aluminum Sheet: Flat sheet complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties of not less than Alloy 5005-H32.

1. Metal Thickness: 0.125 inch.
2. Perforation Pattern: 0.750 inch on 1.25 inch - 33% Open.
3. Text Pattern: Delegated Design using Drawing perforated panel elevations for font, text, and image. Adams County logo to be provided to manufacturer after selection.
4. Forming: J-Bends all 4 sides with 0.5 inch circular openings at top and bottom of panel on bended edge. Location of circular openings as indicated on Drawings.

C. Basis-of-Design Manufacturer: Subject to compliance with requirements; Hendrick Architectural; contact Paul Yacabitis: pyacabitis@hendrickcorp.com.

2.02 MISCELLANEOUS MATERIALS

A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless otherwise indicated.
2. Provide self-drilling screws for aluminum sub-framing connections.

B. Aluminum Sub-Framing

1. Include all angles and tee's required to attach to structural tubing.
2. Finish: Mill.
2.03 FABRICATION, GENERAL

A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.

D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.

   1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.

F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.

G. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.

   1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.

2.04 GENERAL FINISH REQUIREMENTS

A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
2.05 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

B. Warranty: 5 year minimum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

C. Install concealed gaskets, joint fillers, insulation, sealants, and flashings, as the Work progresses, to make exterior decorative formed metal items weatherproof.

D. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.

3.03 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.

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.
3.04 PROTECTION

A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 05 75 00
SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.01 REFERENCES

A. Definitions:

1. Applications:
   a. Architectural Work: Applications for carpentry work requiring a greater degree of precision, less warp, less bow, fewer knots and other defects which may affect finish tolerances and other performance of the Work.
   b. Utility Work: Applications for carpentry where economy is of greater importance than precision and performance of the Work; temporary rough carpentry.

2. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

3. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.02 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

2.01 WOOD PRODUCTS, GENERAL

A. Named Wood Species: Lumber species named in this Section may be known by other names (e.g. Idaho white pine may also be known as Western white pine or White pine). Provide named species or same species as known by another name that can be verified in an authoritative reference such as "The Encyclopedia of Wood", Sterling Publishing Co., Inc.

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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
a. If acceptable with Authorities having Jurisdiction, markings may be omitted if certificates of grade compliance issued by grading agency are submitted.

3. Dress lumber, S4S, unless otherwise indicated.

2.02 MISCELLANEOUS LUMBER

A. General: Provide the following miscellaneous lumber where indicated and lumber for support or attachment of other construction.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate supports to comply with requirements for attaching other construction.

C. Do not splice structural members between supports unless otherwise indicated.

D. Sort and select lumber so that natural characteristics do 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.

E. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. ICC-ES evaluation report for fastener.

F. Fastening to Wood: 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.

G. Fastening to Metal: Use screw type fasteners 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. Do not countersink screw heads unless otherwise indicated.

H. Bolt and Nut Fastening: Where indicated, bolt and nut fasten carpentry work. Recess bolts and nuts flush with surfaces unless otherwise indicated.
3.02 PROTECTION

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

END OF SECTION 06 10 53
SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wall sheathing of following type(s).
   a. Plywood.

2. Composite nail base insulated wall sheathing of following type(s).
   a. Plywood-surfaced (fire-retardant-treated), polyisocyanurate-foam (Class A).

3. Parapet sheathing of following type(s).
   a. Glass-mat gypsum.

4. Fasteners.

1.02 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.

1.03 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

2.01 WALL SHEATHING

A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.

1. Span Rating: Not less than 20/0.
2. Nominal Thickness: Not less than 5/8 inch.
2.02 COMPOSITE NAIL BASE INSULATED WALL SHEATHING

A. Plywood-Surfaced, Polyisocyanurate-Foam Sheathing: ASTM C 1289, Type V with either DOC PS 1 or DOC PS 2, Exposure 1 fire-retardant plywood on one face.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. Cornell Corporation.
   c. Dow Chemical Company (The).
   d. Hunter Panels Xci Ply (Class A).
   e. Johns Manville; a Berkshire Hathaway company.
   f. Rmax, Inc.

2. Polyisocyanurate-Foam:
   a. Grade: ASTM C 1289, Type II; Class 1; Grade 2, 20 psi.
   b. Flame-Spread and Smoke Developed Index: 25 or less and 450 or less respectively when test according to ASTM E 84 or UL 723, including facings.
   c. Thickness: 3-1/2 inches.
   d. Plywood Nominal Thickness: 5/8 inch.

3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

2.03 PARAPET SHEATHING

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

1. Type and Thickness: Type X, 5/8 inch thick.

2.04 FASTENERS

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

1. Roof, Parapet, and Wall Sheathing Fasteners:
   a. Provide one of following at contractor's discretion, unless indicated otherwise:
      1) Fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
2) Fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
3) Fasteners of Type 304 stainless steel.

b. Provide fasteners either with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel for the following Work:

1) Sheathing exposed to weather.
2) Sheathing in areas of high relative humidity.
3) Interior exposed sheathing that is pressure-preservative treated (WPT).
4) Sheathing that is fire-resistive-treated (FRT).

c. Provide only Type 304 stainless steel fasteners for the following Work:

1) Sheathing that is part of exterior building envelope that is pressure-preservative treated (WPT).
2) Sheathing that is in contact with earth or below grade.

B. Nails, Brads, and Staples: ASTM F 1667.

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 C 1002.

E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing with the following metal thickness, use screws that comply with ASTM C 1002:

   a. 18 mil (25 gage).
   b. 27 mil (22 gage).
   c. 30 mil (20 gage drywall).
   d. Less than 0.0329 inch.

2. For steel framing with the following metal thickness, use screws that comply with ASTM C 954:

   a. 33 mil (20 gage structural).
   b. 43 mil (18 gage).
   c. 54 mil (16 gage).
   d. 68 mil (14 gage).
   e. From 0.033 to 0.112 inch.
F. Screws for Fastening Composite Nail Base Insulated Wall Sheathing to Metal Stud Framing: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

PART 3 - EXECUTION

3.01 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. ICC-ES evaluation report for fastener.

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, parapet, and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 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 panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install panels 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, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel 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 panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel 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 panels.
2. For sheathing under stucco cladding, panels 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.

END OF SECTION 06 16 00
SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced architectural cabinets.
   2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

1.02 REFERENCES

A. Acronyms:
   1. AWS - Architectural Woodwork Standards and its joint adoptees and publishers including:
      a. AWI - Architectural Woodwork Institute.

B. Definitions:
   1. Exposed Surfaces: (See AWS for detailed inclusions and exclusions.)
      a. Exterior surfaces exposed to view.
      b. Interior surfaces exposed to view in open casework or behind transparent doors.

   2. Semi-Exposed Surfaces: Interior surfaces only exposed to view when doors or drawers are opened. (See AWS for detailed inclusions and exclusions.)

   3. Concealed surfaces: Exterior or interior surfaces that are covered or not normally exposed to view. (See AWS for detailed inclusions and exclusions.)

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
1. **Product Data:** For adhesives, indicating that product contains no urea formaldehyde.

2. **Product Data:** For composite wood products, indicating that product contains no urea formaldehyde.

**C. 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 electrical switches and outlets installed in architectural plastic-laminate cabinets.

**D. Samples for Initial Selection:**

1. Plastic laminates.
2. PVC edge material.

**E. Samples for Verification:**

1. Plastic laminates, 12 by 12 inches, for each type, color, pattern, and surface finish.
2. Wood-grain plastic laminates, 12 by 24 inches, for each type, pattern and surface finish, with one sample applied to core material.
3. Thermoset decorative panels, 12 by 12 inches, for each color, pattern, and surface finish, with edge banding on one edge.
4. 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.
   b. Miter joints for standing trim.
5. Exposed cabinet hardware and accessories, one unit for each type and finish.

**1.05 INFORMATIONAL SUBMITTALS**

**A. Qualification Data:** For fabricator and installer.

**B. Product Certificates:** For each type of product.

1. Composite wood and agrifiber products.
2. Thermoset decorative panels.
3. High-pressure decorative laminate.
4. Adhesives.
1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets are 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 cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 ARCHITECTURAL PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.02 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Grade: Premium Custom.

B. Type of Construction: Type A - Frameless.

C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

E. Laminate Cladding for Exposed Surfaces:

1. Vertical Surfaces: Grade VGS.
2. Edges: Grade VGS.

F. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
   a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
   b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS Grade CLS.
2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

I. 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 by laminate manufacturer’s designations as indicated on Drawing’s General Finishes Legend.

2.03 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 4 to 9 percent.

B. Composite Wood and Agrifiber Products:

1. Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

2. Sustainability Characteristics:

   a. Composite Wood Products: Products shall be made without urea formaldehyde.


2.04 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 120 degrees of opening, self-closing.

C. Wire Pulls: Back mounted, solid metal, 5 inches long, 2-1/2 inches deep, and 5/16 inch in diameter.

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.

F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

G. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.
4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
5. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Door and Drawer Silencers: BHMA A156.16, L03011.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
   2. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.05 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: 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 metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate:
   1. For the following uses:
      a. General Use: Unpigmented contact cement, contact cement, PVA, or resorcinol.
      b. General Use Postforming: Unpigmented contact cement or contact cement.
      c. Through-Color Laminates: Unpigmented contact cement or PVA.
e. Cabinets Constructed with Fire-Retardant Treated Wood: Resorcinol.

f. Postformed Cabinet Construction: Do not use PVA or resorcinol.


2.06 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly 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 before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, 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.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.02 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

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, and at ends not more than 16 inches o.c. using following fastener types:
   a. Wood Framing, Blocking or Hanging Strips: No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood.
   b. Metal Backing or Framing Behind Wall Finish:
      1) No. 10 wafer-head sheet metal screws.
      2) Toggle bolts.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, 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 cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16
SECTION 06 61 19.13 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertops.
2. Quartz agglomerate backsplashes.
3. Quartz agglomerate end splashes.

1.02 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. One full-size quartz agglomerate countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.05 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.
1.06 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.01 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Cambria.
   b. Cosentino USA.

2. Colors and Patterns: Match Architect's samples.

B. Plywood Subtop: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.02 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom.

B. Configuration:

1. Front: Beveled.
2. Backsplash: Beveled.

C. Countertops: 1/2-inch- 3/4-inch- thick, quartz agglomerate .

D. Backsplashes: 1/2-inch- 3/4-inch- thick, quartz agglomerate.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
F. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.

1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
2. Joint Type: Bonded, 1/32 inch or less in width.
3. Joint Type: Grouted, 1/16 inch in width.
4. Joint Type: Sealant filled, 1/16 inch in width.
5. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
   a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
   b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
   c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.03 INSTALLATION MATERIALS

A. Adhesive: Product recommended by quartz agglomerate manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.

B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Fasten subtops to support framing by screwing through subtops into framing material. Shim as needed to align subtops in a level plane.

E. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

F. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

G. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 06 61 19.13
SECTION 06 64 00 - PLASTIC PANELING - FRP-1

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Plastic sheet paneling of following type(s):

2. Accessories including:
   a. Plastic trim.
   b. Sealant.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 QUALITY ASSURANCE

A. Testing Agency: Acceptable to authorities having jurisdiction.

1.04 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.02 PLASTIC SHEET PANELING

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. Crane Composites, Inc.
   b. Glasteel.
   c. Marlite.

2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

3. Nominal Thickness: Not less than 0.09 inch.
4. Surface Finish: As selected by Architect from manufacturer's full range.
5. Color: As selected by Architect from manufacturer's full range.

2.03 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, and caps as needed to conceal edges.

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

B. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.
B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels so that trimmed panels at corners are not less than 12 inches wide.

1. Mark plumb lines on substrate at following locations for accurate installation:
   a. Trim accessory.

2. Locate following to allow clearance at panel edges according to manufacturer's written instructions:
   a. Trim accessories.

3.03 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install trim accessories with adhesive. Do not fasten through panels.

C. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

D. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

E. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 64 00
SECTION 07 11 13 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Cold-applied, emulsified-asphalt dampproofing.
   2. Protection course.
B. Damproofing applications include the following:
   1. Unexposed face of retaining walls.
   2. On steel connections in footings and foundation walls below grade, where precast panels connect to footings and to each other.

1.02 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.03 FIELD CONDITIONS
A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL
A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course auxiliary materials recommended in writing by manufacturer of primary materials.

B. Where more than one type of dampproofing material is indicated for the same application, use either material at Contractor's discretion.

C. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.02 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING
A. Trowel Coats: ASTM D 1227, Type II, Class 1.
B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.03 AUXILIARY MATERIALS

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

B. Cut-Back-Asphalt Primer: ASTM D 41. For use only at foundation walls outside the weatherbarrier, and at retaining walls.

C. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

D. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

E. Patching Compound for Concrete Substrates: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.

F. Protection Course: Either of following at Contractor's discretion:

1. 1/8-inch-thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners, complying with ASTM D 6506.

2. Fan folded, with a core of extruded-polystyrene board insulation faced on one side or both sides with plastic film, nominal thickness 1/4 inch, with a compressive strength of not less than 8 psi per ASTM D 1621, and maximum water absorption by volume of 0.6 percent per ASTM C 272.

3. Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch thick.

4. Smooth-surfaced roll roofing complying with ASTM D 6380, Class S, Type III.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover reveals and construction joints with asphalt-coated glass fabric.

3.03 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. On steel connections in footings and foundation walls below grade, where precast panels connect to footings and to each other: Apply one trowel coat at not less than 1/16 inch thick. Extend over adjacent concrete surfaces not less than 2 inches.

B. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft..

3.05 INSTALLATION OF PROTECTION COURSE

A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
2. Install protection course on same day of installation of dampproofing (while coating is tacky) to ensure adhesion.
3.06 CLEANING

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

END OF SECTION 07 11 13
SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Modified bituminous sheet waterproofing.
   2. Blindside sheet waterproofing.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
   1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

C. Samples: For each exposed product and for each color and texture specified, including the following products:
   1. 8-by-8-inch square of waterproofing and flashing sheet.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.05 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.06 WARRANTY

A. Manufacturer’s Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Installer’s Special Warranty: Specified form, on warranty form at end of this Section, signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, from single source from single manufacturer.

2.02 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Physical Properties:
a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970/D 1970M.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836/C 836M.
e. Puncture Resistance: 40 lbf minimum; ASTM E 154/E 154M.
f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
g. Water Vapor Permeance: 0.05 perm maximum; ASTM E 96/E 96M, Water Method.
h. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.

2. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.03 BLINDSIDE SHEET WATERPROOFING

A. Blindside Sheet Waterproofing for Horizontal Applications: Uniform, flexible, multilayered-composite sheet membrane that forms a permanent bond with fresh concrete placed against it; complete with accessories and preformed shapes for an unbroken waterproofing assembly; with the following physical properties:

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. Carlisle Coatings & Waterproofing Inc; MiraPLY-H.
   b. Polyguard Products, Inc.; Underseal Underslab Membrane.
   c. W.R. Meadows, Inc; SealTight PRECON.

2. Physical Properties:
   b. Peel Adhesion to Concrete: 5 lbf/in. minimum; ASTM D 903, modified.
   c. Lap Adhesion: 5 lbf/in. minimum; ASTM D 1876, modified.
   e. Puncture Resistance: 200 lbf minimum; ASTM E 154/E 154M.
   f. Water Vapor Permeance: 0.1 perm maximum; ASTM E 96/E 96M, Water Method.
   g. Ultimate Elongation: 335 percent minimum; ASTM D 412, modified.

B. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
2.04 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

   1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne or solvent-borne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch, predrilled at 9-inch centers.

G. Protection Course:

   1. ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

      a. Thickness: Nominal 1/4 inch.
      b. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

   2. Fan folded, with a core of extruded-polystyrene board insulation faced on one side with plastic film, nominal thickness 1/4 inch, with compressive strength of not less than 8 psi per ASTM D 1621, and maximum water absorption by volume of 0.6 percent per ASTM C 272/C 272M.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of waterproofing.

   1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer’s written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips of width according to manufacturer’s written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer’s written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

   a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
   b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.
3.03 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

   1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths, to provide a minimum of two thicknesses of sheet membrane over areas to receive waterproofing.

E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

G. Seal edges of sheet-waterproofing terminations with mastic.

H. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

I. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

J. Immediately install protection course with butted joints over waterproofing membrane.

   1. may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.04 BLINDSIDE SHEET-WATERPROOFING APPLICATION

A. Install blindside sheet waterproofing according to manufacturer's written instructions.

B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.
C. Vertical Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.

1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detail tape.

D. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.

E. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

F. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

G. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests.

B. Manufacturer's Field Service: Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

C. Flood Testing: Flood test each deck area for leaks, according to procedures in ASTM D 5957, after completing waterproofing but before placing overlying construction. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and a maximum depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
2. Flood each area for 72 hours.
3. Testing agency shall observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.
4. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

D. Electronic Leak-Detection Testing:

1. Testing agency shall test each deck area for leaks using an electronic leak-detection method that locates discontinuities in the waterproofing membrane.
2. Testing agency shall perform tests on abutting or overlapping smaller areas as necessary to cover entire test area.
3. Testing agency shall create a conductive electronic field over the area of waterproofing to be tested and electronically determine locations of discontinuities or leaks, if any, in the waterproofing.
4. Testing agency shall provide survey report indicating locations of discontinuities, if any.

E. Waterproofing will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.06 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

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

END OF SECTION 07 13 26
SECTION 07 16 16 - CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY
A. Section includes crystalline waterproofing.

1.02 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, and installation instructions.

1.04 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Applicator.
B. Product Certificates: For each type of waterproofing, patching, and plugging material.
C. Product Test Reports: For each product formulation, for tests performed by manufacturer and witnessed by a qualified testing agency.
D. Field quality-control reports.

1.05 FIELD CONDITIONS
A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions.
B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.
C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F or above during work and cure period, and space is well ventilated and kept free of water.
PART 2 - PRODUCTS

2.01 WATERPROOFING MATERIALS

A. Crystalline Waterproofing: Prepackaged, gray-colored proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and concrete unit masonry and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate; with properties complying with or exceeding the criteria specified below.

1. Water Permeability: Maximum zero for water at 30 feet when tested according to COE CRD-C 48.
2. Compressive Strength: Minimum 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.02 ACCESSORY MATERIALS

A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; and compatible with substrate and other materials indicated.

B. Water: Potable.

2.03 MIXES

A. Crystalline Waterproofing: Add prepackaged dry ingredients to water according to manufacturer's written instructions. Mix together with mechanical mixer or by hand to required consistency.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for suitable conditions where waterproofing is to be applied.

B. Proceed with application only after unsatisfactory conditions have been corrected.

C. Notify Architect in writing of active leaks or defects that would affect system performance.
3.02 PREPARATION

A. Comply with manufacturer’s written instructions.

B. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.

C. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.

D. Stop active water leaks with plugging compound.

E. Repair damaged or unsatisfactory substrate with patching compound.
   1. At holes and cracks 1/16 inch wide or larger in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and minimum 1 inch deep. Fill reveal with patching compound flush with surface.

F. Surface Preparation: Remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form-release agents to ensure that waterproofing bonds to surfaces.
   1. Clean concrete surfaces according to ASTM D 4258.
      a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic acid solution according to ASTM D 4260.
   2. Concrete Joints: Clean reveals.

3.03 APPLICATION

A. General: Comply with waterproofing manufacturer’s written instructions for application and curing.
   1. Saturate surface with water for several hours and maintain damp condition until applying waterproofing. Remove standing water.
   2. Apply waterproofing to surfaces, and extend waterproofing onto adjacent surfaces as follows:
      a. Onto every substrate in areas indicated for treatment, including pits.
   3. Number of Coats: Two.
   4. Application Method: Apply to ensure that each coat fills voids and is in full contact with substrate or previous coat.
   5. Dampen surface between coats.

B. Final Coat Finish: Smooth.
Curing: Moist-cure waterproofing for three days immediately after final coat has set, followed by air drying, unless otherwise recommended in writing by manufacturer.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed application of waterproofing.

B. Prepare test and inspection reports.

END OF SECTION 07 16 16
SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Extruded polystyrene foam-plastic board.

B. Applications include:
   1. Under slab-on-grade.
   2. On exterior foundation walls surfaces backfilled.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.04 DELIVERY, STORAGE, AND HANDLING

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

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

2.01 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Extruded Polystyrene Board, Type VII: ASTM C 578, Type VII, 60-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Applications include:
   a. Under slab-on-grade.


2.02 MORTAR-FACED FOAM-PLASTIC BOARD INSULATION

A. Mortar-Faced, Extruded-Polystyrene Board Insulation:  ASTM C 578, Type VI, 1.8-lb/cu. ft. minimum density, with tongue-and-groove edges on long dimension, and latex-modified cement mortar topping, 15/16 inch thick, 11 lb/sq. ft. Include manufacturer's galvanized steel mounting clips and clip fasteners.

1. Insulation Thickness: 2 inches.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. T. Clear Corporation; WallGuard.

2.03 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: 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.

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. CertainTeed Corporation.
   b. Guardian Building Products, Inc.
   c. Johns Manville; a Berkshire Hathaway company.
   d. Knauf Insulation.
   e. Owens Corning.
2.04 ACCESSORIES

A. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

1. Adhesives shall have a VOC content of 70 g/L or less.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

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

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.03 INSTALLATION UNDER SLAB-ON-GRADE

A. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. Stagger end joints and tightly abut insulation units.
2. Seal seams and penetrations with joint tape centered over joints.

3.04 INSTALLATION AT FOUNDATION WALL EXTERIOR FACE

A. Butt panels together for tight fit.
B. Mortar-Faced Board Insulation: Install according to manufacturer's written instructions, with tongue-and-groove joints nested and oriented as indicated on Drawings. Mechanically fasten tongue-and-groove edges using manufacturer furnished metal securement clips and fasteners; clips must be concealed in nested joints. Finish exposed ends of panels at outside corners according to manufacturer's written instructions; corners shall be cut clean and smooth, ends of cement board shall be flush with face of adjacent panel; plastic-foam material shall be fully concealed.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.05 PROTECTION

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

END OF SECTION 07 21 00
SECTION 07 26 16 - BELOW-GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes vapor retarders for use beneath concrete slabs set on earthen grade and receiving floor finishes sensitive to the transmission of water vapor from below. Section includes the following:

1. Vapor retarder with Performance Class A sheet membrane.
2. Aggregate fill materials used with vapor retarder.

B. Locate vapor retarder where indicated on Drawings.

1.02 REFERENCES

A. ACI - American Concrete Institute:

1. ACI 302.1R, "Guide for Concrete Floor and Slab Construction."

1.03 DEFINITIONS

A. Floor Finishes Sensitive to Water Vapor Transmission:

1. Materials bonded to concrete slab using latex, acrylic, epoxy, or water-solvent-based adhesives.
2. Materials specified to be installed on concrete tested for moisture-vapor-emission rate not exceeding 3 lb. of water/1000 sq. ft. in 24 hours or for relative humidity level not exceeding 75 percent.
3. Paints and coatings with alkyd, urethane, epoxy, acrylic, or silicone formulations.
4. Resilient sheet or tile flooring including vinyl, rubber, and linoleum products.
5. Carpeting with synthetic, vinyl, or other plastic material backing.
6. Access flooring supported by pedestals bonded to concrete slab with epoxy adhesive.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review vapor-retarder installation.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
1.06 INFORMATIONAL SUBMITTALS
    A. Minutes of preinstallation conference.

1.07 QUALITY ASSURANCE
    A. Installer Qualifications: Installer must be certified or approved by vapor retarder manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
    A. Source Limitations: Obtain vapor retarder sheet, tape, sealants, and adhesives from single source from single manufacturer.

2.02 VAPOR RETARDERS
    A. Preformed, flexible sheet material complying with ASTM E 1745, Performance Class A.
    1. Water Vapor Permeance: Maximum 0.1 perms or 0.1 gr/(h x sq.ft. x in.Hg).
    2. Tensile Strength: Minimum 45.0 lbf/in..
    3. Puncture Resistance: Minimum 2200 g.
    4. Include manufacturer's recommended adhesive tape or pressure-sensitive tape.
    5. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
       a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
       b. Fortifiber Building Systems Group; Moistop Ultra 15.
       e. Raven Industries Inc.; Vapor Block 15.
       g. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.03 AGGREGATE FILL MATERIALS
    A. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2 inch sieve and 0 to 5 percent passing a No. 8 sieve.
B. Fine-Graded Granular Material or Sand: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8 inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install vapor retarders below interior concrete slabs-on-grade on prepared subgrade where indicated on Drawings.

B. Placement Method: Place vapor retarder as indicated in ACI 302.1R, using one of the following Methods for the conditions indicated:

1. Method 1: For conditions where earthen grade is directly exposed to the overhead sky and will get wet when it rains:
   a. Place vapor retarder over 3 inches of well graded fine-graded granular material or sand, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.
   b. Concrete slab is placed directly on vapor retarder.

2. Method 2: For conditions where earthen grade is in a fully enclosed structure or protected from rain by an overhead covering or roof:
   a. Place vapor retarder over well graded compacted subgrade.
   b. Place 3 inches of well graded fine-graded granular material or sand over vapor retarder, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.
      1) Place and compact a 1/2 inch thick layer of fine-graded granular material over granular fill.
   c. Concrete slab is placed on granular material.

C. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

3.02 PROTECTION

A. Protect vapor retarder from damage including cutting and puncturing. If vapor retarder is damaged during subsequent construction operations repair damage and reseal vapor retarder before placing concrete.

END OF SECTION 07 26 16
SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Vapor-permeable, fluid-applied air barriers; either of the following at Contractor's discretion:
      a. High-build type.
      b. Medium-build type.
      c. Low-build type.

1.02 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.
1.05 INFORMATIONAL SUBMITTALS
   A. Field quality-control reports.

1.06 QUALITY ASSURANCE
   A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
   B. Protect stored materials from direct sunlight.

1.08 FIELD CONDITIONS
   A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
      1. Protect substrates from environmental conditions that affect air-barrier performance.
      2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.01 MATERIALS
   A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS
   A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.03 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. High-Build, Vapor-Permeable Air Barrier: synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.

1. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
   c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
   d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.
   e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   f. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

2.04 MEDIUM-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. Medium-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 17 to 30 mils over smooth, void-free substrates.

1. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
   c. Ultimate Elongation: Minimum 250 percent; ASTM D 412, Die C.
   d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.
   e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   f. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.
2.05 LOW-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. Low-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 6 to 15 mils over smooth, void-free substrates.

1. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
   c. Ultimate Elongation: Minimum 250 percent; ASTM D 412, Die C.
   d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.
   e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   f. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

2.06 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer’s written instructions and details.
3.03 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply preformed silicone extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.
2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, transition strip.
I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.04 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils, applied in one or more equal coats.

C. Medium-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Permeable, Medium-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, applied in one or more equal coats. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.

D. Low-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Permeable, Low-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, applied in one or more equal coats. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.
E. Do not cover air barrier until it has been tested and inspected by testing agency.

F. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Include the following

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

C. Tests: Include the following:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.06 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.

2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26
SECTION 07 42 13.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY
   A. Section Includes:
      1. Concealed-fastener, lap-seam metal wall panels.

1.02 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include construction details, material descriptions, dimensions of individual
         components and profiles, and finishes for each type of panel and accessory.
   B. Shop Drawings:
      1. Include fabrication and installation layouts of metal panels; details of edge
         conditions, joints, panel profiles, corners, anchorages, attachment system, trim,
         flashings, closures, and accessories; and special details.
      2. Accessories: Include details of the flashing, trim, and anchorage systems, at a
         scale of not less than 1-1/2 inches per 12 inches.
   C. Samples for Verification: For each type of exposed finish, prepared on Samples of size
      indicated below:
      1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures,
         and other metal panel accessories.

1.03 INFORMATIONAL SUBMITTALS
   A. Sample Warranties: For special warranties.

1.04 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For metal panels to include in maintenance manuals.

1.05 QUALITY ASSURANCE
   A. Installer Qualifications: An entity that employs installers and supervisors who are
      trained and approved by manufacturer.
1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.07 FIELD CONDITIONS

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

1.08 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.09 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.
   3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.02 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Flush-Profile, Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Morin; a Kingspan Group company; Concealed F-12 or comparable product by one of the following:
      a. AEP Span; a BlueScope Steel company.
      b. ATAS International, Inc.
      c. Berridge Manufacturing Company.
      d. CENTRIA Architectural Systems.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   a. Nominal Thickness: 0.035.
   c. Color: Match: Morin; a Kingspan Group company; Weathered Zinc (Mica) 439RZ1563M.

4. Panel Height: 1.5 inches.

2.03 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, Mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

2.04 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

   a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.
2.05 FINISHES

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

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.01 EXAMINATION

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

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

   a. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.03 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

5. Flash and seal panels with weather closures at perimeter of all openings.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.

2. 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 waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.04 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.13
SECTION 07 46 46.13 - FIBER-CEMENT SIDING RAINSCREEN (FCS-1 & FCS-2)

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fiber-cement panel siding:
      a. FCS-1 - Panel siding with extruded aluminum trim joints.
   2. Fiber-cement soffit/ceiling panels:
      a. FCS-2 - Soffit/ceiling panel with extruded aluminum trim joints.
   3. Furring and backing of following material(s):
      a. Metal furring and backing.
   4. Metal flashing and trim of following material(s):
      a. Extruded aluminum.
   5. Vent and insect screening of following material(s):
      a. Plastic mesh type.
      b. Metal wire screen type.
   6. Fasteners for:
      a. Furring strips.
      b. Fiber-cement siding.

B. Products Installed but not Furnished under this Section:
   1. Metal flashing and trim is furnished under Section 07 62 00 "Sheet Metal Flashing And Trim."

1.02 DEFINITIONS

A. Panel as in "Panel Siding" and "Soffit/Ceiling Panel:" Fiber-cement units manufactured to not less than 3 feet wide and 8 feet long.
1.03 REFERENCE STANDARDS


2. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. to 0.112 in. in Thickness.
10. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel studs.

B. ASME - ASME International; (American Society of Mechanical Engineers):

1. ASME B18.6.1 Wood Screws (Inch Series).

C. WCLIB - West Coast Lumber Inspection Bureau.

D. WWPA - Western Wood Products Association.
1.04 COORDINATION
A. Coordinate siding installation with trim, flashings, and other adjoining construction to ensure proper sequencing.
B. Coordinate locations of stud framing in walls to ensure alignment with locations of furring.

1.05 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include the following:
   1. Material descriptions, dimensions of individual components and profiles, and finishes.
   2. Construction details.
   3. Storage and handling requirements.
B. Samples for Verification: For each type, color, texture, and pattern required.
   1. Fiber-cement Panel Siding: 24 inches wide by 36 inches long.
   2. Fiber-cement soffit/ceiling panels: 24 inches wide by 36 inches long.
   3. Metal flashing and trim: 24 inches long.
   4. Vent and insect screening: 12 inches long.
   5. Fasteners.

1.06 INFORMATIONAL SUBMITTALS
A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding used in fire-resistive rated walls.
B. Research/Evaluation Reports: For the following from the ICC or other reporting service acceptable to Authorities having Jurisdiction. Reports must include fastener spacing requirements for typical applications.
   1. Fiber-cement panel siding.
   2. Fiber-cement soffit/ceiling panels.
C. Warranty: Sample of special warranty(ies).

1.07 CLOSEOUT SUBMITTALS
A. Maintenance Data: For each type of siding and related accessories to include in maintenance manuals.
1.08 QUALITY ASSURANCE

A. Sample Panels (for approved Substitutions): After sample approval and before delivering products to site produce a minimum of of two sample panels approximately 16 sq. ft. in area and assembled on plywood backing for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels using specified furring, trim, and fasteners at required spacings.

1. Locate panels where indicated or, if not indicated, as directed by Architect.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After acceptance of repair technique, maintain sample panels at Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

C. Protect siding edges and corners from damage.

1.10 WARRANTY

A. Special Siding Finishes Warranty: Manufacturer agrees to repair finish or replace fiber-cement siding products that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Siding Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to fiber-cement siding.

2. Finish Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 FIBER-CEMENT PANEL SIDING

A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E136; with a flame-spread index of 25 or less and smoke developed index of 5 or less when tested according to ASTM E84.

B. Panel Siding - FCS-1:

1. Manufactured Size: 48 inches wide by not less than 96 inches long. Provide longer panels where required by panel layout indicated on Drawings.

2. Nominal Thickness:
   a. 5/16 inch.
   b. 5/16 inch minimum, 7/16 inch maximum.
   c. 3/8 inch.
   d. 3/8 inch minimum, 7/16 inch maximum.
   e. 7/16 inch.


4. Vertical Pattern:
   a. None.
   b. Grooves 6 inches o.c.

5. Edges: Plain, square style.

6. Finish:

7. Basis of Design Product: Subject to compliance with requirements, provide the following:
   a. Nichiha Fiber Cement; VintageWood Cedar with aluminum trim/mounting system.
   b. Or comparable product by one of the following manufacturers.

1) American Fiber Cement Corp.; Minerit HD.
2) Cemplank.
3) CertainTeed Corp.
4) James Hardie; Hardie Panel Vertical Siding Smooth.
5) MaxiTape, Inc; a California corporation.
c. Comparable product shall be submitted as a substitution required prior to procurement.

2.02 FIBER-CEMENT SOFFIT/CEILING PANELS

A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E136; with a flame-spread index of 25 or less and smoke developed index of 5 or less when tested according to ASTM E84.

B. Soffit/Ceiling Panel - FCS-2:

1. Manufactured Size: 48 inches wide by not less than 96 inches long. Provide longer panels where required by panel layout indicated on Drawings.

2. Nominal Thickness:
   a. 1/4 inch.
   b. 5/16 inch.
   c. 5/16 inch minimum, 7/16 inch maximum.
   d. 3/8 inch.
   e. 3/8 inch minimum, 7/16 inch maximum.
   f. 7/16 inch.


4. Horizontal Pattern:
   a. None.
   b. Grooves 6 inches o.c.

5. Edges: Plain, square style.

6. Finish:

7. Basis of Design Product: Subject to compliance with requirements, provide the following:
   b. Or comparable product by one of the following manufacturers.
      1) American Fiber Cement Corp.; Minerit HD.
      2) Cemplank.
      3) CertainTeed Corp.
      4) James Hardie; Hardie Panel Vertical Siding Smooth.
      5) MaxiTile, Inc; a California corporation.
2.03 FURRING AND BACKING

A. Metal Furring and Backing: As specified by Basis of Design Product Nichiha Ultimate Clip System or ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation.

1. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   a. Minimum Base-Metal Thickness: 0.033 inch (20 ST ga.).

2. Hat-Shaped, Rigid Furring Channels: ASTM C645 with furring face of width indicated below.
   a. Minimum Base-Metal Thickness: 0.033 inch (20 ST ga.).

3. Z-Shaped Furring: With furring face flange of width indicated below, wall attachment flange of 7/8 inch.
   a. Minimum Base-Metal Thickness:
      1) Vertical Furring Attached to Horizontal Furring: 0.033 inch (20 ST ga.).
      2) Horizontal Furring (Girts) Supporting Vertical Furring: 0.043 inch (18 ga.).

4. Furring Face Width:
   a. At Abutting Siding Edges: 3-1/2 inches minimum.
   b. At Siding Edges Abutting other Materials: 1-1/4 inches minimum.
   c. In Siding Field: 1-1/4 inches minimum.

2.04 METAL FLASHING AND TRIM

A. Extruded Aluminum Trim: Profiles and dimensions as specified by Basis of Design Product Nichiha Tamlyn trim or Products for Comparable Panel Products.

1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
2. Minimum Wall Thickness: 0.050 inch.
3. Minimum Length: 8 feet prior to field cutting.
4. Throat Depth:
   b. Nominal 1/2 inch for 3/8 inch thick fiber-cement siding.
   c. Nominal 1/2 inch for 7/16 inch fiber-cement siding.
5. Available Flashing and Trim Products for Comparable Panel Products: Subject to compliance with requirements:
   a. Comparable products by one of the following:
      1) Gordon, Inc.
      2) Pittcon Industries.
      3) James Hardie

6. Profiles:
   a. Horizontal Base Trim:
      1) For use at bottom edge of lowest siding panel, producing 1/2 inch reveal.
      2) Available Product:
         a) Fry; FCP-Base.
   b. Horizontal Reveal Trim:
      1) For use where horizontal edge of adjoining siding panels meet in field of wall, producing 1/2 inch reveal.
      2) Available Product:
         a) Fry; FCP-Horizontal.
         b) HardieReveal2.0; Prime 9000319 and 9000373.
   c. Horizontal Drip Trim:
      1) For use at bottom edge of lowest siding panel, producing 1/2 inch reveal.
      2) For use at bottom edge of siding panel located over door and window headers, producing 1/2 inch reveal.
      3) Available Product:
         a) Fry; FCP-Drip Cap.
         b) HardieReveal2.0; Prime 9000321.
   d. Vertical Reveal Trim:
      1) For use where vertical edge of adjoining siding panels meet in field of wall, with 1 inch reveal.
      2) Available Product:
         a) Fry; FCP-Vertical.
   e. Vertical Edge 'J' Trim:
      1) For use where vertical edge of siding panel abuts dissimilar material.
      2) Available Product:
f. Vertical Inside Corner Trim:

1) For use where vertical edge of adjoining siding panels meet at inside corner of wall.
2) For use where vertical edge of siding panel abuts dissimilar material.
3) Available Product:
   a) Fry; FCP-Inside Cnr.
   b) HardieReveal2.0; Prime 9000374.

g. Vertical Outside Corner Trim:

1) For use where vertical edge of adjoining siding panels meet at outside corner of wall.
2) Available Product:
   a) Fry; FCP-Outside Cnr.
   b) HardieReveal2.0; Prime 9000318.

2.05 VENT AND INSECT SCREENING

A. Plastic Mesh Type: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

2. Mesh Thickness: Manufacturer’s standard thickness slightly thicker than rainscreen cavity.
   a. For 3/8 inch cavity provide 1/2 inch thick mesh.
   b. For 7/8 inch cavity provide 1 inch thick mesh.
3. Mesh Height: Strips, cut to 2-1/2 inch high from manufacturer’s standard 10 inch high product.

B. Metal Wire Mesh Type:

1. Application: Where exposed to view.
2. Material and Mesh:
   a. Aluminum, 18-by-16 mesh.
   b. Stainless steel, 18-by-18 mesh.

2.06 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacturer.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and soffit/ceiling and related accessories.

1. Confirm that a minimum 3/8 inch continuous air cavity remains clear behind siding for venting purposes and that drainage plane (back side of siding) remains continuous to its lowest level (weep level) subsequent to installation of siding.

B. Ensure that penetrations through weather barrier are sealed in accordance with Section Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.03 INSTALLATION, GENERAL

A. General: Comply with fiber-cement siding manufacturer’s written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Install fasteners at spacing indicated, but no more than 24 inches o.c.
3. Seal field cut edges of fiber-cement siding with cut edge sealer.

B. Install joint sealants where indicated on Drawings, as specified in Section 07 92 00 "Joint Sealants."

3.04 WALL FURRING INSTALLATION

A. Layout and fasten furring vertically and plumb, in locations to produce siding layout indicated on Drawings. Horizontal furring installed on cavity drainage plane will not be accepted.

B. Space furring not more than 16 inches o.c. Maintain even spacing within siding field.

C. At abutting siding edges use furring with 3-1/2 inch minimum face width.

D. At siding edges abutting other materials use furring with minimum face width of 1-1/2 inches for wood and 1-1/4 inches for metal.
E. In siding field use furring with minimum face width of 1-1/2 inches for wood and 1-1/4 inches for metal.

F. Fastening Furring:
   1. Offset furring fasteners 1 inch minimum from siding fasteners.
   2. Space fasteners as indicated on approved furring/fastening schedule(s) Submittal.

3.05 VENT AND INSECTION SCREENING INSTALLATION

A. Plastic Mesh Type Screening: Install snugly between vertical furring at following locations:
   1. Behind horizontal base flashing and trim with bottom edge of screening slightly above bottom face of flashing and trim.
   2. Behind horizontal drip flashing and trim.
   3. Behind top edge of uppermost siding.
   4. Where indicated on Drawings.

B. Metal Wire Mesh Type: Install where indicated on Drawings. Form screening to profiles required to fit conditions indicated, with sufficient hem to lap and fasten mesh behind trim.

3.06 METAL FLASHING AND TRIM INSTALLATION

A. Extruded Aluminum Trim: Install to produce panel siding layout indicated on Drawings and as follows:
   1. Install trim at following locations:
      a. Horizontal Base Trim: At bottom edge of lowest siding panel, except where drip trim is indicated.
      b. Horizontal Reveal Trim: At horizontal edges of abutting siding panels in field of wall.
      c. Horizontal Drip Trim: At bottom edge of siding panels located over heads of doors, windows, and other openings.
      d. Vertical Reveal Trim: At vertical edges of abutting siding panels in field of wall.
      e. Vertical Edge 'J' Trim: At vertical edges of siding panels abutting dissimilar materials.
      f. Vertical Inside Corner Trim: At vertical edges of adjoining siding panels meeting at inside corners of wall.
      g. Vertical Outside Corner Trim: At vertical edges of adjoining panels meeting at outside corners of wall.
   2. Install horizontal trim continuous across face of wall.
   3. Install inside and outside corner trim continuous full height of wall.
4. Cut vertical 'J' and reveal trim to terminate at each horizontal trim.
5. Where aluminum trim will contact dissimilar metals, protect against galvanic action by painting contact surfaces with bituminous paint or by applying galvanic corrosion inhibiting tape.

3.07 PANEL SIDING SOFFIT/CEILING PANEL INSTALLATION

A. At horizontal joints maintain a 1/2 inch clear air space (reveal) between edge of panel and horizontal surface of metal trim below.
   1. Bottom edge of panel must be the factory primed edge only; field-cut bottom edges will not be accepted. Bottom edges must remain exposed to air in completed construction.
   2. Sealant filled reveals will not be accepted.

B. Cut fiber-cement panels to produce layout indicated on Drawings; use means and methods recommended in writing by panel manufacturer. Prime cut edges using manufacturer recommended primer. Field-cut bottom edges will not be accepted.

C. Coordinate installation of panel siding with parapet copings, drip edges, roof eave and rake flashing, scuppers and conductor heads, and other penetrations.
   1. Ensure that waterproof underlayments and flexible flashings lap over face of panel siding.
   2. Ensure that drips deflect water away from the siding.

D. Maintain the following clearances between bottom edge of siding panels and adjacent construction below:
   1. 6 inches minimum above landscaped finished grade.
   2. 2 inches minimum above hard surfaced pavements, walkways, decks, roof planes, and similar construction.

E. Fastening Panel Siding:
   1. Place fasteners no closer than 3/4 inch from panel edges and no closer than 2 inches from panel corners.
   2. Arrange fasteners in evenly spaced and straight horizontal rows, and straight, plumb vertical rows.

F. Fastening Soffit/Ceiling Panels:
   1. Place fasteners no closer than 3/4 inch from panel edges and no closer than 2 inches from panel corners.
   2. Arrange fasteners in evenly spaced and rows.
3.08 INSTALLATION

A. Cut fiber-cement boards to produce layout indicated on Drawings; use means and methods recommended in writing by panel manufacturer. Prime cut edges using manufacturer recommended primer.

B. Coordinate installation of board siding with parapet copings, drip edges, roof eave and rake flashing, scuppers and conductor heads, and other penetrations.
   1. Ensure that waterproof underlayments and flexible flashings lap over face of board siding.
   2. Ensure that drips deflect water away from the siding.

C. Maintain the following clearances between bottom edge of siding boards and adjacent construction below:
   1. 6 inches minimum above landscaped finished grade.
   2. 2 inches minimum above hard surfaced pavements, walkways, decks, roof planes, and similar construction.

3.09 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align fiber-cement siding to within installed tolerance of 1/4 inch in 20 feet on exposed high points of siding faces, and within 1/16 inch offset of adjoining faces.

3.10 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07 46 46.13
SECTION 07 53 23 – ADHERED EPDM SINGLE-PLY ROOFING

PART 1 - GENERAL

1.01 DESCRIPTION: Furnish the labor, administration, materials and equipment to integrate the work into the overall building system so as to provide a leak free, EPDM (Ethylene Propylene Diene Monomer) elastomeric roof system. The system is an assembly of components including the insulation, roofing membrane, metal flashings, and all related parts necessary to complete the assembly.

1.02 Adhered EPDM single-ply roof systems are to be installed at the Adams County Fleet/Public Works Service Facility. A brief description of the major base bid work items follows:

A. Single-Ply Roofing – Metal Decking Assembly
   1. Set a base layer of 2” thick isocyanurate foam insulation over the metal decking. Cover the base layer of foam with a layer of 3.5” thick isocyanurate foam insulation. Secure both layers of insulation simultaneously to the decking with FM Approved screw and plate insulation fasteners.
   2. Set tapered insulation crickets over the base layers of foam where indicated on the roof plans. Secure tapered insulation boards with low rise foam adhesive.
   3. Set a 0.5” thick gypsum cover board over the layers of foam insulation. Secure the cover board with low rise foam adhesive.
   4. Install an adhered 60 mil thick EPDM roof membrane over the cover board.
   5. Install cured and uncured EPDM flashings.

B. Single-Ply Roofing – Concrete Decking Assembly With Vapor Retarder
   1. Over the concrete roof decking, set a self-adhering modified bitumen vapor retarder.
   2. Set a base layer of 2” thick isocyanurate foam insulation over the concrete decking. Cover the base layer of foam with a layer of 3.5” thick isocyanurate foam insulation. Secure both layers of insulation in low rise foam adhesive.
   3. Set tapered insulation crickets over the base layers of foam where indicated on the roof plans. Secure tapered insulation boards with low rise foam adhesive.
   4. Set a 0.5” thick gypsum cover board over the layers of foam insulation. Secure the cover board with low rise foam adhesive.
   5. Install an adhered 60 mil thick EPDM roof membrane over the cover board.
   6. Install cured and uncured EPDM flashings.

C. Single-Ply Roofing - Concrete Decking Assembly Without Vapor Retarder
   1. Set adhesive primer over the concrete roof decking, if required by manufacturer.
   2. Set a base layer of 2” thick isocyanurate foam insulation over the concrete decking. Cover the base layer of foam with a layer of 3.5” thick isocyanurate foam insulation. Secure both layers of insulation in low rise foam adhesive.
3. Set tapered insulation crickets over the base layers of foam where indicated on the roof plans. Secure tapered insulation boards with low rise foam adhesive.
4. Set a 0.5" thick gypsum cover board over the layers of foam insulation. Secure the cover board with low rise foam adhesive.
5. Install an adhered 60 mil thick EPDM roof membrane over the coverboard.
6. Install cured and uncured EPDM flashings.

D. Warranty Requirements: Provide a written 20 year manufacturer’s warranty covering material and labor in a leak free state at a no-dollar-limit. Also provide a two year written roofing contractor’s warranty covering the completed roof systems in a leak free state.

E. Wind Uplift Resistance Requirements: Finished roofing assembly shall meet the requirements of an FM 1-75 wind uplift resistance assembly.

F. Fire Resistance Requirements: The finished roof system must meet the requirements of a UL Class roofing assembly.

1.03 This section includes:

A. Adhered EPDM Roofing Membrane
B. Roof Board Insulation
C. Insulation Cover Board
D. EPDM Flashings & seam Tapes
E. Insulation Fasteners & Membrane Adhesives

1.04 PRE-CONSTRUCTION CONFERENCE

A. Prior to the start of work hold a pre-construction conference covering all aspects of the new roof installation. The meeting attendees shall include the manufacturer’s representative along with the roofing subcontractor’s foreman and superintendent. At a minimum, the following items must be addressed:

1. Mobilization and staging.
2. Protection of the public.
4. Environmental installation requirements.
5. Protection of new roofing.
6. Tie-in to existing roofing.
7. Construction of new drain sumps.
8. Fume control.
9. Manufacturer’s inspections.
10. Warranty.
1.05 QUALITY ASSURANCE

A. A roofing consultant has been engaged to provide part time inspection of materials and workmanship. The Contractor shall provide a minimum of one week’s notice to the Contracting Officer prior to the start of roofing operations so that such services can be scheduled.

B. Except as modified and supplemented herein, follow the published requirements and written recommendations of the EPDM membrane and other material manufacturers. Concerning methods of application industry standards apply only when this contract does not address the matter. Industry Standards shall be pre-defined in the “NRCA (National Roofing Contractors Association) Manual of Roofing and Waterproofing”.

C. Qualifications:

1. Qualifications of Contractor: Contractor shall be approved by the membrane manufacturer to install the specified roof system and shall be eligible to receive the specified warranty upon completion of the work. Such approval shall have been issued and in effect for not less than two years prior to the bid opening date.

2. Qualifications of Installers: Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section. In acceptance or rejection of the work, no allowance will be made for lack of skill on the part of the workers. Technicians working on the project shall have received training by the roof membrane manufacturer for the procedures necessary to perform the specified work.

3. Supervisor Qualifications: Supervisor shall be certified by the membrane manufacturer. Certification shall have been issued at least 2 years prior to bid date.

4. Manufacturer Representation: Membrane manufacturer shall be represented by a full time individual or firm based in Colorado. Products represented by part time or regional entity will not qualify.

D. U.L. Listing: Provide materials bearing Underwriters Laboratories (U.L.) marking on bundle, package or container indicating that materials have been produced under U.L.’s classification and follow-up service.

E. FM Listing: Provide roofing system and roof covering material that have been evaluated by Factory Mutual for fire spread, wind uplift and hail damage, and bearing FM Class 1 approval markings.

1.06 REFERENCES


1.07 SUBMITTALS

A. When submitting manufacturer’s literature, highlight all items pertaining to this project. See Division 1 for other items.

B. Submit all items referenced in this specification and any other pertinent items not listed but necessary to complete the construction.

C. Submit a tapered insulation shop drawing.

D. Submit current manufacturer’s literature for all items shown above. Also submit literature for any other items which may have a direct bearing on the quality of the finished roofing.

E. Provide certification that materials meet the ASTM and Federal Specifications.

1.08 MATERIAL STORAGE AND HANDLING

A. Where applicable, the Contractor shall store material in accordance with the material manufacturer's recommendation as to temperature.

B. All insulation and water sensitive products shall be protected from the elements at all times. Such materials are to be stored in an enclosure or securely covered with a waterproof tarp; the plastic wrappers on the insulation products shall not be used as a means of weather protection.

C. All materials shall be labeled for ready identification. Labels shall include the name of the manufacturer and product description.

D. The Contractor shall store only that material on the roof that can be used in one day. Material stored on the roof shall be scattered so as not to apply a concentrated load to the roofing system (greater than 20 psf). No materials shall be stored on new roofing unless a protective layer of plywood with a foam insulation base is used.

E. The Contractor shall use extreme care when transporting materials to the roof surface. Damaged materials shall not be installed and must be removed from the job site.

F. The Contractor shall provide all required storage enclosures and safeguards.

G. Materials shall be delivered in their original, unopened containers, clearly labeled. No materials shall be stored below 40 degrees F. Should any materials be stored below this temperature, they may not be installed until they are restored to a temperature greater than this.

H. No materials shall be stored on surfaces with slopes greater than ½” per foot.
I. Extreme caution must be used to properly secure the materials from wind.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Roofing materials shall not be installed in rain or snow. Roofing materials shall not be applied when there is heavy dew or frost on the roofing area. Application will not be allowed when the forecasted daily high temperature is less than 40 degrees or the wind speed is greater than 15 MPH.

B. Do not heat the solvent based materials with an open flame in order to bring to a proper application temperature. Store materials in a heated location overnight if necessary.

C. Provide drum heaters to properly maintain adhesive materials.

1.10 PROTECTION

A. Adjacent surfaces shall be protected from stain and disfigurement during the demolition and application of roofing materials.

B. The Contractor shall keep the building interior protected from the elements at all times. Representatives from the Contractor shall be available in one hour's notice should an emergency occur.

1.11 SCHEDULE

A. Work is to be performed on a daily basis with each section completed before progressing to the next section of roofing unless specifically directed otherwise by the A/E.

B. Completion of work will be defined as the installation of all specified roof preparation, insulation, field membrane, flashings, termination bars, and caulking.

1.12 DEFECTS

A. Conditions which may be detrimental to the completion or performance of the specified work shall be reported in writing to the Architect/Engineer prior to commencing such work. Such work shall not start until defects have been corrected.

PART 2 - PRODUCTS

2.01 ABBREVIATIONS

A. ASTM - American Society for Testing and Materials
B. AWPB - American Wood Preservers Bureau  
C. FM - Factory Mutual  
D. FS - Federal Specification or Federal Standard  
E. SMACNA - Sheet Metal and Air Conditioning Contractors National Assoc., Inc.  
F. UL - Underwriters Laboratories  
G. WWPA - Western Wood Products Association

2.02 APPLICABLE PUBLICATIONS  
A. The following publications of the issue listed below and referred thereafter by basic designation only form a part of this specification to the extent indicated by the references thereto (use latest publication):

2.03 ASTM PUBLICATIONS:  
A. ASTM A 307 - Bolts & Nuts  
B. ASTM A 526 - Galvanized Steel

2.04 FEDERAL STANDARDS/SPECIFICATIONS:  
A. TT-S 230C - Sealing Compound

2.05 ROOF SYSTEM COMPONENTS  
A. Vapor Retarder: Self-adhering sheet comprised of SBS modified bitumen film on a high density polyethylene top surface. The top surface of the sheet shall be compatible with membrane manufacturer’s approved low rise foam adhesive. Sheet shall meet ASTM D 1970 and shall have a perm rating of 0.1 perms or less.

B. Isocyanurate Foam Insulation: Provide material meeting ASTM C 1289, Type II, Class I, Grade 2. Product shall have fiberglass facers. Provide flat and tapered panels.

C. Cover Board: Use membrane manufacturer’s high wind resistant fiberglass faced gypsum cover board.

D. Mechanical Insulation Attachment: Use FM Approved screw and plate insulation fasteners. Boards shall be secured to meet FM 1-75 Approval.

E. Adhesive Insulation Attachment: Use the membrane manufacturer’s approved low rise foam insulation adhesive. Boards shall be secured to meet FM 1-75 Approval.
F. EPDM Roofing: ASTM D4637, Type I fully adhered 60 mil fire rated EPDM sheet over insulation. Finished construction must provide UL Class A surface. Products from Manville, Firestone and Carlisle are approved.

G. Seam Tape: Where possible use manufacturer’s EPDM seam tape to construct field seams.

H. Crickets: Tapered isocyanurate foam insulation with a factory slope of 0.5” per foot.

I. Drain Sumps: Tapered insulation edge strip insulation built to have a slope of 1” per foot.

J. Sheet Metal Finished: Where prefinished sheet metal is indicated, provide Kynar finish or equivalent.

K. Accessories: Supply manufacturer required accessory products such as lap sealant in order to fully construct EPDM membrane system.

   1. Termination Bar: Where termination bars are indicated, they shall be a minimum 1/8” x 1” extruded aluminum, with caulk lip as required.
   2. Batten Strips: Where batten strips are indicated, they shall be minimum 1” x .043” Galvalume steel strip.
   3. Screw Fasteners: Corrosion-resistant, self-tapping, self-drilling #14 screw with low profile head meeting Factory Mutual 4470 requirements.
   4. Corrosion-resistant, factory-made metal batten strip, bar, or individual locking metal plates as indicated in details.

2.06 PRODUCTS SUPPLIED BY OTHER MANUFACTURERS

A. Temporary water cutoff shall be constructed with hot asphalt or sprayed polyurethane foam sealant.

B. Exposed sealant joints at termination bars and roof related sheet metal shall be constructed with one part polyurethane sealant; NP-1 by Sonneborn or approved equal.

C. All other materials not specifically described but required for a complete and proper installation of the work in this section shall be as selected by the Contractor, approved by the manufacturer, and subject to the approval of the A/E.

PART 3 - EXECUTION

3.01 GENERAL

A. Deliver all materials to the site in a dry condition with labels intact. Either enclose materials in a trailer or cover with a waterproof tarpaulin to protect from the weather and moisture.
B. For materials delivery in quantity to the site, obtain and submit a certification that the materials meet the required specification.

C. Work so that each area of the membrane is completed the same day it is begun. This includes all base flashings.

D. Ensure that fasteners do not penetrate conduit or other miscellaneous items located on the underside of the roof deck.

E. All surfaces scheduled to receive membrane or flashing must be free of physical contact with any bituminous surfaces, clean, and smooth.

F. One, thirty-gallon per minute puddle type pump must be available on the job in case water must be removed from the roof surface on an emergency basis.

G. The workers will not have access to the interior of the building unless it is related to associated interior work.

3.02 PREPARATION

A. Prepare all surfaces according to applicable specification sections.

B. Perform any and all measures necessary to protect the work of other trades from damage due to performance of work specified under this section. Contractor shall restore to original condition any damage caused during performance of such work.

C. Surfaces scheduled to receive roofing are to be free of any standing water, frost, snow, or loose debris.

D. Substrate is to be smooth, free of sharp projections, and free of obvious depressions.

E. All metal fittings shall be in place before roofing.

F. All nailers shall be securely installed prior to roofing.

G. At start of each workday, drains located within daily work area shall be temporarily plugged to prevent debris from falling into the drain. Plugs to be removed at the end of each workday.

3.03 OPERATIONAL PROCEDURES

A. Install temporary tie-ins and water cut-offs at the end of each workday. Remove all temporary tie-ins at the beginning of each workday.

B. Except for expedient temporary work, do not roof during inclement weather as defined in the General Section of the Specification. Remove all temporary work prior to installing permanent components and materials.
C. Confine equipment, storage of materials, debris, operations and movement of workers within the limits established for access at the pre-construction conference.

D. Protect the building, all contents, and surrounding areas from damage, and building occupants from injury during the work. Do not affect the normal conduct of operations of the personnel in the building. Repairs must be made to all damage caused by lack of such protection to the Owner’s satisfaction. If they determine that the repairs are beyond the Contractor’s ability, then they will have the repairs performed by others and may charge the Contractor for these repairs.

E. Remove daily all debris from the installation of the roof.

F. When wheeled or other traffic over the partially or fully completed roofing is unavoidable, use adequate plywood protection for the membrane.

G. Provide fifteen pound fire extinguishers at the point of application of any solvent based materials. The extinguishers should be Type A, B, C. No open flames shall be allowed around any of the solvent based products.

3.04 INSULATION INSTALLATION

A. Cut the insulation to fit snugly around penetrations and at the perimeters. No insulation gaps of over 1/4” shall be allowed. If gaps greater than this are created, then they shall be eliminated using trimmed pieces of isocyanurate insulation glued in place.

B. Insulation boards shall be fully adhered with the 4’ dimension staggered if possible.

C. Follow additional applicable requirements of the roof insulation manufacturer and membrane manufacturer. No wet insulation shall be included in the final construction.

D. Install tapered insulation with slope direction as indicated on the approved shop drawings. Miter cut all panels at valleys for tight fit and alignment throughout valley length.

E. Install tapered saddles in valleys, where indicated on the approved drawings in the sizes shown. End of saddle shall provide for slope into the sump at the drainage device. End of saddle shall be of sufficient width at sump such that flat spots do not occur in valley. Saddle slope shall be twice the field slope.

F. When a tapered insulation system is installed along a perimeter edge of uniform nailer height, utilize tapered edge strip along nailers as tapered insulation thickness decreases for smooth transition and for proper support for the membrane system.
G. Utilize tapered insulation panels and tapered edge strips to construct sumps at roof drains, scuppers and gutters where detailed. Sump size shall be as shown in approved shop drawings. Delete thermal insulation within sumps, as required, for installation of tapered panels so as to provide continuous slope down to drainage device, without creating a sharp/steep sloped transition. At no time shall slope within drain sump exceed 1:12, unless otherwise noted in drawings.

H. Install tapered cricketts on the upslope side of all rectangular penetrations greater than 2'-0" in width perpendicular with slope. Cricket slope shall be twice the field’s slope.

I. Utilize tapered edge strip at transitions in construction of more than ¼” to provide a smooth transition and proper support for the membrane system or subsequent insulation layer. Field cut and shape edge strip as required. Direct slope of edge strip so as to provide for proper drainage.

J. Verify that tapered insulation is properly installed according to the approved shop drawings and that no irregularities exist that will result in ponding water in the finished roof system.

3.05 MEMBRANE INSTALLATION

A. Except as modified and supplemented herein, apply membrane to meet the requirements and recommendations of the membrane manufacturer.

B. Surfaces which have been contaminated by bitumen or other products which are not compatible with the membrane, flashings, or adhesives shall be cleaned or covered with plywood prior to the application of any roofing materials.

C. Lift all mechanical unit and other roof top items as necessary to facilitate the proper installation of the membrane and flashings. Unit must be reset and brought back to proper functioning condition as soon as possible after the application of the roofing system. HVAC and other mechanical units require 96 hours of written notice from the Contractor to the Owner before approval can be given for this type of work.

D. When placing the membrane, ensure factory and field fabricated seams do not intersect drain sumps. Seams through drain sumps will not be approved.

E. Over the new insulation system, unroll the EPDM sheet without stretching. Allow sheet to relax for 1/2 hour prior to seaming operations.

F. Work with largest sheets possible.

G. Use seam tape at all field formed rubber to rubber membrane seams unless indicated otherwise by manufacturer.

H. Fold membrane back approximately in half so as to expose the underside. Sweep the mating surface and insulation to remove contaminants.
I. Apply bonding adhesive with roller to both the underside of the membrane and the insulation. Keep bonding adhesive out of seam area. Bonding adhesive shall be applied at rates directed by the manufacturer.

J. Allow bonding adhesive to flash off until tacky. Roll the coating portion of the sheet into the coated substrate slowly and evenly to avoid wrinkling.

K. Repeat the process on the remaining half sheet.

L. Overlap each successive sheet at side laps and all end laps 3” minimum. Sheets shall be spliced so that 2.75” minimum splice tape seam results.

M. All seams shall be cleaned prior to seaming. Change cleaning pads and membrane cleaner often.

N. After required seam cleaning, apply seam primer and allow to dry.

O. After primer has dried, apply splice tape and press onto lower sheet. Peel release paper and allow upper sheet to fall onto splice tape. Immediately roll seam with 2” silicon roller.

P. On a daily basis, seams shall be checked for voids or other deficiencies, repairs made and lap seam sealant applied where required.

Q. All T-joints at factory seams and field formed seams shall be covered with 6” diameter, self-adhering, semi-cured EPDM patches.

R. Repair all cuts, punctures, wrinkles within 18” of seams, wrinkles running toward seams, or wrinkles that can be pinched and folded over. Wrinkles requiring repair shall be cut out and patched. Seam cleaner, seam primer, splice adhesive and lap sealant shall be used for all repairs. All cuts and punctures shall be repaired the same day they are discovered.

S. For cold weather application procedures, refer to the manufacturer’s specifications for additional requirements.

T. After waiting at least two hours, but prior to leaving the job for the day, the Contractor shall apply lap sealant as recommended by the manufacturer.

3.06 FLASHING INSTALLATION

A. Clean all surfaces to be flashed prior to the application of any new materials.

B. Bond the specified flashing materials to the substrate in such a manner as to avoid loose spots, sags, and wrinkles. Flash all items in the configuration shown on the Drawings.
C. Flashings shall be constructed and terminated as indicated. Care shall be taken when drilling into brick or terra cotta surfaces. The specified water cutoff sealant shall be applied behind the top edges of the flashings. All base flashing details that are terminated to surfaces of walls shall be detailed using a termination bar and a subsequent sheet metal counterflashing. Termination bars shall be fastened at all prepunched holes using appropriate fasteners. All fasteners heads and top edges of termination bars shall be sealed using a one part, polyurethane sealant.

D. Uncured EPDM flashing usage shall be limited to scuppers, pitch pans, vent pipes and other unusually shaped penetrations. Otherwise, cured EPDM or self-adhering, semi-cured EPDM shall be used.

E. Where possible, pre-manufactured, self-adhering EPDM pipe boots shall be used in lieu of field wrapping of pipes.

F. All base flashings shall be totally bonded to the substrate. Loose, wrinkled or poorly bonded flashings will not be accepted.

G. Flashing seams shall be constructed by cleaning and priming the seam areas and installing 3” splice tape.

H. If splice adhesive bonding of seams is required, all splices shall be 3” minimum width. All splice-bonded seams shall be stripped-in with self-adhering, semi-cured EPDM flashing.

3.07 DRAIN FLASHINGS

A. Install tapered insulation drain sump.

B. Position the membrane over the drain ensuring no factory or field fabricated seams are located within the sump.

C. Cut hole with ½” - ¾” membrane extending past drain bolt locations. Drain holes shall be no smaller than the drain pipe size.

D. Cut holes in the membrane for the bolts to penetrate through. **DO NOT CUT NOTCHES BACK TO THE BOLT LOCATIONS.**

E. Apply water cutoff sealant over the drain bowl flange.

F. Install the clamping ring and tighten all bolts to achieve complete compression. All bolt locations shall be functional.

G. Set drain strainer.

H. At job’s end test all drains for functionality with a ¾” diameter hose running into the drain for 10 minutes.
3.08 SEALANT

A. Clean the substrate as best possible so no contaminants such as bitumen and dust remain.

B. If required, prime the surface with the primer recommended by the manufacturer. Also, use sealant backing if required by manufacturer.

END OF SECTION 07 53 23
SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

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. Formed low-slope roof sheet metal fabrications.
   a. Roof edge flashing (gravel stop).
   b. Copings.
   c. Base flashing.
   d. Counterflashing.
   e. Flashing receivers.
   f. Cold pipe roof-penetration flashing.
   g. Hot pipe roof-penetration flashing.

2. Formed equipment support flashing.

3. Underlayment Materials:
   a. Self-Adhering, high-temperature sheet.

4. Miscellaneous materials for sheet metal flashing and trim.

1.03 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including the following and others as applicable:
   a. Roof edge flashings.
   b. Counterflashings.
9. Include details of special conditions.
10. Include details of connections to adjoining work.
11. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.
   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. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.05 INFORMATIONAL SUBMITTALS

A. Product Certificates: For the following:
   1. Roof Edge Flashing:
      a. For each type that is SPRI ES-1 tested.
   2. Coping:
      a. For each type that is SPRI ES-1 tested.

B. Sample Warranty: For special warranty.
1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. Shop shall be listed as able to fabricate required details for following:
   a. Roof Edge Flashings:
      1) SPRI ES-1 as tested.
   b. Copings:
      1) SPRI ES-1 as tested.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.09 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standards:

1. For Roof Edge Flashings: Comply with requirements indicated in the following publications for dimensions and profiles shown unless more stringent requirements are indicated.
   a. NRCA's "The NRCA Roofing Manual."
   b. SMACNA's "Architectural Sheet Metal Manual."

2. For Copings: Comply with requirements indicated in the following publications for dimensions and profiles shown unless more stringent requirements are indicated.
   a. NRCA's "The NRCA Roofing Manual."
   b. SMACNA's "Architectural Sheet Metal Manual."

C. SPRI Wind Design Standard: Manufacture and install the following materials tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Roof Edge Flashing Design Pressure: As indicated on Drawings.
2. Copings Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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

2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40.
1. Surface Texture:
   a. Smooth, flat.

2. Surface Finish or Coating:
   a. Coil-Coated Paint Finishes: Metallic-coated steel sheet prepainted by coil-coating process to comply with ASTM A 755/A 755M.
      1) Exposed Surface Finish:
         a) Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers’ written instructions.
      2) Exposed Surface Color: As indicated by manufacturer's designations.
      3) Concealed Surface Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

2.04 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM sealing washers under heads of exposed fasteners bearing on weather side of metal.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide, or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

2.05 FABRICATION, GENERAL

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

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

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

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.

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

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams: Shop fabricate nonmoving seams with flat-lock seams and seal as follows:

1. Metallic-Coated Steel Sheet:
   a. With Coil-Coated Painted Finish: Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces of the following:


2.06 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop): Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.

2. Fabricate with scuppers spaced 10 feet apart, to dimensions required with 4-inch-wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.

3. Fabricate from the Following Materials:

   a. Prefinished Galvanized Steel: Metal thickness as follows for exposed face height of:

      1) Up to 8 inches: 0.028 inch thick.
      2) Greater than 8 inches up to 10 inches: 0.034 inch thick.
      3) Greater than 10 inches up to 16 inches: 0.040 inch thick.

   b. Prefinished Aluminum-Zinc Alloy-Coated Steel: Metal thickness as follows for exposed face height of:

      1) Up to 8 inches: 0.028 inch thick
2) Greater than 8 inches up to 10 inches: 0.034 inch thick
3) Greater than 10 inches up to 16 inches: 0.040 inch thick

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

1. Coping Profile: Fig 3-4A according to SMACNA’s “Architectural Sheet Metal Manual.”
2. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
3. Fabricate from the Following Materials:
   a. Galvanized Steel: Gage thickness indicated on Drawings.
   b. Aluminum-Zinc Alloy-Coated Steel: Gage thickness indicated on Drawings.

C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

E. Flashing Receivers: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

F. Cold Pipe Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

G. Hot Pipe Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.07 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

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

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

1. Provide underlayment sheet at locations where the EPDM flashing sheet is not present as an underlayment.

3.03 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces of the following:

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of flashing and trim fabricated from the following sheet metal(s) with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install following underlayment(s).
   a. Self-Adhering, high-temperature sheet.

C. Expansion Provisions:

1. Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
   a. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
   b. Use lapped expansion joints only where indicated on Drawings. Apply sealant tape concealed in joint.

2. Conceal where possible in exposed work.
3. Locate to minimize possibility of leakage.
4. Cover and seal anchors as required for a tight installation.

D. Fasteners:

1. Size: Use fastener sizes that:
   a. Penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
   b. Penetrate other substrates not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

2. Conceal where possible in exposed work.
3. Locate to minimize possibility of leakage.
4. Cover and seal as required for a tight installation.

E. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

F. Rivets:

1. Where necessary for strength, rivet field joints if riveting is permitted for shop fabricated joints.
2. Do not rivet soldered joints unless otherwise indicated.
3. Rivets heads exposed to view must closely match color of sheet metal finish.

3.04 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer’s written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Copings:

1. Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
   a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
   b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means indicated on Drawings.
F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.05 MISCELLANEOUS FLASHING INSTALLATION

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

3.06 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 indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.07 CLEANING AND PROTECTION

A. Clean the following exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00
SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roof hatches.

1.02 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

   1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

D. Delegated-Design Submittal: For 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. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.

   2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

1.05 CLOSEOUT SUBMITTALS

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

1.06 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes 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: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bilco; Type F - 48x48 or comparable product by one of the following:

   a. AES Industries, Inc.
   b. Babcock-Davis.
c. Bilco Company (The).
d. Dur-Red Products.

B. Type and Size: Single-leaf lid, 48 inches by 48 inches.


D. Hatch Material: Zinc-coated (galvanized) or Zinc-coated (galvanized) Aluminum-zinc alloy-coated steel sheet.
   1. Thickness: Manufacturer's standard thickness for hatch size indicated.
   2. Finish: Two-coat fluoropolymer.
   3. Color: As selected by Architect from manufacturer's full range.

E. Construction:
   1. Insulation: Polyisocyanurate board.
      a. R-Value: 12.0 according to ASTM C 1363.
   3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
   4. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.

F. Hardware: Spring operators, hold-open arm, galvanized-steel spring latch with turn handles, galvanized-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

G. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
   1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
   2. Height: 42 inches above finished roof deck.
   5. Finish: Manufacturer's standard baked enamel or powder coat.
      a. Color: As selected by Architect from manufacturer's full range.

2.02 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.
   1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.

1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

C. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

2.03 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
   1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
   2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
   3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
   4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer’s recommended slip sheet.
   2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch Installation:
   1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
   2. Attach ladder-assist post to side according to manufacturer's written instructions.

3.03 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 91 13 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00
SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

   1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.04 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.05 PROJECT CONDITIONS

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

1.06 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

   a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

      1) UL in its "Fire Resistance Directory."
      2) Intertek Group in its "Directory of Listed Building Products."
      3) FM Global in its "Building Materials Approval Guide."

2.02 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Sealant shall have a VOC content of 250 g/L or less.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

3.03 INSTALLATION

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

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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 penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 13
SECTION 07 84 43 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Joints in or between fire-resistance-rated constructions.

1.02 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
   1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.03 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.
B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.04 CLOSEOUT SUBMITTALS
A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

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

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Joint Firestopping Systems" Article.
      Provide rated systems complying with the following requirements:
      a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
         1) UL in its "Fire Resistance Directory."
         2) Intertek Group in its "Directory of Listed Building Products."

2.02 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
   1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Sealant shall have a VOC content of 250 g/L or less.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately 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 elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping 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.

3.03 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.05 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping 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.

END OF SECTION 07 84 43
SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. The following joint sealant compositions:
   a. Silicone joint sealants.
   b. Nonstaining silicone joint sealants.
   c. Urethane joint sealants.
   d. Silyl-terminated polyether joint sealants.
   e. Mildew-resistant joint sealants.
   f. Butyl joint sealants.
   g. Latex joint sealants.

2. Joint sealant backings:
   a. Cylindrical backings.
   b. Bond-breaker tape.

3. Miscellaneous materials including:
   a. Primers.
   b. Cleaners.
   c. Masking tape.

B. Joint Sealant Schedule: Select joint sealant compositions from the following application schedules for each severity of use, substrate, and joint type. Where more than one sealant composition is listed, select the one best suited for the conditions indicated or encountered.

1. Exterior joints in horizontal traffic surfaces (not subject to water immersion):
   a. Cast-in-place concrete slabs:

2. Exterior joints in vertical surfaces and horizontal nontraffic surfaces (not subject to water immersion), including ceilings, soffits and other overhead surfaces.
   a. Cast-in-place concrete:


3) Expansion joints: JS-051, JS-056, JS-106, JS-206; except do not use silicone sealant at joints receiving field applied paint coatings.


b. Plant- and site-precast architectural concrete:


c. Between different materials listed above:

1) Joints (not expansion joints): Sealant selected for for use on materials listed above, except as follows:

   a) Do not use silicone sealant at joints receiving field applied paint coatings.
   b) If only nonstaining sealant is prescribed for a material, then use only nonstaining sealant.

2) Expansion joints: Expansion joint sealant selected for for use on materials listed above, except as follows:

   a) Do not use silicone sealant at joints receiving field applied paint coatings.
   b) If only nonstaining sealant is prescribed for a material, then use only nonstaining sealant.

d. Between materials listed above and perimeter of frames of doors, window, louvers, and similar building envelope penetrations:

1) Perimeter joints (not expansion joints): Sealant selected for for use on materials listed above, except do not use silicone sealant at joints receiving field applied paint coatings.

2) Expansion joints: Expansion joint sealant selected for for use on materials listed above, except do not use silicone sealant at joints receiving field applied paint coatings.
3. Interior joints in horizontal traffic surfaces.

a. Cast-in-place concrete slabs and decks:


   a) For locations receiving wheeled equipment and vehicular traffic provide semirigid joint filler specified under Section 03 30 00 "Cast-In-Place Concrete."


4. Interior joints in vertical surfaces and horizontal nontraffic surfaces, subject to differential movement, including ceilings, soffits and other overhead surfaces.

a. Exposed interior surfaces including ceilings, soffits, walls, and partitions:


   a) Do not use silicone sealants and joints receiving field applied paint coatings.

   b) For materials listed below use sealants indicated.

2) Expansion joints: JS-001, JS-011, JS-106, JS-206; except do not use silicone sealants at joints receiving field applied paint coatings.

   a) Do not use silicone sealants at joints receiving field applied paint coatings.

   b) For materials listed below use sealants indicated.

b. Exposed surfaces of unit masonry and concrete, walls and partitions:


2) Vertical expansion joints: JS-051, JS-056, JS-106, JS-206; except do not use silicone sealants at joints receiving field applied paint coatings.

c. Plant-precast structural concrete beams and planks:

2) Expansion joints, underside between panels JS-001, JS-011, JS-106, JS-206; except do not use silicone sealants at joints receiving field applied paint coatings.

5. Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement; dry locations only.
   a. Joints in ceilings, soffits, and other overhead surfaces: JS-401, except do not use silicone containing sealant for joints receiving field applied paint coatings.
   b. Control joints on exposed interior surfaces of exterior walls: JS-401; except do not use silicone containing sealant for joints receiving field applied paint coatings.
   c. Joints between interior wall surfaces and perimeter of door and opening frames, windows, and elevator entrances. JS-401, except do not use silicone containing sealant for joints receiving field applied paint coatings.

6. Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces, including ceilings, soffits and other overhead surfaces; including in rooms with sinks, showers, toilets, urinals, and similar plumbing fixtures.
   a. Plumbing fixtures and adjoining walls, floors, and counters:
      1) Joints between fixture and adjacent surface: JS-254, JS-257; except use only JS-257 where receiving field applied paint coatings.
   b. Ceramic and stone tile:
      1) Control joints: JS-254, JS-257; except use only JS-257 where receiving field applied paint coatings.
      2) Joints at inside corners, vertical and horizontal: JS-254, JS-257; except use only JS-257 where receiving field applied paint coatings.
      3) Expansion joints: JS-257.

7. Concealed mastics.
   a. Metal thresholds: JS-351
   b. Metal sill plates: JS-351.

1.02 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples 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.
D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. 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.

C. Field-Adhesion-Test Reports: For each sealant application tested.

D. Sample Warranties: For special warranties.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.05 PRECONSTRUCTION TESTING

A. 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 kind of sealant and joint substrate.
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.

      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.

1.06 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.07 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 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 stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.
PART 2 - PRODUCTS

2.01 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content: Sealants and sealant primers shall comply with the following:
   1. Architectural sealants shall have a VOC content of 250 g/L or less.
   2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
   3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

A. JS-001 - Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

B. JS-002 - Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

C. JS-011 - Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

D. JS-012 - Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.

E. JS-014 - Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
F. JS-016 - Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 100/50, Uses T and NT.


H. JS-021 - Silicone, M, P, 100/50, T, NT: Multicomponent, pourable, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade P, Class 100/50, Uses T and NT.

2.03 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. JS-051 - Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

C. JS-052 - Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

D. JS-056 - Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

E. JS-062 - Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.

2.04 URETHANE JOINT SEALANTS

A. JS-104 - Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
B. JS-106 - Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

C. JS-109 - Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.

D. JS-113 - Urethane, S, P, 35, T, NT: Single-component, pourable, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 35, Uses T and NT.


F. JS-117 - Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.

G. JS-119 - Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.

H. JS-122 - Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T and NT.

I. JS-124 - Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T and NT.

J. JS-127 - Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.


2.05 SILYL-TERMINATED POLYETHER (STPE) JOINT SEALANTS

A. JS-202 - STPE, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
B. JS-203 - STPE, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT.

C. JS-204 - STPE, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

D. JS-206 - STPE, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 100, Uses T and NT.

E. JS-207 - STPE, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.

F. JS-208 - STPE, S, NS, 35, T, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Uses T and NT.

G. JS-209 - STPE, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.

2.06 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. JS-254 - Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

C. JS-257 - STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

2.07 BUTYL JOINT SEALANTS

A. JS-351 - Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
2.08 LATEX JOINT SEALANTS
A. JS-401 - Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.09 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance, and type indicated below except where approved otherwise in writing by joint-sealant manufacturer for joint application indicated:

1. Location, Exterior:
   a. Exposure, Wet:
      1) Position, Vertical:
         a) Type C (closed cell material with a surface skin).
         b) Type B (bicellular material with a surface skin).
      2) Position, Horizontal:
         a) Type C (closed cell material with a surface skin).
         b) Type B (bicellular material with a surface skin).
   b. Exposure, Dry:
      1) Position, Vertical: Type B (bicellular material with a surface skin).
      2) Position, Horizontal: Type B (bicellular material with a surface skin).

2. Location, Interior:
   a. Exposure, Wet:
      1) Position, Vertical:
         a) Type C (closed cell material with a surface skin).
         b) Type B (bicellular material with a surface skin).
      2) Position, Horizontal:
         a) Type C (closed cell material with a surface skin).
         b) Type B (bicellular material with a surface skin).

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b. Exposure, Dry:

1) Position, Vertical:
   a) Type O (open-cell material)
   b) Type B (bicellular material with a surface skin).

2) Position, Horizontal: Type B (bicellular material with a surface skin).

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.

2.10 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

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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 abrating, 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. Unglazed surfaces of ceramic tile.

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. 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.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
   a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.04 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

   a. 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.

3. Inspect tested joints and report on the following:
a. Whether sealants filled joint cavities and are free of voids.
b. Whether sealant dimensions and configurations comply with specified requirements.
c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer’s field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 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.

3.06 PROTECTION

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

END OF SECTION 07 92 00
SECTION 07 92 19 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY
   A. Section includes exposed concealed joint sealants.

1.02 ACTION SUBMITTALS
   A. Product Data: For each acoustical joint sealant.
   B. Samples for Initial Selection: For exposed sealants, manufacturer’s color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
   C. Samples for Verification: For exposed sealants, each kind and color of acoustical 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.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS
   A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
   B. Sealant shall have a VOC content of 250 g/L or less.

2.02 ACOUSTICAL JOINT SEALANTS
   A. Acoustical Sealant for Exposed Joints: Manufacturer’s standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
      1. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer’s full range of colors.
   B. Acoustical Sealant for Concealed Joints: Manufacturer’s standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.
2.03 MISCELLANEOUS MATERIALS

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

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

3.01 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer’s written instructions.

B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. 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.

3.03 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer’s written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.04 CLEANING

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

3.05 PROTECTION

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

END OF SECTION 07 92 19
SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes hollow-metal work for the following:

1. Interior doors and frames complying with SDI Standards.
2. Exterior doors and frames complying with SDI Standards.
4. Louvers for doors.

1.02 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8 and as follows:

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1.03 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.02 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
2.03 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Frame Construction:
   1. Face welded unless indicated otherwise.
   2. Full profile welded for frames installed in high humidity spaces including rooms containing showers and water spray equipment.
   3. Slip-on drywall for installation in existing drywall openings. Slip-on drywall frames will not be accepted in new construction.
   4. Knocked down for installation in existing openings (not drywall). Knocked down frames will not be accepted in new construction.

   1. Locations: Where indicated in the Door and Frame Schedule.
   2. Physical Performance: Level C according to SDI A250.4.
   3. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.032 inch.
      c. Edge Construction: Model 2, Seamless.
      d. Core:
         1) Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
         2) Vertical steel stiffener, core filled with (either of) following:
            a) Polyurethane.
            b) Mineral board or batt.
   4. Frames:
      a. Materials: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.042 inch.

D. Heavy-Duty 1-3/4 inch Thick Doors with Frames, Ungalvanized: SDI A250.8, Level 2.
   1. Locations: Where indicated in the Door and Frame Schedule.
   2. Physical Performance: Level B according to SDI A250.4.
3. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
   c. Edge Construction: Model 2, Seamless.
   d. Core:
      1) Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polysisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
      2) Vertical steel stiffener, core filled with (either of) following:
         a) Polyurethane.
         b) Mineral board or batt.

4. Frames:
   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.


2.04 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Frame Construction:
   1. Full profile welded unless indicated otherwise.
   2. Face welded frames will be accepted where protected from rain and snow by overhead canopies or other structure.
   3. Knocked down for installation in existing openings. Knocked down frames will not be accepted in new construction.

   1. Physical Performance: Level A according to SDI A250.4.

2.05 BORROWED LITES

A. Frame Construction:
   1. Face welded unless indicated otherwise.
   2. Full profile welded for frames installed in high humidity spaces including rooms containing showers and water spray equipment.
   3. Slip-on drywall for installation in existing drywall openings. Slip-on drywall frames will not be accepted in new construction.
4. Knocked down for installation in existing openings (not drywall). Knocked down frames will not be accepted in new construction.

B. Heavy-Duty Hollow Metal Lite Frames, Ungalvanized:

1. Locations: Where indicated in the Door and Frame Schedule.

2. Materials: Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch.


2.06 LOUVERS

A. Fire-Rated Automatic Louvers, Ungalvanized: Louvers which comply with SDI 111C, constructed with movable blades formed of minimum 0.020-inch thick, cold-rolled steel sheet set into minimum 0.032-inch thick steel frame. Blades are closed by actuating fusible link. Louver is listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.

1. Locations: Where indicated in the Door and Frame Schedule.

2. Exposed Finish: Matching door panel.

2.07 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 0.042 inch thick.

3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, 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.
2.08 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.09 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:
1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.

2. Fire Door Cores: As required to provide fire-protection ratings indicated.


4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.

5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.

6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

7. 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 or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.

4. Jamb Anchors: Provide number and spacing of anchors as follows:

   a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:

      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus one 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 one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

c. Compression Type: Not less than two anchors in each frame.
d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

5. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers 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 glazing and installation types indicated.

2.10 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
2.11 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer’s written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

   a. At fire-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

c. Install frames with removable stops located on secure side of opening.
d. 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 plumb, square, 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 will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and Mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.


4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer’s written instructions.

8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.

b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.

c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Touchup Painting:

1. Prime-Coated Surfaces: 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 - ALUMINUM DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Interior aluminum frames for doors installed in gypsum board partitions.

1.02 PREINSTALLATION MEETINGS

1.03 ACTION SUBMITTALS

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

B. Shop Drawings: For aluminum frames:
   1. Include elevations, sections, and installation details for each wall-opening condition.
   2. Include details for each frame type, including dimensioned profiles and metal thicknesses.
   3. Include locations of reinforcements and preparations for hardware.
   4. Include details of anchorages, joints, field splices, connections, and accessories.
   5. Include details of moldings, removable stops, and glazing.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard sizes.

D. Product Schedule: For aluminum frames. Coordinate with door hardware schedule and glazing.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum frames to include in maintenance manuals.
PART 2 - PRODUCTS

2.01 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. Frameworks, Inc.; an ASSA ABLOY Group company.
2. RACO Interior Products, Inc.
3. Versatrac Frames; a division of American Door Products Inc.
4. Western Integrated Materials, Inc.
5. Wilson Partitions; a division of Arcadia, Inc.

B. Source Limitations: Obtain the following from single source from single manufacturer:

1. Door frames.

2.02 COMPONENTS, GENERAL

A. Aluminum Framing: ASTM B 221, with alloy and temper required to suit structural and finish requirements, and not less than 0.062 inch thick.

2.03 DOOR FRAMES

A. Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers.

B. Door Stops: Extruded aluminum, not less than 0.062 inch thick; removable, snap-in, without exposed fasteners.

C. Casing Trim: Extruded aluminum, not less than 0.062 inch thick; removable, snap-in, without exposed fasteners.

1. Trim Style: Square.

D. Frame, Trim, and Stop Finish: Clear-anodized aluminum.

E. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals in gray color.

2.04 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.
B. Door Hardware: As specified in Section 08 71 00 "Door Hardware."

2.05 FABRICATION

A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted and mitered connections.

B. Factory prepare aluminum door frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Door Hardware."

C. Fabricate components to allow secure installation without exposed fasteners.

2.06 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.01 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. Verify that wall thickness does not exceed standard tolerances allowed by throat size of indicated aluminum frame.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install aluminum frames plumb, rigid, properly aligned, and securely fastened in place; according to manufacturer's written instructions.

B. Install frame components in the longest possible lengths with no piece less than 48 inches; components 96 inches or shorter shall be one piece.
1. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
2. Secure clips to extruded main-frame components and not to snap-in or trim members.
3. Do not leave screws or other fasteners exposed to view when installation is complete.

C. Door Hardware: Install according to aluminum-frame manufacturer's written instructions and the following:
   1. Section 08 71 00 "Door Hardware."

3.03 ADJUSTING

A. Inspect installation, correct misalignments, and tighten loose connections.

B. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended in writing by frame manufacturer and according to AAMA 609 & 610.

C. Touch Up: Repair marred frame surfaces to blend inconspicuously with adjacent unrepaired surface so touchup is not visible from a distance of 48 inches as viewed by Architect. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION 08 11 16
SECTION 08 11 19 - STAINLESS-STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Stainless-steel, hollow-metal doors.
   2. Stainless-steel, hollow-metal frames.

1.02 COORDINATION

A. Coordinate anchorage installation for stainless-steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: For stainless-steel hollow-metal work.
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.

C. Samples:
   1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
   2. Doors: Include section of vertical-edge, top, and bottom construction; core construction; glazing; and hinge and other applied hardware reinforcement.
3. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

D. Product Schedule: For stainless-steel, hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Shipping Spreaders: Deliver welded frames with two removable spreader bars across bottom of frames, tack welded or mechanically attached to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.01 STAINLESS-STEEL DOORS

A. Stainless-Steel Doors: Not less than 1-3/4 inches thick, of seamless, hollow-metal construction. Construct doors with smooth, flush surfaces without visible joints or seams on faces.

1. Face Sheets: Fabricate from 0.062-inch thick, stainless-steel sheet.
2. Core Construction:
   a. Laminated Core: foam-plastic insulation fastened to face sheets with waterproof adhesive.

1) Foam-Plastic Insulated Doors: Thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
   a) Locations: Exterior doors and interior doors.

4. Moldings for Glazed Lites in Doors: 0.038-inch thick stainless steel.
5. Loose Stops for Glazed Lites in Doors: 0.038-inch thick stainless steel.
6. Top and Bottom Channels: Closed with continuous channels, 0.062-inch thick stainless steel.
a. Spot welded to both face sheets.

7. Hardware Reinforcement: Fabricate according to NAAMM-HMMA 866 with reinforcing plates from stainless steel.

B. Materials:

1. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, Type 316 Insert type.
2. Foam-Plastic Insulation: Manufacturer's standard urethane board insulation with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within door.

C. Stainless-Steel Finishes: Remove tool and die marks and stretch lines, or blend into finish. Grind and polish surfaces to produce uniform finish, free of cross scratches. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

1. Directional Satin Finish: No. 4.

2.02 STAINLESS-STEEL FRAMES

A. Stainless-Steel Frames: Fabricate stainless-steel frames of construction indicated, with faces of corners mitered and contact edges closed tight.

1. Frame Construction: Saw mitered and full (continuously) welded or Machine mitered and full (continuously) welded.

a. Weld frames according to NAAMM-HMMA 820.

2. Door Frames for Openings 48 Inches Wide or Less: Fabricate from 0.078-inch-thick, stainless-steel sheet.

3. Door Frames for Openings More Than 48 Inches Wide: Fabricate from 0.078-inch-thick, stainless-steel sheet.

4. Hardware Reinforcement: Fabricate according to NAAMM-HMMA 866 with reinforcing plates from stainless steel.

5. Head Reinforcement: 0.109-inch-thick, stainless-steel channel or angle stiffener for opening widths more than 48 inches.

6. Jamb Anchors:

a. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter, stainless-steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

7. Floor Anchors: Not less than 0.078-inch-thick stainless steel, and as follows:

a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
B. Materials:

1. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, Type 316.
2. Frame Anchors: Stainless-steel sheet. Same type as door face.
3. Inserts, Bolts, and Anchor Fasteners: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts.

C. Stainless-Steel Finishes: Remove tool and die marks and stretch lines, or blend into finish. Grind and polish surfaces to produce uniform finish, free of cross scratches. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

1. Directional Satin Finish: No. 4.

2.03 FABRICATION

A. Stainless-Steel Door Fabrication: Stainless-steel doors 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.

1. Seamless Edge Construction: Door face sheets joined at vertical edges by continuous weld extending full height of door; with edges ground and polished, providing smooth, flush surfaces with no visible seams.
2. Exterior & Interior Doors: Close top edges flush and seal joints against water penetration. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
3. Stops and Moldings: Factory cut openings in doors. Provide stops and moldings around glazed lites. Form corners of stops and moldings with butted or mitered hairline joints.
   a. Glazed Lites: Provide fixed stops and moldings welded on secure side of door.
   b. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
4. Hardware Preparation: Factory prepare stainless-steel doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the door hardware schedule.
   a. Reinforce doors to receive nontemplated mortised and surface-mounted door hardware.
5. Tolerances: Fabricate doors to tolerances indicated in NAAMM-HMMA 866.
B. Stainless-Steel Frame Fabrication: Fabricate stainless-steel frames 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.

1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.

2. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

3. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

4. Head Reinforcement: For frames more than 48 inches wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.

5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Provide plastic plugs to 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.

6. Hardware Preparation: Factory prepare stainless-steel frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the door hardware schedule.
   a. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.

7. Tolerances: Fabricate frames to tolerances indicated in NAAMM-HMMA 866.

2.04 ACCESSORIES

A. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stainless-steel doors and frames.
B. Examine roughing-in for embedded and built-in anchors to verify actual locations of stainless-steel door-frame connections before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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 and with installation spreaders in place, adjust and securely brace stainless-steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. **Squareness:** Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb, and 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.

3.03 INSTALLATION

A. General: Install stainless-steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with NAAMM-HMMA 866 and manufacturer's written instructions.

B. Stainless-Steel Frames:

1. Set frames accurately in position; plumb, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   b. Install door silencers in frames before grouting.
   c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   d. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
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. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

4. Installation Tolerances: Adjust stainless-steel 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, and 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. Stainless-Steel Doors: Fit stainless steel doors accurately in frames with the following clearances:
   1. Non-Fire-Rated 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. Glazing: Install glazing in sidelites, transoms, and borrowed lites to comply with installation requirements in Section 08 80 00 "Glazing."
   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.

3.04 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 stainless-steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off stainless-steel doors and frames immediately after installation.
C. Stainless-Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish to match undamaged finish.

END OF SECTION 08 11 19
SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Wood doors complying with WDMA Quality Standards:
      a. Interior solid-core doors with wood-veneer faces.
   2. Factory finishing wood doors indicated.
   3. Factory fitting flush wood doors to frames.
   4. Factory machining wood doors for hardware.

1.02 REFERENCES

A. Acronyms:
   1. WDMA - Window & Door Manufacturers Association.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of door. Include the following:
   1. Details of core and edge construction.
   2. Factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
   1. Dimensions and locations of blocking.
   2. Dimensions and locations of mortises and holes for hardware.
   3. Dimensions and locations of cutouts.
   4. Undercuts.
   5. Requirements for veneer matching.
   6. Doors to be factory finished and finish requirements.

C. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
   2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
a. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

1.04 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer’s written instructions.

B. Packaging Doors:

1. Factory Finished Doors: Package individually in plastic bags or cardboard cartons; if in cardboard cartons, wrap bundles of doors in plastic sheeting.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.06 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period: As follows from date of Substantial Completion:

a. WDMA Interior Solid-Core Doors with Wood-Veneer Faces: Life of installation.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain flush wood doors and wood paneling from single manufacturer.

2.02 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with the following:
   2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Adhesives: Do not use adhesives that contain urea formaldehyde.

C. Composite Wood Products: Products shall be made without urea formaldehyde.

2.03 WDMA INTERIOR SOLID-CORE DOORS WITH WOOD-VENEER FACES

A. WDMA Aesthetic Grade: Premium with Grade A faces.


C. Species: Red oak.

D. Cut: Rift cut.

E. Match between Veneer Leaves: Slip match.

F. Assembly of Veneer Leaves on Door Faces: Running match.

G. Pair and Set Match: Provide for doors hung in same opening.

H. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.

I. Core:
   1. Particleboard: ANSI A208.1:
a. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for the following:

1) Doors receiving exit devices.
2) Doors indicated to be Extra Heavy Duty Performance Grade.

2. Glued wood stave.

a. Screw Withdrawal, Face: 700 lbf.
b. Screw Withdrawal, Edge: 400 lbf.

J. Panel Construction:

1. Bonded Core: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

K. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.
2. Extra Heavy Duty: At following locations:
   a. Janitor's closets.
   b. Assembly spaces.
   c. Exits.
   d. Where indicated.

3. Standard Duty: At following locations:
   a. Closets (not including janitor's closets).
   b. Where indicated.

L. Transparent Factory Finish:

1. Grade: Same as specified for doors.
2. WDMA Finish: Either of following systems:
   a. TR-4 conversion varnish.
   b. TR-6 catalyzed polyurethane.

3. Staining: Match Basis of Design; Masonite Architectural: Aspiro Series; custom color 266347C.
4. Effect: Open-grain finish.
5. Sheen: Satin.

2.04 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2.05 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.
B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16
SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Access doors and frames for walls and ceilings.

B. Schedule: Provide access door and frames at following installation locations:
   1. Interior Non-Fire-Rated Walls:
      a. Equipment Accessed: Piping Shut-Off Valves (See Note 2).
         1) Type: Flush Access Doors and Frames with Exposed Flanges.
         2) Nominal Size: 12 inches square.
      b. Equipment Accessed: Clean-Outs (See Note 2).
         1) Type: Flush Access Doors and Frames with Exposed Flanges.
         2) Nominal Size: 12 inches square.
   2. Interior Non-Fire-Rated Gypsum Board Ceilings:
         1) Type: Flush Access Doors and Frames with Exposed Flanges.
         2) Nominal Size: 18 inches square.
      b. Equipment Accessed: VAV Terminal Units (See Note 3).
         1) Type: Flush Access Doors and Frames with Exposed Flanges.
         2) Nominal Size: 18 inches square.
      c. Equipment Accessed: Combination Fire/Smoke dampers (See Note 3).
         1) Type: Flush Access Doors and Frames with Exposed Flanges.
         2) Nominal Size: 18 inches square.
      d. Equipment Accessed: Piping Shut-Off Valves (See Note 2).
         1) Type: Flush Access Doors and Frames with Exposed Flanges.
         2) Nominal Size: 12 inches square.
      e. Equipment Accessed: Clean-Outs (See Note 2).
         1) Type: Flush Access Doors and Frames with Exposed Flanges.
2) Nominal Size: 12 inches square.

e) Equipment Accessed: Fan Coil Units.

1) Type: Flush Access Doors and Frames with Exposed Flanges.
2) Nominal Size: 24 inches square.

3. Notes:
   a. Note 1: In fire-resistance rated building elements provide access doors and frames with fire rating not less than that of adjacent construction.
   b. Note 2: Reference Plumbing Drawings.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details materials, individual components and profiles, and finishes.

B. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.01 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

B. Flush Access Doors with Exposed Flanges:
   1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
   2. Locations: Wall and ceiling.
   3. Door Size: See schedule at beginning of Section.
   4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
   5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
   6. Frame Material: Same material, thickness, and finish as door.
8. Hardware:
   a. Latch:
      1) Self-latching bolt operated by screwdriver.

C. Flush Access Doors with Concealed Flanges:
   1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
   2. Locations: Wall.
   3. Door Size: See schedule at the beginning of Section.
   4. Stainless-Steel Sheet for Door: Nominal 0.062 inch, 16 gage.  
      a. Finish: No. 4.
   5. Frame Material: Same material and thickness as door.
   7. Hardware:
      a. Latch:
         1) Cam latch operated by screwdriver.

D. Exterior Flush Access Doors:
   1. Assembly Description: Fabricate door to be weatherproof and fit flush to frame. Provide manufacturer's standard 2-inch thick fiberglass insulation and extruded door gaskets. Provide manufacturer's standard-width frame for surface mounting, proportional to door size.
   2. Locations: Wall.
   3. Door Size: 18 inches by 18 inches.
   4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
   5. Frame Material: Same material, thickness, and finish as door.
   7. Hardware:
      a. Lock/Latch: As indicated in schedule.
         1) Lock Preparation: Prepare door panel to accept cylinder specified in Section 08 71 00 "Door Hardware."

2.02 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Frame Anchors: Same type as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.03 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 doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. Provide mounting holes in frames for attachment of units to metal or wood framing.
3. Provide mounting holes in frame for attachment of masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.04 FINISHES

A. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:
   1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION
   A. Comply with manufacturer's written instructions for installing access doors and frames.
   B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.03 ADJUSTING
   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 13 - COILING COUNTER DOORS

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Counter doors.

1.02 ACTION SUBMITTALS
A. Product Data: For each type and size of coiling counter door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer’s product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.

C. Samples for Initial Selection: Manufacturer’s finish charts showing full range of colors and textures available for units with factory-applied finishes.
   1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer’s standard sizes:
   1. Curtain slats.
   2. Bottom bar.
   3. Guides.
   5. Hood.
   6. Locking device(s).
   7. Include similar Samples of accessories involving color selection.

1.03 CLOSEOUT SUBMITTALS
A. Maintenance Data: For coiling counter doors to include in maintenance manuals.
1.04 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than [two] <Insert number> hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

2.01 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

1. Obtain operators and controls from coiling counter door manufacturer.

2.02 COUNTER DOOR ASSEMBLY

A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   b. Clopay Building Products.
   c. Wayne-Dalton Corp.

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Door Curtain Material: Stainless steel.

D. Door Curtain Slats: Flat profile slats of 1-1/4-inch to 1-1/2-inch center-to-center height.

1. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match door.

F. Hood: Stainless steel.
1. Shape: Square.

G. Integral Frame, Hood, and Fascia: Stainless steel.
   1. Mounting: Face of wall.

H. Sill Configuration: No sill.
   1. Stainless steel countertops are specified in Section 05 58 26 "Metal
      Countertops."

I. Locking Devices: Equip door with slide bolt for padlock.

   1. Provide operator with through-wall shaft operation.
   2. Provide operator with manufacturer’s standard removable operating arm.

K. Curtain Accessories: Equip door with push/pull handles pull-down strap.

L. Door Finish:
   1. Stainless-Steel Finish: No. 4 (polished directional satin).

2.03 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate coiling counter-door curtain of interlocking metal slats in a
   continuous length for width of door without splices. Unless otherwise indicated,
   provide slats of thickness and mechanical properties recommended by door
   manufacturer for performance, size, and type of door indicated, and as follows:

   1. Stainless-Steel Door Curtain Slats: ASTM A 666, Type 304; sheet thickness of
      0.025 inch; and as required.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of
   same material and finish as curtain slats unless otherwise indicated, with sufficient
   depth and strength to retain curtain, to allow curtain to operate smoothly, and to
   withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on
   guides to prevent overtravel of curtain.

2.04 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating
   mechanism at opening head. Contour to fit end brackets to which hood is attached.
   Roll and reinforce top and bottom edges for stiffness. Form closed ends for
   surface-mounted hoods and fascia for any portion of between-jamb mounting that
   projects beyond wall face. Equip hood with intermediate support brackets as required
   to prevent sagging.
1. Stainless Steel: 0.025-inch-thick stainless-steel sheet, Type 304, complying with ASTM A 666.

B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):
   1. Stainless Steel: Type 304, complying with ASTM A 666.

2.05 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

2.06 CURTAIN ACCESSORIES

A. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

B. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches high.

2.07 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.08 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.
B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf.

2.09 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   1. Run grain of directional finishes with long dimension of each piece.
   2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
   3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.
3.03 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

END OF SECTION 08 33 13
PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Steel sectional doors, insulated, with full-vision aluminum framed section(s),
   motor operated.

B. See Part 2 Article "Operational Requirements" for sequence of operation and operating
   environment requirements for Wash Bay doors 4-102C and 4-102B.

1.02 DEFINITIONS

A. This Section uses nominal thicknesses (coated) for metallic-coated steel sheet.
   Representative equivalencies specified in this Section are included in the table below.

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<th>Gage No.</th>
<th>Metallic-Coated Steel Nominal (Coated)</th>
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1.03 REFERENCE STANDARDS

1. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.

B. ASCE - American Society of Civil Engineers.

2. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
11. ASTM E1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

1. DASMA 102 Specifications for Sectional Doors.
2. DASMA 105 Test Method for Thermal Transmittance and Air Infiltration of Garage Doors.

E. UL - Underwriters Laboratories Inc.
   1. UL 325 Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.04 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied finishes.
   1. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
   1. For Steel sectional doors, insulated, with full-vision aluminum framed section(s), motor operated; a flat door section and an aluminum framed section.

1.05 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.
1.06 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.07 QUALITY ASSURANCE
   A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.08 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Structural failures including, but not limited to, excessive deflection.
         b. Failure of components or operators before reaching required number of operation cycles.
         c. Faulty operation of hardware.
         d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
         e. Delamination of exterior or interior facing materials.
      2. Warranty Period for Steel Sectional Doors, Insulated, with Full-Vision Aluminum Framed Section(s), Motor Operated: 5 years from date of Substantial Completion.

   B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
      1. Warranty Period for Steel Sectional Doors, Insulated, with Full-Vision Aluminum Framed Section(s), Motor Operated: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS, GENERAL
   A. Source Limitations:
      1. Obtain sectional doors from single source.
         a. Obtain steel section doors with full-vision aluminum framed sections from a single manufacturer.
2. Obtain operators and controls from sectional door manufacturer.
3. Vehicle detector system may be obtained from other sources approved by door manufacturer for use with their system.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: As indicated on Structural Drawings.
2. Testing: According to ASTM E330 or DASMA 108 for garage doors and complying with the acceptance criteria of DASMA 108.
3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
   a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
   b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.

4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

2.03 OPERATIONAL REQUIREMENTS

A. Sequence of Door Operation - Wash Bay doors 4-102C and 4-102B:

1. Entrance door shall open automatically upon detection by motion/presence detector located at head of door opening. Door shall remain open as vehicle passes through opening, as controlled by obstruction detection device(s) specified in this Section. Door shall automatically close after vehicle passes through opening.
   a. Vehicle detection device is specified in Section 11 12 00 "Parking Control Equipment."

2. Exit door shall open automatically when vehicle trips sensor integral to wash equipment. Door shall remain open as vehicle passes through opening, as controlled by obstruction detection device(s) specified in this Section. Door shall close automatically after vehicle passes through opening.
a. Vehicle trip sensor is specified in Section 11.11.26 "Vehicle Washing Equipment."

B. Operating Environment - Wash Bay doors 4-102C and 4-102B:

1. Door components will be exposed to water and detergent overspray. Doors, tracks, controls, motors, conduit, piping, electrical equipment, and mechanical equipment shall be weather-proof and water-proof. Doors and related components furnished shall be suitable and warrantable for a continuously wet environment. Door manufacturer components shall remain operational under the following combined conditions:

   a. Temperature Range: Between minus 30 deg F to plus 120 deg F, dry bulb.
   b. Water Resistance: Exposure to overspray from washing equipment.

2. Door components may be exposed to volatile organic compounds in the form of fumes from either or all of the fuels listed below. Electrical components within 18 inches or less above floor shall comply with NEC Class 1, Division 1 for explosion-proof devices.

   a. Liquid natural gas.
   b. Diesel fuel.
   c. Gasoline.

2.04 STEEL SECTIONAL DOORS, INSULATED, WITH FULL-VISION ALUMINUM FRAMED SECTION(S), MOTOR OPERATED

A. Steel Sectional Door with Full-Vision Aluminum Framed Section(s): Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Clopay Building Products; Model 3724 energy series with intellicore; (Complete Door Systems: josh@completedoorsystems.com or comparable product by one of the following:

   b. Wayne-Dalton Corp.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E283 or DASMA 105.

D. R-Value: 15.0 deg F x h x sq. ft./Btu.
E. Steel Sections:

2. Section Thickness: 2 inches.
3. Provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.
4. Exterior Section Faces and Frames: Fabricate from cold-rolled, commercial steel (CS) sheet.
   a. Steel Sheet Thickness: 0.022 inch nominal coated thickness.
   b. Surface:
      1) Flat.
   c. Fabricate section faces from single sheets to provide sections not more than 24 inches high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weather-resistant seal, with a reinforcing flange return.
5. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064 inch nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064 inch thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.
6. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile.
7. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place.
8. Provide reinforcement for hardware attachment.
9. Insulation:
   a. Foamed-in-Place Thermal Insulation: Insulate interior of steel sections with door manufacturer’s standard CFC-free polyurethane insulation, foamed in place to completely fill interior of section and pressure bonded to face sheets to prevent delamination under wind load, and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84. Enclose insulation completely within steel sections and the interior facing material, with no exposed insulation.
10. Interior Facing Material:
   a. Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A653/A653M, with a nominal coated thickness of 0.015 inch.
11. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

F. Full-Vision Aluminum Framed Sections: Locate where indicated on Drawings.

1. Stile and Rail Members: Extruded-aluminum with manufacturer's standard dimensions and profiles with glazing channels; members joined by welding or with concealed, 1/4 inch minimum diameter, aluminum or nonmagnetic stainless-steel through bolts, full height of door section; and with meeting rails shaped to provide a weather-resistant seal.

   a. Aluminum: ASTM B221 (ASTM B221M) extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; with minimum wall thickness of 0.065 inch, and as required to comply with requirements.

      1) Door Section Depth: Not less than 1-3/4 inches deep.

   b. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.

   c. Provide reinforcement for hardware attachment.

   d. Thermal Insulation: Insulate interior of aluminum extrusions with door manufacturer's standard CFC-free polyurethane insulation, foamed in place to completely fill interior of section, and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84. Enclose insulation completely within aluminum framing with no exposed insulation.

2. Glazing:

   a. Vision Lites: Glazing of following type set in vinyl, rubber, or neoprene glazing channel and with removable extruded-vinyl or aluminum stops.

      1) Insulating Glass: Manufacturer's standard.

         a) Color: Clear, transparent.

G. Weatherseals:

1. Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene.

2. Fit to bottom and top and around entire perimeter of sectional door.

H. Track: Comply with Part 2 Article "Tracks" and the following:

1. Material:
a. Galvanized Steel unless indicated otherwise: ASTM A653/A653M, minimum G60 zinc coating.
b. Stainless-Steel at wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B: Series 300 with mill or better finish.

2. Track Depth: As required for door size and weight.
3. Configuration: As indicated on Drawings.
4. Vertical Track Support:
   a. Continuous reinforcing angle attached to track and attached to wall with jamb brackets.
   b. Intermittent, jamb brackets attached to track and attached to wall.

I. Rollers: Comply with Part 2 Article "Hardware" and the following:
   1. Manufacturer’s standard heavy-duty tires, stem and bearings unless indicated otherwise.
   2. At wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B: Polyethylene or nylon tires with stainless-steel stem and pre-lubricated stainless-steel ball-bearings in case hardened stainless-steel races.

J. Hinges: Comply with Part 2 Article "Hardware" and the following:
   1. Galvanized Steel unless indicated otherwise: Heavy-duty, fabricated from galvanized-steel of not less than 0.079 inch nominal coated thickness.
   2. Stainless Steel at wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B: Heavy-duty, fabricated from 300 Series stainless-steel of not less than 0.079 inch nominal thickness.

K. Locking Devices: Equip door with the following:
   1. Chain Lock Keeper: Suitable for padlock; fabricated from the following:
      a. Galvanized steel unless indicated otherwise.
      b. Stainless-steel, 300 Series at wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B.

L. Counterbalance Mechanism Type: Comply with Part 2 Article "Counterbalance Mechanism" and the following:
   1. Torsion spring assembly; with components of following materials:
      a. Steel unless indicated otherwise: Springs fabricated from steel-spring wire complying with ASTM A229/A229M; torsion shaft made of steel tube or solid steel; cones and couplers made of gray-iron casting; cable drums made of cast-aluminum or gray-iron casting; galvanized-steel keystock; galvanized-steel brackets (bearing plates, head plates, spreader bars, etc.), galvanized-steel cables; and galvanized-steel fasteners.
b. Stainless Steel at wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B: Springs fabricated from stainless-steel-spring wire complying with ASTM A229/A229M; torsion shaft made of stainless-steel tube or solid stainless-steel with stainless-steel bearings; cones and couplers made of epoxy coated gray-iron casting; cable drums made of cast-aluminum or epoxy coated gray-iron casting; stainless-steel keystock; stainless-steel brackets (bearing plates, head plates, spreader bars, etc.), stainless-steel cables; and stainless-steel fasteners.

2. Cable Safety Factor: Manufacturer's standard.

M. Electric Door Operator: Comply with Part 2 Article "Electric Door Operators" and the following:

1. Usage Classification:
   a. Light duty, up to 10 cycles per hour.

2. Operator Type and Location: Unit consisting of electric motor, gears, pulleys, bells, sprockets, chains, and controls needed to operate door and meet required usage classification.
   a. Manufacturer's standard for door requirements, location indicated on Drawings.

3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use.

4. Motor: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
   a. Motor Exposure:
      1) Interior, clean, and dry unless indicated otherwise.
      2) Interior, wet, and humid at wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B.

b. Electrical Characteristics:
   1) Phase: Single phase.
   2) Volts: 115 V.
   3) Hertz: 60.

   c. Motor Size: Large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

5. Emergency Manual Operation:
   a. Chain type.

a. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

1) Exposure: Dry unless indicated otherwise except provide wet and humid at wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B.

2) Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.

7. Control Station(s), Mounting Locations(s), and Exposure(s): Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."

a. Interior-Mounted Units, Dry Exposure unless indicated otherwise: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure. Mount where shown on Drawings.

b. Interior-Mounted Units, Wet and Humid Exposure at wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated. Mount where shown on the Drawings.

8. Other Equipment:

a. Portable, Radio-Control System: One for each door consisting of the following:

1) Basis-of-Design Product: Subject to compliance with requirements, provide Nortek Security & Control, LLC. Linear Allstar 639T Model 535 or equal product.

   a) Three-channel universal coaxial receiver to open, close, and stop door.

   b) Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.

   c) Remote antenna and mounting kit.

N. Door Finish:

1. Aluminum Sections Finish:
a. Factory Paint: Grayish color and gloss as selected by Architect from manufacturer's full range.

2. Steel Sections Finish:
   a. Factory Paint: Grayish color and gloss as selected by Architect from manufacturer's full range.

3. Finish of Interior Facing Material: Finish as selected by Architect from manufacturer's full range.

2.05 MATERIALS, GENERAL
   A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.06 TRACKS, SUPPORTS, AND ACCESSORIES
   A. Tracks: Of metal type, depth, and configuration specified under Part 2 door assembly Article(s), sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings. Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of roller guides for required door type, size, weight, and loading.
      1. Slot vertical sections of track for door-drop safety device; space 2 inches apart.
      2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
      3. Track Reinforcement and Supports: Members of same metal type matching track, sized to support track without sag, sway, and vibration during opening and closing of doors.
         a. For Vertical Track: Support of type indicated.
         b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.

2.07 HARDWARE
   A. General: Heavy-duty, corrosion-resistant hardware fabricated from metal type specified under Part 2 door assembly Article(s); with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
      1. Use stainless steel fasteners with stainless steel hardware.
B. Hinges: Of material specified under Part 2 door assembly Article(s), mounted at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet wide unless otherwise recommended by door manufacturer.

C. Rollers: Of tire, stem and bearing type and material specified under Part 2 door assembly Article(s), mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3 inch diameter roller tires for 3 inch wide track and 2 inch diameter roller tires for 2 inch wide track.

2.08 LOCKING DEVICES

A. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.09 COUNTERBALANCE MECHANISM

A. Torsion Spring Mechanism: Counterbalance mechanism consisting of adjustable-tension torsion springs mounted on torsion shaft. Provide springs designed for number of operation cycles indicated. Materials for springs, torsion shafts, and related components are specified under Part 2 door assembly Article(s).

B. Cable Drums and Shaft for Doors: Cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts more than 16 feet long unless closer spacing is recommended by door manufacturer. Materials for cable drums and related components are specified under Part 2 door assembly Article(s).

C. Cables: Multistrand, lifting cables made of metal material and with cable safety factor specified under Part 2 door assembly Article(s).

1. Use stainless steel cable at wash bay doors 1-146B, 1-146E, 4-102C, and 4-102B.

D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Motors: As indicated for each door specified under Part 2 door assembly Article(s).

1. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
2. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
3. Use adjustable motor-mounting bases for belt-driven operators.

D. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.


F. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

G. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 ALUMINUM FINISHES

A. Factory Painted Finish:
   1. Exterior Doors: High-performance organic or powder-coat finish; AAMA 2604. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Painted Finish:
   1. Exterior Doors: High-performance organic or powder-coat finish; AAMA 2604. Comply with coating manufacturer's written instructions for cleaning, pretreatment, and applying and baking finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
B. Tracks:
   1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
   2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

C. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.03 STARTUP SERVICES
A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.04 ADJUSTING
A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
B. Lubricate bearings and sliding parts as recommended by manufacturer.
C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.
D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780/A780M.

3.05 DEMONSTRATION
A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 08 36 13
SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Storefront framing for exterior storefronts.
2. Storefront framing for interior storefronts.
4. Exterior manual-swing entrance doors and door-frame units.
5. Interior manual-swing entrance doors and door-frame units.
6. Glazing gaskets and sealants for storefront framing.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions.
   d. Glazing.
   e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.03 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by the manufacturer and witnessed by their qualified testing agency, or tests performed by a qualified testing agency, for the following:

   1. Seismic design.
   2. NFRC energy performance.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

   1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.06 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Deterioration of metals and other materials beyond normal weathering.
   d. Water penetration through fixed glazing and framing areas.
   e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

B. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.

C. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane:
      a. Glass Glazing: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
      b. Non-Glass Glazing: Amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
      c. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

D. Structural: Test according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
   1. Fixed Framing and Glass Area:
      a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
   2. Entrance Doors:
      a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
      b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..

G. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement.

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.38 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.

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

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

2.02 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America; 451UT or comparable product by one of the following:

1. Arcadia, Inc.
2. EFCO Corporation.
3. Oldcastle BuildingEnvelope.
4. TRACO.
5. Tubelite.
6. United States Aluminum.
7. YKK AP America Inc.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.
2.03 FRAMING

A. Exterior Storefront Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   4. Finish: Finish Type 02 - Clear anodic finish.
   5. Fabrication Method: Field-fabricated stick system.

B. Interior Storefront Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   4. Finish: Finish Type 01 - Clear anodic finish.
   5. Fabrication Method: Field-fabricated stick system.

C. Punched Window Openings Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   4. Finish: Finish Type 02 - Clear anodic finish.
   5. Fabrication Method: Field-fabricated stick system.

D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Materials:
   1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      a. Sheet and Plate: ASTM B 209.
      b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
      c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
      d. Structural Profiles: ASTM B 308/B 308M.
2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.04 ENTRANCE DOOR SYSTEMS

A. Exterior Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

   1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

   2. Door Design: Medium stile; 3-1/2-inch nominal width.

B. Interior Entrance Doors: Matching exterior entrance doors.

2.05 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware." General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

   1. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

   2. Opening-Force Requirements:

      a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion.
      b. Accessible Interior Doors: Not more than 5 lbf to fully open door.

B. Weather Stripping: Manufacturer's standard replaceable components.

   1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
   2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

D. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.06 GLAZING

A. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

B. Glazing Sealants: As recommended by manufacturer.

1. LEED2009 - Sealant shall have a VOC content of 250 g/L or less.

2.07 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.08 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At exterior doors and interior vestibule doors, provide compression weather striping at fixed stops.
   2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
   1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
   2. At exterior doors and interior vestibule doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.09 ALUMINUM FINISHES

A. Finish Type 01 - Clear Anodic: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

B. Finish Type 02 - Clear Anodic: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full mastic sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 08 80 00 "Glazing."

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors and Interior Vestibule Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.03 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.

b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.

c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

   a. Perform a minimum of two tests in areas as directed by Architect.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 08 41 13
SECTION 08 45 23 - FIBERGLASS-SANDWICH-PANEL ASSEMBLIES FSP-01

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Aluminum-framed assemblies incorporating fiberglass-sandwich panels as follows:

   a. Wall assemblies with structural composite sandwich panels, translucent skins and aluminum interlocking grid framework unitized with integrated louvers as indicated in the drawings (provided by Fiberglass Sandwich Panel manufacturer).

1.02 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 aluminum components of panel assemblies.

B. Shop Drawings: For panel assemblies.

   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior for the entire system.

C. Samples: In manufacturer's standard size.

   1. For each type of fiberglass-sandwich panel.
   2. For each type of exposed finish for framing members.

D. Delegated-Design Submittal: For panel assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranties: For special warranties.
1.04 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.05 QUALITY ASSURANCE
   A. Manufacturer Qualifications: For fiberglass-sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, accredited quality-control agency for compliance with applicable requirements in ICC-ES AC04 or ICC-ES AC177.
   B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING
   A. Delivery: Deliver to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and installation location.
   B. Storage/Handling: Store products above the floor and under cover in a clean, dry area until installation. Protect materials and finish from damage during handling and installation.

1.07 SITE 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.

1.08 WARRANTY
   A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of panel assemblies that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Structural failures including, but not limited to, excessive deflection.
         b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
         c. Water leakage.
      2. Warranty Period: Five years from date of Substantial Completion.
B. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace fiberglass-sandwich panels that exhibit defects in materials or workmanship within specified warranty period.

1. Defects include, but are not limited to, the following:
   a. Fiberbloom.
   b. Delamination of coating, if any, from exterior face sheet.
   c. Color change exceeding requirements.
   d. Delamination of panel face sheets from panel cores.

2. Warranty Period: 10 years from date of Substantial Completion.

C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS, GENERAL

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design fiberglass-sandwich-panel assemblies.

B. Structural Loads: As indicated on Drawings.

C. Deflection Limits: As indicated for each assembly type specified below.

D. Structural-Test Performance: Provide panel assemblies tested according to ASTM E 330, as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not show evidence of deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not show evidence of material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
F. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 100 deg F, ambient; 180 deg F, material surfaces.

G. Energy Performance: As indicated for each assembly type specified below.

2.02 ALUMINUM FRAMING SYSTEMS, GENERAL

A. Components: As indicated for each assembly type specified below.

B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.

D. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.

1. At closures, retaining caps, or battens, use ASTM A 193, 300 series stainless-steel screws.
2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

E. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.03 FIBERGLASS-SANDWICH PANELS, GENERAL

A. Fiberglass-Sandwich Panels: Uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core.

1. Core Insulation: As indicated for each assembly type specified below.

B. Panel Thickness: As indicated for each assembly type specified below.

C. Grid Core: Mechanically interlocked, extruded-aluminum I-beams, with a minimum flange width of 7/16 inch.
1. Extruded Aluminum: ASTM B 221, in alloy and temper recommended in writing by manufacturer.
2. I-Beam Construction and Grid Pattern: As indicated for each assembly type specified below.

D. Exterior and Interior Face Sheets: As indicated for each assembly type specified below.

E. Fiberglass-Sandwich-Panel Adhesive: Manufacturer's standard for permanent adhesion of facings to cores.

F. Panel Strength:
   1. Maximum Panel Deflection: 3-1/2 inches when a 4-by-12-foot panel is tested according to ASTM E 72 at 34 lbf/sq. ft., with a maximum 0.090-inch set deflection after five minutes.
   2. Panel Support Strength: Capable of supporting, without failure, a 300-lbf concentrated load when applied to a 3-inch- diameter disk according to ASTM E 661.

G. Panel Performance:
   1. Self-Ignition Temperature: 650 deg F or more according to ASTM D 1929.
   2. Smoke-Developed Index: 450 or less according to ASTM E 84, or 75 or less according to ASTM D 2843.
   3. Classifications for the following are indicated for each assembly type specified below.
      a. Combustibility.
      b. Roof-covering.
      c. Interior Finish.
   4. Color Change: Not more than 3.0 units Delta E, when measured according to ASTM D 2244, after outdoor weathering compliant with procedures in ASTM D 1435.
      a. Outdoor Weathering Conditions: Sixty months in southern Florida.
   5. Impact Resistance: As indicated for each assembly type specified below.
   6. Haze Factor: As indicated for each assembly type specified below.

2.04 WALL ASSEMBLIES

A. Wall Fiberglass-Sandwich-Panel Assemblies: Vertical translucent assemblies that are supported by aluminum framing and glazed with fiberglass-sandwich panels. Polycarbonate systems are not acceptable.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Major Industries, Inc.; Aluminum Framed Translucent Wall Panel System with Guardian 275 panels as distributed by Fountaine Design Group, Denver, CO (303)989-4001, contact: Isaac Vigil isaac@fdgproducts.com, or comparable product subject to compliance with 08 45 23 specification requirements by one of the following:

   a. Kalwall Corporation.

B. Assembly Performance:

1. Deflection Limits: Limited to 1/120 of clear span for each assembly component.
2. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer’s published test data, based on procedures indicated below and certified and labeled according to NFRC:
   a. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.20 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
   b. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas shall have a SHGC of no greater than 0.36 as determined according to NFRC 200.
   c. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.01 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbs/sq. ft..

C. Fiberglass-Sandwich Panels:

1. Core Insulation: Fill panel cores with aerogel or white fiberglass batt insulation.
3. Grid Core: Mechanically interlocked aluminum alloy 6061-T6
   b. Grid Pattern: Match Verti-Lite (vertical grids only) - 12 inch vertical grid pattern.
4. Exterior Face Sheet:
   a. Thickness: 0.070 inch.
   b. Color: Match Guardian 275 Crystal.
   c. Protective Weathering Surface: Manufacturer’s standard to meet the specified warranties.
5. Interior Face Sheet:
   a. Thickness: 0.045 inch.
   b. Color: Match Guardian 275 Crystal.
6. Panel Performance:

Stantec Architecture Inc.

Adams County Fleet & Public Works

FIBERGLASS-SANDWICH-PANEL
ASSEMBLIES
a. Combustibility Classification: Class CC1 based on testing according to ASTM D 635.
b. Impact Resistance: No fracture or tear at impact of 70 ft. x lb by a 3-1/4-inch- diameter, 5-lb freefalling ball according to UL 972 test procedure.
c. Haze Factor: Greater than 90 percent when tested according to ASTM D 1003.

D. Aluminum Framing System:

1. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
   b. Finish: Anodized Coating: Architectural Class I, Type AA-M10C22A41
      1) Color: Clear.

2. Exposed Flashing and Closures: Aluminum sheet not less than 0.040 inch thick, finished to match framing.
3. Interior/Exterior Framing Gaskets: Insert requirements.
   a. Factory installed (in extruded dovetail slots) EPDM hybrid, 9/16 inch wide.
   c. Compression Set, 22 Hours at 158 Degrees F, ASTM D 395, Method B.
   d. Heat Aging, 70 Hours at 212 Degrees F, Change in Compression Values.
   e. Type I, 1 Ppm Ozone: No cracks/Type II, 3 Ppm Ozone: No cracks.
   f. Straining of Surface, ASTM D 925: Non-straining, no migratory strain.

4. Glazing Caps: Extruded aluminum. Attach with fasteners a maximum of 12 inches on center or as required to resist negative loading.
5. Fastener covers with finish to match system framing.
6. Concealed Fasteners: for translucent sandwich panel system.

E. Integrated Air Louvers (ESD-202):

1. Conventional Stationary Louvers made with extruded aluminum and drainable blades integrated within the translucent panel system and provided by the translucent sandwich panel manufacturer.
   a. Basis of Design: Greenheck ESD202
   b. Construction: Frame - Heavy gauge extruded 6063-T5 aluminum
   c. Construction: Blades - Drainable design, heavy gauge extruded 6063-T5 aluminum positioned at 45 degree angles on approximately 3” centers and mechanically fastened with a birdscreen.
   d. Glazing Adaptor: to integrate with translucent sandwich panel system
   e. Finish: Clear Anodize 215R1
   f. Depth: 2”
   g. Blade Style: D
2.05 FABRICATION

A. Frame System Fabrication:
   1. Fabricate components that, when assembled, have the following characteristics:
      a. Profiles that are sharp, straight, and free of defects or deformations.
      b. Accurately fitted joints with ends copeed or mitered.
      c. Internal guttering systems or other means to drain water passing through joints, and moisture migrating within entire framing assembly to exterior.
   2. Fabricate sill closures with weep holes and for installation as continuous component.
   3. Reinforce components as required to receive fastener threads.

B. Panel Fabrication: Factory assemble and seal panels.
   1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.
      a. White spots indicating lack of bond at intersections of grid-core members are limited in number to four for every 40 sq. ft. of panel and limited in diameter to 3/64 inch.
   2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
   3. Fabricate panel to allow condensation within panel to escape.
   4. Reinforce panel corners.

2.06 ALUMINUM FINISHES

A. Finish Type 02 - Clear Anodic: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 INSTALLATION

A. General: Comply with manufacturer's written instructions.
   1. Do not install damaged components.
   2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
   3. Rigidly secure nonmovement joints.
   4. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.
   5. Seal joints watertight unless otherwise indicated.

B. Install components plumb and true in alignment with established lines and elevations.

C. Erection Tolerances: Install panel assemblies to comply with the following maximum tolerances:
   1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.
   2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet, but no greater than 1/2 inch over total length.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
   1. Water-Spray Test: Before installation of interior finishes has begun, panel assemblies shall be tested according to AAMA 501.2 and shall not show evidence of water penetration.
   2. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E 1105.
      a. Test Procedures: Test under uniform and cyclic static-air pressure.
      b. Water Penetration: None.

B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

END OF SECTION 08 45 23
SECTION 08 62 23 - TUBULAR SKYLIGHTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes tubular skylight daylighting assemblies. Required layouts of major components are shown on Drawings (light collection domes as shown on roofing plans, light diffusers as shown on reflected ceiling plans, and light guide tubes as shown on other plans). Layouts of domes and diffusers must not be altered. HVAC ductwork, plumbing, and other facility services routing must be coordinated by Contractor to avoid clashing with light guide tubing.

1. Tubular Skylight - TDD-1: A single unit serving a single space or a grouping of units serving a single space; with closed ceilings (diffuser penetrates ceiling).
   a. Sunlight collection domes.
   b. Insulated 12" rise curb and curb cap.
   c. Light guide tubes.
   d. Light diffusers - Square Fresnel.
   e. Suspension system.
   f. Thermal Insulation Panel.

2. Tubular Skylight - TDD-2: A grouping of units serving a single space; with closed ceilings (diffuser penetrates ceiling).
   a. Sunlight collection domes.
   b. Insulated 12" rise curb and curb cap.
   c. Light guide tubes.
   d. Light diffusers - Square Frosted.
   e. Suspension system.
   f. Thermal Insulation Panel.

3. Tubular Skylight - TDD-3: A grouping of units serving a single space; with closed ceilings (diffuser penetrates ceiling).
   a. Sunlight collection domes.
   b. Insulated 12" rise curb and curb cap.
   c. Light guide tubes.
   d. Light diffusers - Square Fresnel.
   e. Light dimmer controls.
   f. Suspension system.
   g. Thermal Insulation Panel.
   h. Motorized dimmer.
1.02 DEFINITIONS

A. Manufacturer's Standard: Where components are indicated as "manufacturer's standard" they shall have been described in manufacturer's literature published and made available to the public prior to date published for receipt of bids for Project.

1.03 REFERENCE STANDARDS


B. AAMA 1607 Voluntary Installation Guidelines for Unit Skylights.

   7. ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
  12. ASTM E308 Standard Practice for Computing the Colors of Objects by Using the CIE System.

D. NFPA - National Fire Protection Association:
1. NFPA 70 National Electrical Code (NEC)

E. UL - Underwriters Laboratories Inc.:
   1. UL 181 - Factory Made Air Ducts and Air Connectors.

1.04 COORDINATION

A. Coordinate dimensions, locations, and details of the following with roofing system terminations.
   1. Tubular skylight curbs and curb cap flashing.

B. Coordinate locations and terminations of interior light guide tube and diffuser assemblies with structural layout, ceiling assembly, ceiling mounted items, and other items mounted overhead.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site prior to installation of roof deck and delivery of tubular skylights.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of tubular skylight.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Motors: Show nameplate data, power requirements, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: For tubular skylight work.
   1. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
      a. Wiring Diagrams: For power and control wiring for dimmers.

C. Daylighting Performance Analysis: Substantiating that tubular skylights meet minimum performance requirements for conditions indicated. Provide separate analysis for each space served. Include the following:
1. Reflected Ceiling Diagram: Drawn to a proportional scale fitting an 8-1/2 x 11 sheet. Show face of perimeter walls, and overall, intermediate, and typical dimensions locating skylight diffusers with respect to each other and walls. Indicate height of workplane and diffuser(s) above finished floor level.

2. Illuminance Contour Diagram: Drawn to proportional scale matching reflected ceiling diagram. Show location of each workpoint in a gridded layout with its calculated illuminance value in fc. Show contours lines for selected workpoint values throughout the range.

3. Analysis Summary and Tables: Tabularize workpoint values; comply with workpoint distribution criteria specified. Values shall be calculated to the nearest 0.1 fc. Indicate criteria used to calculate illuminance values including:
   a. Manufacturer's detailed tubular skylight product descriptor.
   b. Project location and terrestrial latitude.
   c. Day, time, and sky condition.
   d. Workplane height.
   e. Reflectance values of ceiling, wall, and floor surfaces.
   f. Maximum/minimum illuminance ratio at workplane height.
   g. Minimum average illuminance at workplane height.
   h. Other criteria used by manufacturer to substantiate performance.

D. Samples:
   1. Diffuser Lens: For each type indicated, of sufficient size to show lens thickness and optical pattern and profile.
   2. Diffuser Lens Trim: For each type of exposed finish required, of a representative section in manufacturer's standard size.

E. Product Schedule: For tubular skylights. Use same room, space, and tubular skylight designations indicated on Drawings.

1.07 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type and size of tubular skylight, for tests performed within the last four years by a qualified testing agency. Test results based on testing of smaller tubular skylights than specified will not be accepted.

B. Evaluation Reports:
   1. For tubular skylight system from ICC-ES or CCRR (Code Compliance Research Report).
   2. For suspension system anchors and fasteners from ICC-ES.

C. Field quality-control reports.

D. Buy American Act Certification: Documentation certifying that products comply with provisions the Buy American Act 41 U.S.C 10a - 10d.
1.08 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For tubular skylights and light dimmers to include in maintenance manuals.

1.09 DELIVERY, STORAGE, AND HANDLING
   A. Store products in manufacturer's unopened packaging until ready for installation.

1.10 PROJECT CONDITIONS
   A. Environmental Limitations: 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.

1.11 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace components of tubular skylights that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Uncontrolled water leakage.
         b. Deterioration of metals, metal finishes, light collection domes and other materials beyond normal weathering.
         c. Yellowing of acrylic glazing.
         d. Breakage of glazing.
         e. Deterioration of gaskets and seals.
      2. Warranty Period:
         a. Tubular Skylight Assembly: Ten years from date of Substantial Completion.
         b. Light Tube Reflective Coating: Twenty years from date of Substantial Completion.
         c. Electrical Components: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
   A. Source Limitations: Obtain tubular skylights through single source from single manufacturer.
   B. Substitutions: Comply with Section 01 25 00 "Substitution Procedures."
2.02  TUBULAR SKYLIGHTS - TDD-1

A. General: Provide tubular skylights that comply with performance requirements and meet design criteria indicated, in quantity and layout for room or area indicated on Drawings. Unit(s) provided shall transfer ambient sunlight to interior spaces and produce illuminance levels within limits indicated under "Daylighting Performance" paragraph below.

B. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. VELUX America Inc. ( suntunnelskylights.veluxusa.com ); TCC-22-TTC- Fresnel 2' x 2' Square. Contact candice.clark@velux.com.
2. Or comparable product by one of the following:
   a. ODL, Inc. ( www.odl.com ).

C. Type: A single unit or group of units serving a single space; with closed ceilings (diffuser penetrates ceiling).

D. Performance Class and Grade: Class TDDOC-PG 30.

E. Thermal Transmittance Performance: NFRC 100 maximum U-factor of 0.55 Btu/sq. ft. x h x deg F.

F. Solar Heat-Gain Coefficient (SHGC) Performance: NFRC 200 maximum SHGC of 0.30.

G. Daylighting Performance: Provide daylighting photometric performance analysis using the following criteria, at project location, by simulation in accordance with IESNA guidelines:

1. Day, Time, and Sky Condition: March 21, 9 am local time, clear sky at terrestrial latitude for Project.
2. Workplane Height: Finished floor in all hall locations and 30 inches above finished floor in all other locations.
3. Reflectance Values:
   a. Ceiling Surface: 0.8.
   b. Wall Surfaces: 0.5.
   c. Floor Surface: 0.2.
5. Minimum Average Illuminance at Workplane Height: 30 Fc.
6. Workpoint Distribution:
   a. Workpoint Spacing: Not greater than 15 ft. o.c.
   b. Number of Workpoints: Not less than 100.
c. Workpoint Grid Layout: Not less than 10 units by 10 units.

H. Sunlight Collection Domes: Portion of tubular skylight units mounted on roof deck. An assembly with dome-shaped light-transmitting glazing for collecting and concentrating ambient sunlight, and a mounting assembly which retains and supports glazing and top portion of light guide tube. Mounting assembly must be thermally broken and minimize air infiltration. Dome glazing must be shaped to rise above the mounting flange a minimum distance equal to 10 percent of the maximum span of the dome, but not less than 3 inches. Edges of plastic glazing must be protected by a fire band.

1. Dome glazing, glazing materials, and mounting assembly shall withstand temperature changes, wind, and impact loads specified without failure, including loss or breakage of dome glazing attributable to the following:
   a. Failure of gaskets, seals, and sealant to remain watertight and airtight.
   b. Deterioration of dome glazing and glazing materials.
   c. Other defects in materials and installation.

2. Dome Diameter: Slightly larger than diameter of light guide tube retained and supported by mounting assembly.

3. Dome Type and Material:
   a. Single glazed acrylic or polycarbonate plastic.
   b. Dual glazed with outer and inner domes.
      1) Outer Dome Material: Acrylic or polycarbonate plastic.
      2) Inner Dome Material: Acrylic or polycarbonate plastic.
   c. Either single glazed or dual glazed with outer and inner domes.
      1) Single or Outer Dome Material: Acrylic or polycarbonate plastic.
      2) Inner Dome Material: Acrylic, polycarbonate, or PETG plastic.

4. Plastic Glazing Material(s): Impact resistant, formulated with UV absorbing or inhibiting additives, and complying with the following:
   a. Domes: Injection molded or formed with following wall thickness(es):
      1) Single or Outer Dome:
         a) Acrylic or Polycarbonate Plastic: Minimum 0.125 inch.
         b) PETG Plastic (Copolyester polyethylene terephthalate with glycol) will not be accepted for outer dome.
      2) Inner Dome:
         a) Acrylic or Polycarbonate Plastic: Minimum 0.115 inch.
         b) PETG Plastic: Minimum 0.040 inch.
b. Each unit or unit packaging must be identified with a mark or decal acceptable to Authorities having jurisdiction indicating conformance to the following:

1) Self-Ignition Temperature: 650 deg F or more when tested according to ASTM D1929.
2) Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested in manner intended for use according to ASTM E84, or smoke density of 75 or less when tested in thickness intended for use according to ASTM D2843.
3) Combustibility Classification: Either of the following:
   a) Class CC1, burning extent of 1 inch or less for nominal thickness of 0.060 inch or thickness indicated for use when tested according to ASTM D635.
   b) Class CC2, burning rate of 2-1/2 inches per minute or less for nominal thickness of 0.060 inch or thickness indicated for use when tested according to ASTM D635.

5. Dome Optics and Supplemental Devices:
   a. Dome glazing must be optimized to effectively capture low-angle sun rays in mornings, late afternoons, and winter months, as well as high-angle sun rays at midday. Supplemental reflective or optical devices will be accepted.
   b. Dome glazing must be optimized to effectively capture low-angle sun rays in mornings, late afternoons, and winter months, but reject high-angle and high solar heat gain sunlight at midday. Supplemental reflective or optical devices will be accepted.

7. Thermal Breaks: Fabricate tubular skylights with thermal breaks separating exterior and interior metal framing and components, as required to ensure that tubular skylight units comply with specified thermal transmittance performance.
8. Thermal Insulation: Provide non-combustible insulation R-6 minimum as required to ensure that tubular skylight units comply with specified thermal transmittance performance.
   a. Curb Cap Insulation: Suitable for filling cavity formed between inside face of curb and outside face of light guide tube, and from underside face of curb cap flashing to bottom face of roof deck.

9. Condensation Control: Manufacturer's standard design for channeling accumulated condensation out of dome assembly.
10. Fire Band: Manufacturer’s standard plastic dome edge protection band tested in accordance with ASTM E108 and listed as passing Burning Brand test with target roof covering classification of Class B.
11. Mounting Method:

a. Cap Flashing on Curb: One-piece, square shaped curb cap flashing with up-turned tubular flange formed to support dome and light guide tubes, flat top, and down-turned down sides not less than 3 inches long formed with drip flanges. Curb flashing must be leak-proof, top surface of cap must be seamless, sealed seams will be accepted at outside corners, seams must be factory fabricated.

1) Material: Metallic coated steel sheet complying with ASTM A653/A653M or ASTM A463/A463M or ASTM A792/A792M; minimum 0.022 inch (24 ga.) thickness.

2) Finish: Manufacturer standard baked-enamel, powder-coat, or high-performance organic finish, color as selected by Architect from manufacturer’s full range.

3) Size: 21 by 21 inches.

I. Light Guide Tubes: Portion of tubular skylight units transmitting light by reflection from dome to diffuser. Tubular metal fabrications with interior specular reflective finish, and of nominal diameter indicated. Include straight extension tubes, fixed angle tubes (elbows), adjustable angle tubes, couplers, adaptors, and accessories as required to produce a complete assembly for conditions indicated.

1. Nominal Diameter: 22 inch.

2. Provide only rigid tubes. Flexible tubes will not be accepted.

3. Rigid Tube Construction: Fabricated from aluminum sheet in accordance with UL 181 and complying with Class 1 - Air ducts and air connectors having a flame-spread index of not over 25 without evidence of continued progressive combustion and a smoke-developed index of not over 50.

   a. Straight, Extension Tubes: Manufactured to lengths not less than 24 inches.

   b. Telescoping extension tubes will be accepted.

   c. Field assembled tubes will be accepted.

4. Tube Material and Finish:

   a. Aluminum Sheet: Complying with ASTM B209, minimum 0.016 thick.

   b. Exterior Finish: Clear anodized or mill finish.

   c. Interior Finish: Highly reflective specular finish complying with the following:

      1) Reflectance: Not less than 99 percent when measure in accordance with ASTM E1651 at 30 degrees from vertical. Total reflectance not less than 98 percent when measure in accordance with ASTM E1651.

      2) Color Rendition: Either of following:

         a) Total Normal Emittance per ASTM E408: As defined by CIE (International Commission on Illumination) L*a*b* color model, L equal to 99 - 100, values a* and b* shall not exceed +1 or be less than -1.
b) Per ASTM E308: As defined by CIE (International Commission on Illumination) L*a*b* color model, values a* and b* shall not exceed +2 or be less than -2.

5. Tube Connections and Connectors: Manufacturer's standard mechanically fastened, mechanically banded, mechanically interlocking devices, or a combination of such devices. Connectors must prevent tube rotation or disengagement under normal conditions and must function to stiffen connections at seams and joints. Connectors must prevent unintentional disconnection of tubes due to handling, service, or vibration under normal operation or use.

6. Gaskets and Seals: Manufacturer's standard, as required to comply with performance requirements and design criteria specified.

J. Light Diffusers:

1. Closed (Suspended) Ceilings: Portion of tubular skylight unit that illuminates interior space indicated. An assembly with a light diffusing lens and manufacturer's standard trim and transition box designed to connect lens to bottom of the light guide tube. Provide a primary and secondary diffuser assemblies where required to comply with Energy Star performance requirements specified.

a. Diffusing Lens Size:

1) Nominal 24 by 24 inches designed for installation in suspended ceiling grid.

b. Exposed Trim:

1) Material: Manufacturer's standard painted metal. Plastic will not be accepted.

c. Diffusing Lens Type and Material:

1) Plastic, Fresnel, Clear: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives. Formed with parabolic light-diffusing prisms. Broad light dispersion type, designed to maximize light output and diffusion, capable of rendering ambient sky conditions (e.g. clear blue sky versus overcast gray sky).

   a) Visible Light Transmission: Greater than 90 percent.
   b) Lens Thickness: 0.022 inch.

2. Plastic Material Diffusing Lens:

a. Foam plastic materials will not be accepted.

b. Light transmitting plastic diffusers, as installed, must remain in place at an ambient room temperature of 175 deg. F for a period of not less than 15 minutes.
c. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency.

1) Class A: Flame spread index 0 - 25; smoke developed index 0 - 450.
2) Class B: Flame spread index 26 - 75; smoke developed index 0 - 450.
3) Class C: Flame spread index 76 - 200; smoke developed index 0 - 450.
4) Exception: Light transmitting plastic diffusers need not comply with ASTM E84 Class indicated if diffuser will fall from its mounting before ignition, at an ambient temperature of at least 200 deg. F below the ignition temperature of the plastic material.

3. Gaskets, Seals, and Adhesives: Manufacturer's standard, as required to comply with performance requirements and design criteria specified.

a. Liquid adhesive and sealing materials shall be applied in factory.

K. Suspension System: Support and brace suspended components of skylight units from overhead structure as required to ensure that no part of tubular skylight imposes more than 2.5 lbs./sq. ft. of weight on suspended ceilings and to ensure that tubular skylight complies with seismic performance requirements specified. Include the following:

2. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

a. Power-Actuated Fasteners in Concrete Filled Metal Deck: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.

b. Postinstalled Eye Lag Type Screws in Metal Decking Not Concrete Filled: Self-tapping screw fastener designed for use with metal framing. Each fastener shall be about 2 inches long overall and include an integral self-tapping threaded screw, washer, shank and flattened eyelet portion with hole sized to accept suspension wire. Manufacture from 1018 heat-treated steel with electroplated zinc Type II coating.

1) Screws shall comply with following allowable tension load for 20 gage (minimum uncoated thickness of 0.030 inch) metal decking with 38,000 psi minimum yield strength: 170 psi inclusive of 2-1/2 safety factor for steel decking.
2) Use of this screw shall be limited to gravity dead load no greater than 40 lbs.
3) Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:

a) I-LAG Brand Eye Lag Screws, 750 SD; Doc's Marketing Corp.

2.03 TUBULAR SKYLIGHTS - TDD-2

A. General: Provide tubular skylights that comply with performance requirements and meet design criteria indicated, in quantity and layout for room or area indicated on Drawings. Unit(s) provided shall transfer ambient sunlight to interior spaces and produce illuminance levels within limits indicated under "Daylighting Performance" paragraph below.

B. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. VELUX America Inc. (suntunnelskylights.veluxusa.com); TCC 14" Frosted 14" Circular with 14" trim ring. Contact candice.clark@velux.com.
2. Or comparable product by one of the following:
   a. ODL, Inc. (www.odl.com).

C. Type: A grouping of units serving a single space; with closed ceilings (diffuser penetrates ceiling).

D. Performance Class and Grade: Class TDDOC-PG 30.

E. Thermal Transmittance Performance: NFRC 100 maximum U-factor of 0.55 Btu/sq. ft. x h x deg F.

F. Solar Heat-Gain Coefficient (SHGC) Performance: NFRC 200 maximum SHGC of 0.30.

G. Daylighting Performance: Provide daylighting photometric performance analysis using the following criteria, at project location, by simulation in accordance with IESNA guidelines:

1. Day, Time, and Sky Condition: March 21, 9 am local time, clear sky at terrestrial latitude for Project.
2. Workplane Height: 30 inches above finished floor.
3. Reflectance Values:
   a. Ceiling Surface: 0.8.
   b. Wall Surfaces: 0.5.
   c. Floor Surface: 0.2.

5. Minimum Average Illuminance at Workplane Height: 30 Fc.
6. Workpoint Distribution:
   a. Workpoint Spacing: Not greater than 15 ft. o.c.
   b. Number of Workpoints: Not less than 100.
   c. Workpoint Grid Layout: Not less than 10 units by 10 units.

H. Sunlight Collection Domes: Portion of tubular skylight units mounted on roof deck. An assembly with dome-shaped light-transmitting glazing for collecting and concentrating ambient sunlight, and a mounting assembly which retains and supports glazing and top portion of light guide tube. Mounting assembly must be thermally broken and minimize air infiltration. Dome glazing must be shaped to rise above the mounting flange a minimum distance equal to 10 percent of the maximum span of the dome, but not less than 3 inches. Edges of plastic glazing must be protected by a fire band.

1. Dome glazing, glazing materials, and mounting assembly shall withstand temperature changes, wind, and impact loads specified without failure, including loss or breakage of dome glazing attributable to the following:
   a. Failure of gaskets, seals, and sealant to remain watertight and airtight.
   b. Deterioration of dome glazing and glazing materials.
   c. Other defects in materials and installation.

2. Dome Diameter: Slightly larger than diameter of light guide tube retained and supported by mounting assembly.

3. Dome Type and Material:
   a. Single glazed acrylic or polycarbonate plastic.
   b. Dual glazed with outer and inner domes.
      1) Outer Dome Material: Acrylic or polycarbonate plastic.
      2) Inner Dome Material: Acrylic, polycarbonate, or PETG plastic.
   c. Either single glazed or dual glazed with outer and inner domes.
      1) Single or Outer Dome Material: Acrylic or polycarbonate plastic.
      2) Inner Dome Material: Acrylic, polycarbonate, or PETG plastic.

4. Plastic Glazing Material(s): Impact resistant, formulated with UV absorbing or inhibiting additives, and complying with the following:
   a. Domes: Injection molded or formed with following wall thickness(es):
      1) Single or Outer Dome:
         a) Acrylic or Polycarbonate Plastic: Minimum 0.125 inch.
         b) PETG Plastic (Copolyester polyethylene terephthalate with glycol) will not be accepted for outer dome.
      2) Inner Dome:
         a) Acrylic or Polycarbonate Plastic: Minimum 0.115 inch.
b) PETG Plastic: Minimum 0.040 inch.

b. Each unit or unit packaging must be identified with a mark or decal acceptable to Authorities having jurisdiction indicating conformance to the following:

1) Self-Ignition Temperature: 650 deg F or more when tested according to ASTM D1929.

2) Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested in manner intended for use according to ASTM E84, or smoke density of 75 or less when tested in thickness intended for use according to ASTM D2843.

3) Combustibility Classification: Either of the following:

   a) Class CC1, burning extent of 1 inch or less for nominal thickness of 0.060 inch or thickness indicated for use when tested according to ASTM D635.
   b) Class CC2, burning rate of 2-1/2 inches per minute or less for nominal thickness of 0.060 inch or thickness indicated for use when tested according to ASTM D635.

5. Dome Optics and Supplemental Devices:

a. Dome glazing must be optimized to effectively capture low-angle sun rays in mornings, late afternoons, and winter months, as well as high-angle sun rays at midday. Supplemental reflective or optical devices will be accepted.

b. Dome glazing must be optimized to effectively capture low-angle sun rays in mornings, late afternoons, and winter months, but reject high-angle and high solar heat gain sunlight at midday. Supplemental reflective or optical devices will be accepted.


7. Thermal Breaks: Fabricate tubular skylights with thermal breaks separating exterior and interior metal framing and components, as required to ensure that tubular skylight units comply with specified thermal transmittance performance.

8. Thermal Insulation: Provide non-combustible insulation R-6 minimum as required to ensure that tubular skylight units comply with specified thermal transmittance performance.

a. Curb Cap Insulation: Suitable for filling cavity formed between inside face of curb and outside face of light guide tube, and from underside face of curb cap flashing to bottom face of roof deck.

9. Condensation Control: Manufacturer's standard design for channeling accumulated condensation out of dome assembly.

10. Fire Band: Manufacturer's standard plastic dome edge protection band tested in accordance with ASTM E108 and listed as passing Burning Brand test with target roof covering classification of Class B.

11. Mounting Method:

a. Cap Flashing on Curb: One-piece, square shaped curb cap flashing with up-turned tubular flange formed to support dome and light guide tubes, flat top, and down-turned down sides not less than 3 inches long formed with drip flanges. Curb flashing must be leak-proof, top surface of cap must be seamless, sealed seams will be accepted at outside corners, seams must be factory fabricated.

1) Material: Metallic coated steel sheet complying with ASTM A653/A653M or ASTM A463/A463M or ASTM A792/A792M; minimum 0.022 inch thickness.

2) Finish: Manufacturer standard baked-enamel, powder-coat, or high-performance organic finish, color as selected by Architect from manufacturer's full range.

3) Size: 21 by 21 inches.

I. Light Guide Tubes: Portion of tubular skylight units transmitting light by reflection from dome to diffuser. Tubular metal fabrications with interior specular reflective finish, and of nominal diameter indicated. Include straight extension tubes, fixed angle tubes (elbows), adjustable angle tubes, couplers, adaptors, and accessories as required to produce a complete assembly for conditions indicated.

1. Nominal Diameter: 10 inch.

2. Provide only rigid tubes. Flexible tubes will not be accepted.

3. Rigid Tube Construction: Fabricated from aluminum sheet in accordance with UL 181 and complying with Class 1 - Air ducts and air connectors having a flame-spread index of not over 25 without evidence of continued progressive combustion and a smoke-developed index of not over 50.

a. Straight, Extension Tubes: Manufactured to lengths not less than 24 inches.

b. Telescoping extension tubes will be accepted.

c. Field assembled tubes will be accepted.

4. Tube Material and Finish:

a. Aluminum Sheet: Complying with ASTM B209, minimum 0.016 thick.

b. Exterior Finish: Clear anodized or mill finish.

b. Interior Finish: Highly reflective specular finish complying with the following:

1) Reflectance: Not less than 99 percent when measure in accordance with ASTM E1651 at 30 degrees from vertical. Total reflectance not less than 98 percent when measure in accordance with ASTM E1651.

2) Color Rendition: Either of following:
a) Total Normal Emittance per ASTM E408: As defined by CIE (International Commission on Illumination) L*α*b* color model, L equal to 99 - 100, values α* and b* shall not exceed +1 or be less than -1.

b) Per ASTM E308: As defined by CIE (International Commission on Illumination) L*α*b* color model, values α* and b* shall not exceed +2 or be less than -2.

5. Tube Connections and Connectors: Manufacturer's standard mechanically fastened, mechanically banded, mechanically interlocking devices, or a combination of such devices. Connectors must prevent tube rotation or disengagement under normal conditions and must function to stiffen connections at seams and joints. Connectors must prevent unintentional disconnection of tubes due to handling, service, or vibration under normal operation or use.

6. Gaskets and Seals: Manufacturer's standard, as required to comply with performance requirements and design criteria specified.

J. Light Diffusers:

1. Closed (Suspended) Ceilings: Portion of tubular skylight unit that illuminates interior space indicated. An assembly with a light diffusing lens and manufacturer's standard trim and transition box designed to connect lens to bottom of the light guide tube. Provide a primary and secondary diffuser assemblies where required to comply with Energy Star performance requirements specified.

   a. Diffusing Lens Size:

      1) Approximately same diameter of light guide tube and designed for installation in gypsum board ceiling, with manufacturer's standard exposed flange trim.

   b. Exposed Trim:

      1) Material: Manufacturer's standard painted metal or integrally colored plastic.
      2) Color: White.

   c. Diffusing Lens Type and Material:

      1) Plastic, Frosted, White: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives.

2. Plastic Material Diffusing Lens:

   a. Foam plastic materials will not be accepted.
   b. Light transmitting plastic diffusers, as installed, must remain in place at an ambient room temperature of 175 deg. F for a period of not less than 15 minutes.
c. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency.

1) **Class A:** Flame spread index 0 - 25; smoke developed index 0 - 450.
2) **Class B:** Flame spread index 26 - 75; smoke developed index 0 - 450.
3) **Class C:** Flame spread index 76 - 200; smoke developed index 0 - 450.
4) Exception: Light transmitting plastic diffusers need not comply with ASTM E84 Class indicated if diffuser will fall from its mounting before ignition, at an ambient temperature of at least 200 deg. F below the ignition temperature of the plastic material.

3. Gaskets, Seals, and Adhesives: Manufacturer's standard, as required to comply with performance requirements and design criteria specified.

   a. Liquid adhesive and sealing materials shall be applied in factory.

K. Suspension System: Support and brace suspended components of skylight units from overhead structure as required to ensure that no part of tubular skylight imposes more than 2.5 lbs./sq. ft. of weight on suspended ceilings and to ensure that tubular skylight complies with seismic performance requirements specified. Include the following:

1. **Hanger Wire:** ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.
2. **Attachment Devices:** Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

   a. **Power-Actuated Fasteners in Concrete Filled Metal Deck:** Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.

   b. **Postinstalled Eye Lag Type Screws in Metal Decking Not Concrete Filled:** Self-tapping screw fastener designed for use with metal framing. Each fastener shall be about 2 inches long overall and include an integral self-tapping threaded screw, washer, shank and flattened eyelet portion with hole sized to accept suspension wire. Manufacture from 1018 heat-treated steel with electroplated zinc Type II coating.

   1) Screws shall comply with following allowable tension load for 20 gage (minimum uncoated thickness of 0.030 inch) metal decking with 38,000 psi minimum yield strength: 170 psi inclusive of 2-1/2 safety factor for steel decking.

   2) Use of this screw shall be limited to gravity dead load no greater than 40 lbs.
3) Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:

a) I-LAG Brand Eye Lag Screws, 750 SD; Doc's Marketing Corp.

2.04 TUBULAR SKYLIGHTS - TDD-3

A. General: Provide tubular skylights that comply with performance requirements and meet design criteria indicated, in quantity and layout for room or area indicated on Drawings. Unit(s) provided shall transfer ambient sunlight to interior spaces and produce illuminance levels within limits indicated under "Daylighting Performance" paragraph below.

B. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. VELUX America Inc. (suntunnelskylights.veluxusa.com); TCC-22-TTC- Fresnel 2' x 2' Square with dimmer. Contact candice.clark@velux.com.
2. Or comparable product by one of the following:
   a. ODL, Inc. (www.odl.com).

C. Type: A grouping of units serving a single space; with closed ceilings (diffuser penetrates ceiling).

D. Performance Class and Grade: Class TDDOC-PG 30.

E. Thermal Transmittance Performance: NFRC 100 maximum U-factor of 0.55 Btu/sq. ft. x h x deg F.

F. Solar Heat-Gain Coefficient (SHGC) Performance: NFRC 200 maximum SHGC of 0.30.

G. Daylighting Performance: Provide daylighting photometric performance analysis using the following criteria, at project location, by simulation in accordance with IESNA guidelines:

1. Day, Time, and Sky Condition: March 21, 9 am local time, clear sky at terrestrial latitude for Project.
2. Workplane Height: 30 inches above finished floor.
3. Reflectance Values:
   a. Ceiling Surface: 0.8.
   b. Wall Surfaces: 0.5.
   c. Floor Surface: 0.2.
5. Minimum Average Illuminance at Workplane Height: 30 Fc.
6. Workpoint Distribution:
   a. Workpoint Spacing: Not greater than 15 ft. o.c.
   b. Number of Workpoints: Not less than 100.
   c. Workpoint Grid Layout: Not less than 10 units by 10 units.

H. Sunlight Collection Domes: Portion of tubular skylight units mounted on roof deck. An assembly with dome-shaped light-transmitting glazing for collecting and concentrating ambient sunlight, and a mounting assembly which retains and supports glazing and top portion of light guide tube. Mounting assembly must be thermally broken and minimize air infiltration. Dome glazing must be shaped to rise above the mounting flange a minimum distance equal to 10 percent of the maximum span of the dome, but not less than 3 inches. Edges of plastic glazing must be protected by a fire band.

1. Dome glazing, glazing materials, and mounting assembly shall withstand temperature changes, wind, and impact loads specified without failure, including loss or breakage of dome glazing attributable to the following:
   a. Failure of gaskets, seals, and sealant to remain watertight and airtight.
   b. Deterioration of dome glazing and glazing materials.
   c. Other defects in materials and installation.

2. Dome Diameter: Slightly larger than diameter of light guide tube retained and supported by mounting assembly.

3. Dome Type and Material:
   a. Single glazed acrylic or polycarbonate plastic.
   b. Dual glazed with outer and inner domes.
      1) Outer Dome Material: Acrylic or polycarbonate plastic.
      2) Inner Dome Material: Acrylic, polycarbonate, or PETG plastic.
   c. Either single glazed or dual glazed with outer and inner domes.
      1) Single or Outer Dome Material: Acrylic or polycarbonate plastic.
      2) Inner Dome Material: Acrylic, polycarbonate, or PETG plastic.

4. Plastic Glazing Material(s): Impact resistant, formulated with UV absorbing or inhibiting additives, and complying with the following:
   a. Domes: Injection molded or formed with following wall thickness(es):
      1) Single or Outer Dome:
         a) Acrylic or Polycarbonate Plastic: Minimum 0.125 inch.
         b) PETG Plastic (Copolyester polyethylene terephthalate with glycol) will not be accepted for outer dome.
      2) Inner Dome:
         a) Acrylic or Polycarbonate Plastic: Minimum 0.115 inch.
b) PETG Plastic: Minimum 0.040 inch.

b. Each unit or unit packaging must be identified with a mark or decal acceptable to Authorities having jurisdiction indicating conformance to the following:

1) Self-Ignition Temperature: 650 deg F or more when tested according to ASTM D1929.

2) Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested in manner intended for use according to ASTM E84, or smoke density of 75 or less when tested in thickness intended for use according to ASTM D2843.

3) Combustibility Classification: Either of the following:

   a) Class CC1, burning extent of 1 inch or less for nominal thickness of 0.060 inch or thickness indicated for use when tested according to ASTM D635.

   b) Class CC2, burning rate of 2-1/2 inches per minute or less for nominal thickness of 0.060 inch or thickness indicated for use when tested according to ASTM D635.

5. Dome Optics and Supplemental Devices:

   a. Dome glazing must be optimized to effectively capture low-angle sun rays in mornings, late afternoons, and winter months, as well as high-angle sun rays at midday. Supplemental reflective or optical devices will be accepted.

   b. Dome glazing must be optimized to effectively capture low-angle sun rays in mornings, late afternoons, and winter months, but reject high-angle and high solar heat gain sunlight at midday. Supplemental reflective or optical devices will be accepted.


7. Thermal Breaks: Fabricate tubular skylights with thermal breaks separating exterior and interior metal framing and components, as required to ensure that tubular skylight units comply with specified thermal transmittance performance.

8. Thermal Insulation: Provide non-combustible insulation R-6 minimum as required to ensure that tubular skylight units comply with specified thermal transmittance performance.

   a. Curb Cap Insulation: Suitable for filling cavity formed between inside face of curb and outside face of light guide tube, and from underside face of curb cap flashing to bottom face of roof deck.

9. Condensation Control: Manufacturer’s standard design for channeling accumulated condensation out of dome assembly.

10. Fire Band: Manufacturer's standard plastic dome edge protection band tested in accordance with ASTM E108 and listed as passing Burning Brand test with target roof covering classification of Class B.

11. Mounting Method:

a. Cap Flashing on Curb: One-piece, square shaped curb cap flashing with up-turned tubular flange formed to support dome and light guide tubes, flat top, and down-turned down sides not less than 3 inches long formed with drip flanges. Curb flashing must be leak-proof, top surface of cap must be seamless, sealed seams will be accepted at outside corners, seams must be factory fabricated.

1) Material: Metallic coated steel sheet complying with ASTM A653/A653M or ASTM A463/A463M or ASTM A792/A792M; minimum 0.022 inch thickness.
2) Finish: Manufacturer standard baked-enamel, powder-coat, or high-performance organic finish, color as selected by Architect from manufacturer's full range.
3) Size: 21 by 21 inches.

I. Light Guide Tubes: Portion of tubular skylight units transmitting light by reflection from dome to diffuser. Tubular metal fabrications with interior specular reflective finish, and of nominal diameter indicated. Include straight extension tubes, fixed angle tubes (elbows), adjustable angle tubes, couplers, adaptors, and accessories as required to produce a complete assembly for conditions indicated.

1. Nominal Diameter: 22 inch.
2. Provide only rigid tubes. Flexible tubes will not be accepted.
3. Rigid Tube Construction: Fabricated from aluminum sheet in accordance with UL 181 and complying with Class 1 - Air ducts and air connectors having a flame-spread index of not over 25 without evidence of continued progressive combustion and a smoke-developed index of not over 50.

a. Straight, Extension Tubes: Manufactured to lengths not less than 24 inches.
b. Telescoping extension tubes will be accepted.
c. Field assembled tubes will be accepted.

4. Tube Material and Finish:

a. Aluminum Sheet: Complying with ASTM B209, minimum 0.016 thick.
b. Exterior Finish: Clear anodized or mill finish.
c. Interior Finish: Highly reflective specular finish complying with the following:

1) Reflectance: Not less than 99 percent when measure in accordance with ASTM E1651 at 30 degrees from vertical. Total reflectance not less than 98 percent when measure in accordance with ASTM E1651.
2) Color Rendition: Either of following:
a) Total Normal Emittance per ASTM E408: As defined by CIE (International Commission on Illumination) L*a*b* color model, L equal to 99 - 100, values a* and b* shall not exceed +1 or be less than -1.

b) Per ASTM E308: As defined by CIE (International Commission on Illumination) L*a*b* color model, values a* and b* shall not exceed +2 or be less than -2.

5. Tube Connections and Connectors: Manufacturer's standard mechanically fastened, mechanically banded, mechanically interlocking devices, or a combination of such devices. Connectors must prevent tube rotation or disengagement under normal conditions and must function to stiffen connections at seams and joints. Connectors must prevent unintentional disconnection of tubes due to handling, service, or vibration under normal operation or use.

6. Gaskets and Seals: Manufacturer's standard, as required to comply with performance requirements and design criteria specified.

J. Light Diffusers:

1. Closed (Suspended) Ceilings: Portion of tubular skylight unit that illuminates interior space indicated. An assembly with a light diffusing lens and manufacturer's standard trim and transition box designed to connect lens to bottom of the light guide tube. Provide a primary and secondary diffuser assemblies where required to comply with Energy Star performance requirements specified.

a. Diffusing Lens Size:

  1) Nominal 24 by 24 inches designed for installation in suspended ceiling grid.

b. Exposed Trim:

   1) Material: Manufacturer's standard painted metal. Plastic will not be accepted.

c. Diffusing Lens Type and Material:

   1) Plastic, Fresnel, Clear: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives. Formed with parabolic light-diffusing prisms. Broad light dispersion type, designed to maximize light output and diffusion, capable of rendering ambient sky conditions (e.g. clear blue sky versus overcast gray sky).

      a) Visible Light Transmission: Greater than 90 percent.
      b) Lens Thickness: 0.022 inch.

2. Plastic Material Diffusing Lens:
a. Foam plastic materials will not be accepted.
b. Light transmitting plastic diffusers, as installed, must remain in place at an ambient room temperature of 175 deg. F for a period of not less than 15 minutes.
c. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency.
   1) Class A: Flame spread index 0 - 25; smoke developed index 0 - 450.
   2) Class B: Flame spread index 26 - 75; smoke developed index 0 - 450.
   3) Class C: Flame spread index 76 - 200; smoke developed index 0 - 450.
   4) Exception: Light transmitting plastic diffusers need not comply with ASTM E84 Class indicated if diffuser will fall from its mounting before ignition, at an ambient temperature of at least 200 deg. F below the ignition temperature of the plastic material.

3. Gaskets, Seals, and Adhesives: Manufacturer's standard, as required to comply with performance requirements and design criteria specified.
   a. Liquid adhesive and sealing materials shall be applied in factory.

K. Light Dimmer Controls: Portion of tubular skylight unit that varies amount of sunlight passing through diffuser unit. Include housing, junction boxes, dimmer valve, control switch, power supply, and low-voltage electrical wiring/cabling.

   1. Circuit Configuration for Multiple Connected Units: Series.
   2. Housing: Manufacturer's standard plenum-rated kynar PVDF thermoplastic.
   3. Dimmer Valve: Manufacturer's standard electro-mechanically actuated valve butterfly baffle or variable position paddle finished with reflected finish to minimize visibility through diffuser and shadowing on diffuser.
      a. Motor: Of size and capacity suitable for operating valve.
      b. Input Voltage: 24 VDC.
      c. Maximum Current Draw per Unit: 50 ma.
      d. Adjustable for daylight output between 2 and 100 percent.

4. Control Switch: Manufacturer's standard, allowing dimmer valve to stop at any position between fully open and fully closed.
   a. Switch Type: Low voltage DP/DT (double pole/double throw).
   b. Switch Coverplate Color: White.
   c. Switch shall control up to 10 daylight dimmer valves, synchronously.

5. Power Supply: Manufacturer's standard, integrated with dimmer switch or with dimmer valve. 110 to 277 VAC input and 24 VDC output.
   a. Capacity: Suitable for accommodating up to 10 daylight dimmer motors, synchronously.
6. Wiring/Cabling: Manufacturer's standard 2- and 4-conductor low voltage cable, sized for circuit lengths required for conditions indicated, and sized for multiple DC electrical connections, but not less than Size 22.

L. Suspension System: Support and brace suspended components of skylight units from overhead structure as required to ensure that no part of tubular skylight imposes more than 2.5 lbs./sq. ft. of weight on suspended ceilings and to ensure that tubular skylight complies with seismic performance requirements specified. Include the following:

2. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   a. Power-Actuated Fasteners in Concrete Filled Metal Deck: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.
   b. Postinstalled Eye Lag Type Screws in Metal Decking Not Concrete Filled: Self-tapping screw fastener designed for use with metal framing. Each fastener shall be about 2 inches long overall and include an integral self-tapping threaded screw, washer, shank and flattened eyelet portion with hole sized to accept suspension wire. Manufacture from 1018 heat-treated steel with electroplated zinc Type II coating.
      1) Screws shall comply with following allowable tension load for 20 gage (minimum uncoated thickness of 0.030 inch) metal decking with 38,000 psi minimum yield strength: 170 psi inclusive of 2-1/2 safety factor for steel decking.
      2) Use of this screw shall be limited to gravity dead load no greater than 40 lbs.
      3) Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
         a) I-LAG Brand Eye Lag Screws, 750 SD; Doc's Marketing Corp.

2.05 ACCESSORY MATERIALS

A. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.

1. Where removal of exterior exposed fasteners might allow access to building, provide non-removable fastener heads.
B. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. Width: 2 inches.
   2. Thickness: 2 mils aluminum foil; 3.7 mils overall.
   3. Adhesion: 100 ounces force/inch in width.
   4. Elongation: 5 percent.
   5. Tensile Strength: 34 lbf/inch in width.

D. Corrosion-Resistant Coating: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.06 METAL FINISHES

A. Comply with NAAMM's "Metal Finish Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Mill Finish: Manufacturer's standard.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

D. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, mechanical and electrical systems, ceilings, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of tubular skylight assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Comply with recommendations in AAMA 1607, manufacturer's written installation instructions, and approved shop drawings for installing tubular skylights.
B. Coordinate installation roof mounted sunlight collection dome with installation of roofing deck, vapor retarders, insulation, membrane, and flashing to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

C. Coordinate installation of light guide tubes and light diffuser with installation of structural, mechanical, electrical, and other components, and with ceiling assemblies, as required to ensure that each element of the Work performs properly and that combined elements do not interfere with each other.

D. Install interior tubular skylight components after dust producing finishing operations have been completed in area of skylight installation.

E. Install sunlight collection domes and light diffusers level, plumb, and true to line, without distortion.

F. Anchor tubular skylight assemblies securely to supporting substrates. Comply with seismic performance requirements for suspended components.

G. Suspended (Closed) Ceiling Diffuser and Transition Box Supports:
   1. Suspend diffuser, transition box, and light guide tubes from building's structural members, do not use suspended ceiling suspension system as primary support for transition box or light guide tubes.
      a. Install hanger wires plumb or minimally splayed and free from contact with components within ceiling plenum.
      b. Install 4 hanger wires for each diffuser assembly. Attach wires to either of following:
         1) At each quadrant point of transition box in location recommended by manufacturer.
         2) To ceiling suspension grid at not more than 6 inches from each intersecting corner of grid.
      c. Install additional hanger wires to support light guide tubes as indicated on approved shop drawings.
   2. Attach ceiling diffuser through bottom side of ceiling to bottom of transition box using manufacturer furnished clips.
      a. Install secondary diffuser prior to primary diffuser.
   3. Additional Seismic Support: Install at least one independent support wire from structure to a tab on transition box. Wire shall have breaking strength of the weight of transition box assembly plus weight of any vertical tubing and accessories to which it is attached, at a safety factor of 3.
H. Where aluminum surfaces of tubular skylights will contact another metal or corrosive substrates, such as preservative-treated wood, apply corrosion resistant coating on concealed metal surfaces or provide other approved permanent separation recommended in writing by tubular skylight manufacturer.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Leak Detection: After complete installation of sunlight collection domes but before installation of interior finishes, test for water leaks according to AAMA 501.2.
   1. Perform test for total area of first unit installed, prior to installation of subsequent units.

C. Work will be considered defective if it does not pass tests and inspections.

D. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.04 CLEANING AND PROTECTION

A. Clean exposed tubular skylight surfaces according to manufacturer's written instructions. Touch up damaged finish coatings and finishes.

B. Remove excess sealants, glazing materials, dirt, and other substances.

C. Replace dome and diffuser glazing that has been damaged during construction period.

D. Protect tubular skylight surfaces from contact with contaminating substances resulting from construction operations.

E. Light Dimmer Controls: Test and adjust dimmer assemblies and control for proper operation.

END OF SECTION 08 62 23
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.

2. 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 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
2. Division 26 sections for connections to electrical power system and for low-voltage wiring.
3. 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.
5. Capable of coordinating installation of electrified hardware with Architeect 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 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.
   b. Automatic Operators: 2 years.
   c. Exit Devices:
1) Mechanical: 3 years.
2) Electrified: 1 year.

d. Locksets:
   1) Mechanical: 10 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. 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.

B. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect’s approval.

2.02 MATERIALS

A. 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.
2.03 HINGES

A. Manufacturers and Products:


B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high
4. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins
8. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified.
11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.04 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:
   a. Scheduled Manufacturer: Ives.

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.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:
   a. Scheduled Manufacturer: Von Duprin EPT-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.

2.06 FLUSH BOLTS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.

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.
2.07 MORTISE LOCKS

A. Manufacturers and Products:

2. Acceptable Manufacturers and Products: Substitutions by Architect approval

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. 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. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets and comply with the following requirements:
   a. Universal input voltage – single chassis accepts 12 or 24V DC to allow for changes in the field without changing lock chassis.
   b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
   c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
   d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
   e. Request to Exit Switch (RX) –
      1) Modular Design – provide electrified locks capable of using, adding, or changing a modular RX switch without opening the lock case.
      2) Monitoring – where scheduled, provide a request to exit (RX) switch that detects rotation of the inside lever.
9. 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 06

2.08 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:
2. Acceptable Manufacturers and Products: Substitutions by Architect approval

B. Requirements:
   1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
   2. Cylinders: Refer to "KEYING" article, herein.
   3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
   4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
   5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
   6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
   7. Provide electrified options as scheduled in the hardware sets.
   8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
      a. Lever Design: Schlage Rhodes

2.09 EXIT DEVICES

A. Manufacturers and Products:
   2. Acceptable Manufacturers and Products: Substitutions by Architect approval

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. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
2.10 ELECTRIC STRIKES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product: Von Duprin 6000 Series.

B. Requirements:
   1. Provide electric strikes designed for use with type of locks shown at each opening.
   2. Provide electric strikes UL Listed as burglary-resistant.
   3. Where required, provide electric strikes UL Listed for fire doors and frames.
   4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.11 POWER SUPPLIES

A. Manufacturers and Products:

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.

2.12 CYLINDERS

A. Manufacturers:
   1. Scheduled Manufacturer: Schlage (Match existing key system as directed by Owner)

B. Requirements:
1. Provide interchangeable cylinders/cores to match Owner’s existing 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.

2.13 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. 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.

2.14 DOOR CLOSERS

A. Manufacturers and Products:
2. Acceptable Manufacturers and Products: Substitutions by Architect approval

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.

2.15 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

2. Acceptable Manufacturers and Products: Substitutions by Architect approval

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.

2.16 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

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 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.

2.17 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

B. Requirements:

1. Provide kick 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

2.18 OVERHEAD STOPS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson.

B. Requirements:
1. 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.
2. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.19 DOOR STOPS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.

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.

2.20 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

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.

2.21 SILENCERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.

B. Requirements:
   1. Provide "push-in" type silencers for hollow metal or wood frames.
   2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
   3. Omit where gasketing is specified.

2.22 DOOR POSITION SWITCHES

A. Manufacturers:
   1. Scheduled Manufacturer: Schlage.

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.

2.23 LATCH PROTECTORS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.

B. Provide stainless steel latch protectors of type required to function with specified lock.

2.24 FINISHES

A. Finish: BHMA 626/652 (US26D); except:
   1. Hinges at Exterior Doors: BHMA 630 (US32D)
   2. Continuous Hinges: BHMA 628 (US28)
   4. Protection Plates: BHMA 630 (US32D)
   5. Overhead Stops and Holders: BHMA 630 (US32D)
   6. Door Closers: Powder Coat to Match
   7. Wall Stops: BHMA 630 (US32D)
   8. Latch Protectors: BHMA 630 (US32D)
   9. Weatherstripping: Clear Anodized Aluminum
   10. 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. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

2. Custom Steel Doors and Frames: HMMA 831.

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.

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. 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.

K. 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.

L. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

M. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

N. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

O. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

P. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 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.

3.04 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. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   2. 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.
3.05 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.

3.06 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
FOR USE ON MARK/DOOR #(S):
3-101A
EACH TO HAVE:

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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
OUTER ACTUATOR IS DISABLED BY LX SWITCH (INTEGRAL TO LOCKING HARDWARE). WHEN DOORS ARE LATCHED, ACTUATOR IS DISABLED.
AFTER HOURS; CARD READER RETRACTS LATCHBOLT, PRESSING OUTSIDE ACTUATOR OPENS DOOR.
VESTIBULE AND INNERMOST ACTUATORS ARE ALWAYS ENABLED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.

HARDWARE GROUP NO. 02
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3-101B
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FREE EGRESS AT ALL TIMES.
Authorized credential momentarily releases strike allowing entry.
Electric strike will not release deadbolt to allow privacy when room is occupied.
Deadbolt is thrown/retracted by key in outside cylinder or by inside thumbturn. Turning inside lever also retracts deadbolt.
Occupancy indicator normally shows “vacant”. When door is locked, indicator shows “occupied”.
Mechanical key override.
Door contact monitors when door opens and closes.
On fire alarm or loss of power, electrified hardware is disabled. Door is positively latched and trim remains secure.
ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY

HARDWARE GROUP NO. 04
FOR USE ON MARK/DOOR #(S):
1-110  3-125B
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
**ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY**

**HARDWARE GROUP NO. 05**
**FOR USE ON MARK/DOOR #(S):**
**4-101B**
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**FREE EGRESS AT ALL TIMES.**
**AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.**
**RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS. DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.**
**ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.**
HARDWARE GROUP NO. 06
FOR USE ON MARK/DOOR #(S):
1-134A   3-118B   3-119B   3-120B   3-121B   3-122

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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS. DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
HARDWARE GROUP NO. 07
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
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RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
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HARDWARE GROUP NO. 08
FOR USE ON MARK/DOOR #(S):
1-146C         1-146D

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HARDWARE GROUP NO. 09
FOR USE ON MARK/DOOR # (S):
4-102A 4-102D
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HARDWARE GROUP NO. 10
FOR USE ON MARK/DOOR #(S):
1-138A  3-130B
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AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
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ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY

HARDWARE GROUP NO. 11
FOR USE ON MARK/DOOR #S:
1-130A  4-103  4-103A

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DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
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HARDWARE GROUP NO. 12
FOR USE ON MARK/DOOR #(S):
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<td>FB358/FB458 - AS REQUIRED</td>
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<td>SCH</td>
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<td>2</td>
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<tr>
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<td>RAIN DRIP</td>
<td>142AA</td>
<td>AA</td>
<td>ZER</td>
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<tr>
<td>1</td>
<td>GASKETING</td>
<td>429A @ HEAD &amp; JAMBS</td>
<td>A</td>
<td>ZER</td>
</tr>
<tr>
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<td>39A</td>
<td>A</td>
<td>ZER</td>
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<td>OVERLAPPING ASTRAGAL</td>
<td>44STST</td>
<td>STST</td>
<td>ZER</td>
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<td>655A - OR AS REQUIRED BY SILL DETAIL</td>
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<td>ZER</td>
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<td>679-05 WD/HM AS REQUIRED</td>
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<td>BY HARDWARE SUPPLIER</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS. DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
**HARDWARE GROUP NO. 13**

FOR USE ON MARK/DOOR # (S):

1-128A  1-128G  1-128J  1-128Q

EACH TO HAVE:

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<td>EPT10</td>
<td>✓ 689</td>
<td>VON</td>
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<tr>
<td>1</td>
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<td>RX-QEL-98-NL</td>
<td>✓ 626</td>
<td>VON</td>
</tr>
<tr>
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<td>23-030 (MATCH EXISTING KEYWAY)</td>
<td>626</td>
<td>SCH</td>
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<td>20-057 ICX (@ EXIT TRIM)</td>
<td>626</td>
<td>SCH</td>
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<td>4111 SCUSH</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10” X 2” LDW B-CS</td>
<td>630</td>
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<tr>
<td>1</td>
<td>RAIN DRIP</td>
<td>142AA</td>
<td>AA</td>
<td>ZER</td>
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<tr>
<td>1</td>
<td>GASKETING</td>
<td>429A @ HEAD &amp; JAMBS</td>
<td>A</td>
<td>ZER</td>
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<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>39A</td>
<td>A</td>
<td>ZER</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>655A - OR AS REQUIRED BY SILL DETAIL</td>
<td>A</td>
<td>ZER</td>
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<td>DOOR CONTACT</td>
<td>679-05 WD/HM AS REQUIRED</td>
<td>✓ BLK</td>
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<td>WIRING, PT TO PT DIAGRAM &amp; ELEVATION DIAGRAM</td>
<td>BY HARDWARE SUPPLIER</td>
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FREE EGRESS AT ALL TIMES.

AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.

RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS. DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.

ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
HARDWARE GROUP NO. 14
FOR USE ON MARK/DOOR #S:
1-145A     1-145H     1-145K     1-145S
EACH TO HAVE:

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<td>689 VON</td>
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<tr>
<td>1</td>
<td>ELEC PANIC RX-QEL-98-NL</td>
<td>626 VON</td>
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<td></td>
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<tr>
<td>1</td>
<td>FSIC CORE 23-030 (MATCH EXISTING KEYWAY)</td>
<td>626 SCH</td>
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<tr>
<td>1</td>
<td>RIM CYLINDER 20-057 ICX (@ EXIT TRIM)</td>
<td>626 SCH</td>
<td></td>
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<tr>
<td>1</td>
<td>SURFACE CLOSER 4111 CUSH</td>
<td>689 SCH</td>
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<tr>
<td>1</td>
<td>KICK PLATE 8400 10&quot; X 2&quot; LDW B-CS</td>
<td>630 IVE</td>
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<td></td>
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<tr>
<td>1</td>
<td>GASKETING 429A @ HEAD &amp; JAMBS</td>
<td>A ZER</td>
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<tr>
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<td>RAIN DRIP 142AA</td>
<td>AA ZER</td>
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<td>DOOR SWEEP 39A</td>
<td>A ZER</td>
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<tr>
<td>1</td>
<td>THRESHOLD 655A - OR AS REQUIRED BY SILL</td>
<td>A ZER</td>
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1 CREDENTIAL READER PROVIDED BY SECURITY CONTRACTOR

1 EA DOOR CONTACT 679-05 WD/HM AS REQUIRED BLK SCE

1 EA WIRING, PT TO PT DIAGRAM & ELEVATION DIAGRAM

1 EA LOW VOLTAGE POWER PROVIDED BY SECURITY CONTRACTOR

FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
HARDWARE GROUP NO. 15
FOR USE ON MARK/DOOR #(S):
1-128H   1-143
EACH TO HAVE:

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<td>EPT10</td>
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<td>REMOVABLE MULLION</td>
<td>KR4954B STAB</td>
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<td>RX-QEL-98-NL</td>
<td>✓ 626</td>
<td>VON</td>
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<td>ELEC PANIC HARDWARE</td>
<td>RX-QEL-98-DT</td>
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<td>SCH</td>
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<td>FSIC CORE</td>
<td>23-030 (MATCH EXISTING KEYWAY)</td>
<td>626</td>
<td>SCH</td>
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<td>2</td>
<td>SURFACE CLOSER (W/ SPRING STOP)</td>
<td>4111 SCUSH</td>
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<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW B-CS</td>
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<td>429A @ HEAD &amp; JAMBS</td>
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<td>RAIN DRIP</td>
<td>142AA</td>
<td>AA</td>
<td>ZER</td>
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<td>2</td>
<td>DOOR SWEEP</td>
<td>39A</td>
<td>A</td>
<td>ZER</td>
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<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>655A - OR AS REQUIRED BY SILL DETAIL</td>
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<td>BK</td>
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<td>DOOR CONTACT</td>
<td>679-05 WD/HM AS REQUIRED ✓ BLK</td>
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<td>BY HARDWARE SUPPLIER</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
HARDWARE GROUP NO. 16
FOR USE ON MARK/DOOR #(S): 1-109 1-116 3-110 3-111
EACH TO HAVE:

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<td>689 LCN</td>
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<tr>
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<td>KICK PLATE 8400 10&quot; 2&quot; LDW B-CS</td>
<td>630 IVE</td>
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<tr>
<td>1</td>
<td>WALL STOP WS406/407CCV</td>
<td>630 IVE</td>
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<td>3</td>
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<td>GRY IVE</td>
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HARDWARE GROUP NO. 17
FOR USE ON MARK/DOOR #(S): 1-117 3-104
EACH TO HAVE:

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<td>WALL STOP WS406/407CCV</td>
<td>630 IVE</td>
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<tr>
<td>3</td>
<td>SILENCER SR64</td>
<td>GRY IVE</td>
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HARDWARE GROUP NO. 18
FOR USE ON MARK/DOOR #(S): 3-120D
EACH TO HAVE:

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<tr>
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<td>SILENCER SR64</td>
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HARDWARE GROUP NO. 19
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EACH TO HAVE:

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<td>PASSAGE SET ND10S Rho</td>
<td>626 SCH</td>
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<tr>
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<td>SURFACE CLOSER 4111 EDA</td>
<td>689 LCN</td>
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<tr>
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<td>KICK PLATE 8400 10&quot; 2&quot; LDW B-CS</td>
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<tr>
<td>1</td>
<td>WALL STOP WS406/407CCV</td>
<td>630 IVE</td>
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<td>GASKETING 188S @ HEAD &amp; JAMBS</td>
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DOOR HARDWARE 087100-36
# Hardware Group No. 20

For use on Mark/Door #102-103:

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<td>SCH</td>
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<tr>
<td>1</td>
<td>FSIC Core</td>
<td>23-030 (Match Existing Keyway)</td>
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<td>SCH</td>
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<td>Surface Closer</td>
<td>4011</td>
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<td>LCN</td>
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<td>630</td>
<td>IVE</td>
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<td>WS406/407CCV</td>
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<td>IVE</td>
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<td>Silencer</td>
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# Hardware Group No. 21

For use on Mark/Door #113B-107-108:

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<tr>
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<tr>
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<td>FSIC Core</td>
<td>23-030 (Match Existing Keyway)</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>Surface Closer (w/ Spring Stop)</td>
<td>4111 SCUSH</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>Kick Plate</td>
<td>8400 10&quot; X 2&quot; LDW B-CS</td>
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# Hardware Group No. 22

For use on Mark/Door #104-105-109:

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<td>ND53TD RHO</td>
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<td>SCH</td>
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<td>FSIC Core</td>
<td>23-030 (Match Existing Keyway)</td>
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**HARDWARE GROUP NO. 23**

FOR USE ON MARK/DOOR #S:

| 1-106A | 1-106B | 3-112 | 3-113 | 3-114 | 3-115 | 3-127 | 3-134A | 3-136 |

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**HARDWARE GROUP NO. 24**

FOR USE ON MARK/DOOR #S:

| 1-118 | 3-106A | 3-118A | 3-119A |

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<td>626</td>
<td>SCH</td>
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**HARDWARE GROUP NO. 25**

FOR USE ON MARK/DOOR #S:

| 1-107 | 1-121 | 3-106B |

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<td>SCH</td>
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<tr>
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<td>WALL STOP WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
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## HARDWARE GROUP NO. 26
**FOR USE ON MARK/DOOR #(S):**
1-112 3-128

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<td>1</td>
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<td>626 SCH</td>
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<tr>
<td>1</td>
<td>FSIC CORE 23-030 (MATCH EXISTING KEYWAY)</td>
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<tr>
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<td>1</td>
<td>WALL STOP WS406/407CCV</td>
<td>630 IVE</td>
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## HARDWARE GROUP NO. 27
**FOR USE ON MARK/DOOR #(S):**
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<td>626 SCH</td>
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ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY

HARDWARE GROUP NO. 28
FOR USE ON MARK/DOOR #(#): 1-101B 1-101C 1-125

EACH TO HAVE:

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<td>FSIC CORE (MATCH EXISTING KEYWAY)</td>
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<td>SCH</td>
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<td>4111 EDA</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY

HARDWARE GROUP NO. 29
FOR USE ON MARK/DOOR #(S):
1-130B 3-129 3-130A

EACH TO HAVE:

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<td>VON</td>
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<td>689</td>
<td>LCN</td>
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<td>WALL STOP</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.

HARDWARE GROUP NO. 30
FOR USE ON MARK/DOOR #(#):
1-111A 1-111B

EACH TO HAVE:

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DOOR HARDWARE 087100-41
HARDWARE GROUP NO. 31
FOR USE ON MARK/DOOR #(S):
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EACH TO HAVE:

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<td>FSIC CORE</td>
<td>23-030 (MATCH EXISTING</td>
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<td>SCH</td>
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<td>SURFACE CLOSER</td>
<td>4011</td>
<td>689</td>
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HARDWARE GROUP NO. 32
FOR USE ON MARK/DOOR #(S):
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EACH TO HAVE:

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<td>FSIC CORE</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
HARDWARE GROUP NO. 33
FOR USE ON MARK/DOOR #(S):
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<td>MANUAL FLUSH BOLT FB358/FB458</td>
<td>626 IVE</td>
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<tr>
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<td>DUST PROOF STRIKE DP1/DP2 AS REQUIRED</td>
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<td>630 SCH</td>
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<td>FSIC CORE 23-030 (MATCH EXISTING KEYWAY)</td>
<td>626 SCH</td>
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<tr>
<td>2</td>
<td>SURFACE CLOSER (W/ SPRING STOP) 4111 SCUSH</td>
<td>689 LCN</td>
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<td>2</td>
<td>KICK PLATE 8400 10&quot; X 1&quot; LDW B-CS</td>
<td>630 IVE</td>
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<td>GASKETING 188S @ HEAD &amp; JAMBS BK ZER</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.

HARDWARE GROUP NO. 34
FOR USE ON MARK/DOOR #(S):
3-134B
EACH TO HAVE:

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<td>MANUAL FLUSH BOLT FB358/FB458</td>
<td>626 IVE</td>
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<tr>
<td>1</td>
<td>DUST PROOF STRIKE DP1/DP2 AS REQUIRED</td>
<td>626 IVE</td>
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<tr>
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<td>FSIC CORE 23-030 (MATCH EXISTING KEYWAY)</td>
<td>626 SCH</td>
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<tr>
<td>2</td>
<td>OH STOP 90S</td>
<td>630 GLY</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
### HARDWARE GROUP NO. 35

**FOR USE ON MARK/DOOR #(#):**
1-138B  1-139B  1-142

**EACH TO HAVE:**

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<td>1</td>
<td>DUST PROOF STRIKE</td>
<td>DP1/DP2 AS REQUIRED</td>
<td>626</td>
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<td>ND80TD RHO</td>
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<td>626</td>
<td>SCH</td>
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<tr>
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<td>LCN</td>
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<td>44STST STST ZER</td>
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<td>SILENCER</td>
<td>SR64 GRY IVE</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
HARDWARE GROUP NO. 36
FOR USE ON MARK/DOOR #1-147:

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<td>FB358/FB458 - AS REQUIRED</td>
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<tr>
<td>1</td>
<td>DUST PROOF STRIKE</td>
<td>DP1/DP2 AS REQUIRED</td>
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<td>1</td>
<td>STOREROOM LOCK</td>
<td>L9080T 06A</td>
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<td>23-030 (MATCH EXISTING KEYWAY)</td>
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<td>SCH</td>
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<tr>
<td>2</td>
<td>SURFACE CLOSER (W/ SPRING STOP)</td>
<td>4111 SCUSH SRI</td>
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<tr>
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<td>KICK PLATE</td>
<td>8400 10&quot; X 1&quot; LDW B-CS</td>
<td>630</td>
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<td>1</td>
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<td>STST</td>
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<tr>
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<td>188S @ HEAD &amp; JAMBS</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY

HARDWARE GROUP NO. 37
FOR USE ON MARK/DOOR #(S):
1-134C
EACH TO HAVE:

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<td>✔ 689</td>
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<td>FB358/FB458 - AS REQUIRED</td>
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<tr>
<td>1</td>
<td>DUST PROOF STRIKE</td>
<td>DP1/DP2 AS REQUIRED</td>
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<tr>
<td>1</td>
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<td>23-030 MATCH EXISTING KEYWAY)</td>
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<td>679-05 WD/HM AS REQUIRED</td>
<td>✔ BLK</td>
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<td>BY HARDWARE SUPPLIER</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY

HARDWARE GROUP NO. 38
FOR USE ON MARK/DOOR #(S):
4-101C
EACH TO HAVE:

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<td>VON</td>
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<tr>
<td>1</td>
<td>ELEC STOREROOM LOCK (FAIL SECURE)</td>
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<td>39A</td>
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<td>PROVIDED BY SECURITY CONTRACTOR</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.

HARDWARE GROUP NO. 39
FOR USE ON MARK/DOOR #(S):
3-123
EACH TO HAVE:

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<td>626</td>
<td>SCH</td>
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<td>SCH</td>
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<td>SURFACE closer</td>
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DOOR HARDWARE 087100-47
ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY

HARDWARE GROUP NO. 40
FOR USE ON MARK/DOOR #(S):
1-130C  1-130D  4-103B  4-103C

ALL HARDWARE PROVIDED BY DOOR MANUFACTURER.
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<td>EA POWER TRANSFER</td>
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<td>VON</td>
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<td>EA REMOVABLE MULLION HARDWARE</td>
<td>KR4954B STAB</td>
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<td>RX-QEL-98-DT</td>
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<td>A</td>
<td>ZER</td>
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<td>ZER</td>
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS
REMOVED.
OUTER ACTUATOR IS DISABLED BY LX SWITCH (INTEGRAL TO LOCKING HARDWARE). WHEN
DOORS ARE LATCHED, ACTUATOR IS DISABLED.
AFTER HOURS; CARD READER RETRACTS LATCHBOLT, PRESSING OUTSIDE ACTUATOR
OPENS DOOR.
VESTIBULE AND INNERMOST ACTUATORS ARE ALWAYS ENABLED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED
AND TRIM REMAINS SECURE.
HARDWARE GROUP NO. AL-02
FOR USE ON MARK/DOOR #S:
1-145J  3-116A  3-131A
EACH TO HAVE:

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<td>628</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>EA POWER TRANSFER</td>
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<td>VON</td>
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FREE EGRESS AT ALL TIMES.
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KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
HARDWARE GROUP NO. AL-03
FOR USE ON MARK/DOOR #(S):
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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
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RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
**ADAMS COUNTY FLEET / PUBLIC WORKS SERVICES FACILITY**

**HARDWARE GROUP NO. AL-04**
FOR USE ON MARK/DOOR #(S):
3-116B 3-131B

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FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.

**HARDWARE GROUP NO. AL-05**
FOR USE ON MARK/DOOR #(S):
1-106C

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**DOOR HARDWARE** 087100-53
HARDWARE GROUP NO. G-01
FOR USE ON MARK/DOOR #(S):
1-202 1-203 3-201 3-201B

ALL HARDWARE PROVIDED BY GATE MANUFACTURER.

HARDWARE GROUP NO. OH-01
FOR USE ON MARK/DOOR #(S):
1-128B 1-128C 1-128D 1-128E 1-128F 1-128K
1-128L 1-128M 1-128N 1-128P 1-134B 1-135
1-145B 1-145C 1-145D 1-145E 1-145F 1-145G
1-146B 1-146E 3-118C 3-119C 3-120C 3-121C
4-101A 4-101D 4-102B 4-102C

ALL HARDWARE PROVIDED BY OVERHEAD DOOR MANUFACTURER.

END OF SECTION
SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Glass for the following:
      a. Windows.
      b. Doors.
      c. Interior borrowed lites.
      d. Storefront framing.
      e. Glazed curtain walls.
      f. Sloped glazing.
      g. Skylights.
   2. Glazing sealants and accessories.
   3. Monolithic Glass Units: See end of Section for detailed glass schedule.
      a. GL-05: Clear annealed float glass.
      b. GL-05S: Clear fully tempered float glass.
   4. Insulating Glass Units: See end of Section for detailed glass schedule.
      b. GL-01, GL-01S: Low-E-coated, clear insulating glass.
      c. GL-03, GL-03S: Ceramic-coated, low-E, insulating spandrel glass.

1.02 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.


D. Interspace: Space between lites of an insulating-glass unit.

1.03 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
   1. Coated glass.
   2. Insulating glass.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
   1. Installer.
   2. Manufacturers of insulating-glass units with sputter-coated, low-E coatings.

B. Product Certificates: For glass.

C. Sample Warranties: For special warranties.

1.06 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.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.
1.08 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.09 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Low-E Coated Vision Glass Warranty Period: 10 years from date of Substantial Completion.
2. Ceramic-Coated Spandrel Glass Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Glass Product: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:

1. Guardian Industries Corp.
2. PPG Industries, Inc.
3. Viracon, Inc.
B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.02 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. 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 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.

2.03 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Glazing Manual."

B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.

D. Strength:
1. Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article.
2. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article.
3. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.04 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
D. Ceramic-Coated Spandrel Glass: ASTM C 1048, Type I, Condition B, Quality-Q3.

2.05 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
   1. Sealing System: Dual seal of following type(s), with primary and secondary sealants:
      a. Manufacturer's standard.
   2. Perimeter Spacer:
      a. Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.06 GLAZING SEALANTS

A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Application Limitations: As indicated.

4. Sealant shall have a VOC content of 250 g/L or less.

5. 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.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

D. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

E. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.07 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.

2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.08 GLAZING GASKETS

A. Glazing gaskets are specified under the following Section(s):
   1. Section 08 41 13 "Aluminum-Framed Entrances And Storefronts."
   2. Section 08 42 13 "Aluminum-Framed Entrances."
   3. Section 08 44 13 "Glazed Aluminum Curtain Walls."
   4. Section 08 44 13 "Sloped Glazing Assemblies."
   5. Section 08 63 00 "Metal-Framed Skylights."

2.09 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lite in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Butt-Glazed Lite: 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. Lites with Exposed Edges or Corners: Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.01 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.

3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.
3.03 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.
   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.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
3.04 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 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.
3.06 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
   1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.07 MONOLITHIC GLASS SCHEDULE

A. Glass Type GL-05: Clear annealed float glass.
   1. Minimum Thickness: 6 mm.

B. Glass Type GL-05S: Clear fully tempered float glass.
   1. Minimum Thickness: 6 mm.
   2. GL-05S; Safety glazing required.

3.08 INSULATING GLASS SCHEDULE

A. Glass Type GL-04; GL-04S: Clear insulating glass.
   1. Overall Unit Thickness: 1 inch.
   2. Minimum Thickness of Each Glass Lite: 6 mm.
   3. Outdoor Lite: Clear.
      a. Annealed float glass unless indicated otherwise below.
      b. Heat-strengthened float glass where required to comply with performance requirements.
      c. Fully tempered float glass for safety glazing and where required to comply with performance requirements.
   4. Interspace Content: Air.
   5. Indoor Lite: Clear.
a. Annealed float glass unless indicated otherwise below.
b. Heat-strengthened float glass where required to comply with performance requirements.
c. Fully tempered float glass for safety glazing and where required to comply with performance requirements.

6. Winter Nighttime U-Factor: 0.29 maximum.
7. Summer Daytime U-Factor: 0.27 maximum.
8. GL-04S; Safety glazing required.

B. Glass Type GL-01; GL-01S: Low-E-coated, clear insulating glass.

2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Clear float glass.
   a. Annealed float glass unless indicated otherwise below.
   b. Heat-strengthened float glass where required to comply with performance requirements.
   c. Fully tempered float glass for safety glazing and where required to comply with performance requirements.
5. Interspace Content: Air.
6. Indoor Lite: Clear float glass.
   a. Annealed float glass unless indicated otherwise below.
   b. Heat-strengthened float glass where required to comply with performance requirements.
   c. Fully tempered float glass for safety glazing and where required to comply with performance requirements.

7. Low-E Coating: Pyrolytic or sputtered on second surface.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
12. GL-01S; Safety glazing required.

C. Glass Type GL-03; GL-03S: Ceramic-coated, low-E, insulating spandrel glass.

2. Coating Color: As selected by Architect from manufacturer’s full range.
3. Overall Unit Thickness: 1 inch.
4. Minimum Thickness of Each Glass Lite: 6 mm.
5. Outdoor Lite: Clear.
   a. Annealed float glass unless indicated otherwise below.
   b. Heat-strengthened float glass where required to comply with performance requirements.
c. Fully tempered float glass for safety glazing and where required to comply with performance requirements.

6. Interspace Content: Air.
7. Indoor Lite: Clear.
   a. Annealed float glass unless indicated otherwise below.
   b. Heat-strengthened float glass where required to comply with performance requirements.
   c. Fully tempered float glass for safety glazing and where required to comply with performance requirements.

8. Low-E Coating: Pyrolytic or sputtered on second surface.
10. Winter Nighttime U-Factor: 0.29 maximum.
11. Summer Daytime U-Factor: 0.27 maximum.
12. GL-03S; Safety glazing required.

END OF SECTION 08 80 00
SECTION 08 83 00 - MIRRORS

PART 1 - GENERAL

1.01 SUMMARY
   A. Section includes the following types of silvered flat glass mirrors:
      1. Annealed monolithic glass mirrors.

1.02 DELIVERY, STORAGE, AND HANDLING
   A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
   B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.03 FIELD CONDITIONS
   A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
   A. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
   B. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.02 SILVERED FLAT GLASS MIRRORS
   A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
2.03 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.
   a. Manufacturers: Subject to compliance with requirements, provide products by the following:
      1) Laurence, C. R. Co., Inc.


2.04 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Flat polished.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.
3.02 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer’s written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.


B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.

3.03 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 08 83 00
SECTION 08 85 16 - GLAZING TRACK FOR TRANSACTION WINDOWS

PART 1 - GENERAL

1.01 SUMMARY
   A. Section includes sliding glass lite track for transaction window openings.
   B. Related Requirements:
      1. Section 08 80 00 "Glazing" for glass lites.

1.02 SUBMITTALS
   A. Product Data: For tracks, pulls, and locks. Include dimensions of individual components, profiles, and finishes. Provide installation details, operating instructions, and maintenance information.

1.03 DELIVERY, STORAGE AND HANDLING
   A. Package loose components for field installation of glass lites.

PART 2 - PRODUCTS

2.01 SLIDING GLASS LITE TRACK
   A. Track Assembly: Provide ball bearing zinc-plated steel track assembly for 1/4 inch glass lites. Include upper channel, side channels, shoe, ball-bearing carriers and lower double track.
   B. Lite Pulls: Provide one aluminum pull for each sliding glass lite.
   C. Ratchet Locks: Provide one chrome look ratchet lock for each sliding glass window assembly. Include 2 keys for each lock.
PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install glass into track in accordance with track manufacturer written installation instructions.

B. Installation in Metal Framed Openings: Permanently mount track and channels to metal head and sill or counter. Center track and channels with centerline of adjoining partitions walls.

C. Installation in Rough Wall Openings: Permanently mount track and channels to header and sill or counter. Center track and channels on centerline of adjoining partitions walls.

3.02 ADJUSTING

A. Lubricate bearings and sliding parts; adjust lites to operate easily, free from warp, twist, or distortion.

END OF SECTION 08 85 16
SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior partitions and soffits clad with the following:
      a. Gypsum board.
   2. Conventional and grid suspension systems for interior ceilings clad with the following:
      a. Gypsum board.

B. Contractor's Discretion:
   1. Steel Framing: Provide steel studs and track fabricated from conventional steel sheet or embossed, high strength steel sheet.
   2. Partition Head of Wall Systems:
      a. For non-fire-resistance-rated head of wall systems (at Partition Types A### and S###) provide slip-type head joints of any type indicated, except:
         1) Where head of wall is exposed to view, provide slip-type head joints specified for exposed locations only.
   3. For Metal Suspension Framing: Provide either of following:
      a. Metal framing fabricated from conventional sheet steel.
      b. Metal framing fabricated from embossed, high strength sheet steel.
      c. Grid suspension system.

1.02 DEFINITIONS

A. Partition types are indicated on Drawings as:
   1. Types A### for Acoustic rated partitions.
   2. Types S### for Standard partitions (not fire-resistive-rated or acoustic-rated).
   3. Types F### for Furred partitions.

B. Walls: In this Section the term "walls" is synonymous with the term "partition walls" or "partitions."
C. Composite Partition Assemblies: Clad continuously full height on both sides of stud framing.

D. Non-Composite Partition Assemblies: Clad full height on only one side of stud framing; or clad partial height on either side of stud framing.

E. Steel sheet thickness for metal framing specified in this Section is for uncoated conventional steel sheet. Where thickness is indicated by gage, comply with minimum thickness indicated in table below.

<table>
<thead>
<tr>
<th>STEEL SHEET THICKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DW = Drywall ST = Structural</td>
</tr>
<tr>
<td>Gage</td>
</tr>
<tr>
<td>Inch</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>22</td>
</tr>
<tr>
<td>20 DW</td>
</tr>
<tr>
<td>20 ST</td>
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<td>18</td>
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<td>16</td>
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<td>10</td>
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</tbody>
</table>

F. Tie wire and hanger wire diameters (uncoated) and corresponding U.S. steel wire gage are indicated in the table below:

<table>
<thead>
<tr>
<th>WIRE DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Steel Base Metal (Uncoated) Diameter</td>
</tr>
<tr>
<td>Gage</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>19</td>
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<td>18</td>
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<td>16</td>
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<tr>
<td>14</td>
</tr>
</tbody>
</table>

G. Dry Exposures: A location not normally subjected to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of kitchens or locker rooms.
H. Damp Exposures: Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture. Examples of such locations include partially protected locations under canopies, marquees, roofed open balconies/porches, and like locations; and interior locations subject to moderate degrees of moisture, such as rooms with tubs and pools, rooms open to damp and wet exposures, crawl spaces, and like locations.

I. Wet Exposures: Unprotected locations exposed to weather; locations subject to saturation with water or other liquids, such as showers, vehicle washing areas; installations underground or in concrete slabs or masonry in direct contact with the earth; installations in direct contact with water or other liquids, such as pools, fountains, and like locations.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include the following:

1. Image or description of label or other identifying mark applied to steel studs and track visually indicating metal thickness or gage.
2. Embossed, High Strength Steel Studs and Tracks: Include framing manufacturer produced Limiting Wall Height table(s). Include letter signed by authorized representative of framing contractor certifying that steel thicknesses used in framing will comply with framing manufacturer's LWH tables for stud height or length, depth, lateral load, and deflection indicated for each partition type required Project.

B. Design Variation(s) for Suspended Ceilings: Where indicated, Contractor may propose variations in sizing and spacing of suspension hangers, carrying channels, and furring channels from those specified. For each area and variation proposed, submittal shall include the following:

1. Ceiling area for which variation is proposed.
2. All applicable tables from ASTM C754 annotated to indicate proposed variation(s).

1.04 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following from ICC-ES, an ANSI/CLASS ISO 17065 accredited agency, or other qualified agency acceptable to authorities having jurisdiction.

1. Embossed, high strength steel studs and tracks.
2. Power-actuated hanger fasteners.
3. Screw type hanger fasteners.
1.05 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Framing members shall be certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

B. Structural Performance: of Partition Assemblies  Select stud base-steel thickness based on following criteria:

1. Gypsum Board Clad Partitions:
   a. Stud Depth and Spacing:  As indicated on Drawings Partition Type Diagrams.
   b. Horizontal Deflection:  As indicated on Drawings Limiting Wall Height (LWH) Tables.
   c. Horizontal Loading:  5 lbf/sq. ft., except as follows:
      1) Partitions at Perimeter of Shafts (Shaftwalls):  Base-steel thickness shall be selected from framing manufacturer's published LWH Tables using the following criteria:
         a) Non-Pressurized Shafts Open through 4 to 7 floor levels. 7.5 lbf/sq. ft..
         b) Non-Pressurized Shafts Open Through 8 floor levels or more: 10 lbf/sq. ft..
         c) Pressurized Shafts: 15 lbf/sq. ft..

2.02 FRAMING MEMBERS, GENERAL

A. Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.


b. Framed Assemblies at Damp and Wet Exposures: Hot dip galvanized per ASTM A653/A653M, G60. Wet and damp exposures include, but are not limited to, the following:

1) Shower rooms and rooms containing water spray devices.
2) Toilet rooms and bathrooms with openings, including doorways, to shower rooms.
3) Locker rooms with openings, including doorways, to shower rooms.

2.03 FRAMING SYSTEMS FOR PARTITIONS AND SOFFITS

A. Studs and Tracks: ASTM C645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.

1. Conventional Steel Studs and Tracks:

a. Minimum Base-Metal Thickness: As indicated on Drawing's Limiting Wall Height (LWH) Tables. Partition Type Drawings refer to LWH Table used for determining minimum base-steel thickness based on Limiting Wall Height of stud.

b. Depth: As indicated on Drawings.

2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C645 steel studs and tracks.

a. Minimum Base-Metal Thickness: As required by structural performance requirements specified under Part 2 Article “Performance Requirements” and as selected from thicknesses available from manufacturer’s published LWH Tables.

b. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide system capable of allowing partition heads to expand and contract with movement of the structure to prevent axial loading on partition.

1. Minimum Vertical Movement: As indicated on Drawings.

2. Provide one of the following:

a. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing for vertical movement indicated.
b. Single Long-Leg Track System: ASTM C645 top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

c. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction fit over inner track.

d. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness:
   a. For Bracing: 0.018 inch unless indicated otherwise on Drawings.
   b. For Blocking: 0.033 inch unless indicated otherwise on Drawings.

D. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 1-1/2 inches unless indicated otherwise on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base-Metal Thickness: 0.018 inch unless indicated otherwise on Drawings.
2. Depth: As indicated on Drawings.

F. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Configuration: As indicated on Drawings.

G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch.

1. Minimum Base-Metal Thickness: 0.018 inch unless indicated otherwise on Drawings.
2. Depth: As indicated on Drawings.

2.04 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: For securing hangers to structure.
   a. Type: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on following ICC-ES reports as appropriate for the substrate.
      1) Torque-controlled, expansion anchor; ICC-ES AC01 Expansion Anchors in Masonry Elements.
      2) Torque-controlled, expansion anchor; ICC-ES AC193 Mechanical Anchors in Concrete Elements.
      3) Torque-controlled, adhesive anchor; ICC-ES AC308 Post-Installed Adhesive Anchors Installed in Concrete Elements.
      4) Adhesive anchor; ICC-ES AC58 Adhesive Anchors Installed in Masonry Elements.
   b. Material:
      1) For Interior Locations with Dry Exposure: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
      2) For Exterior and Interior Locations with Damp Exposures, and where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
      3) For Exterior and Interior Locations with Wet Exposures: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
   c. Adhesive Anchor Limitations: Adhesive anchors shall not be used to resist tension loads in fire-resistive rated assemblies unless approved for such use in evaluation report or approved by authorities having jurisdiction.

2. Power-Actuated Anchors: For securing hangers to structure.
   a. Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70 Power-actuated Fasteners Driven into Concrete, Steel and Masonry Elements.
   b. Limit use to interior locations with Dry Exposure only.

C. Screw Fasteners: For securing hangers to Metal Decking (Not Concrete Filled).
   Self-tapping screw designed for use with sheet metal decking; fastener includes self-drilling point and self-tapping threaded shank below a washer-like collar, and above the collar a smooth, straight shank transitioning to a flattened portion with an hole for attaching ceiling suspension wire; manufactured from steel with corrosion resistant coating.

1. Only fasteners with a Evaluation Service Report from ICC-ES, Technical Evaluation Report from an ANSI/CLASS ISO 17065 accredited agency, or other agency approved by the AHJ will be accepted.
2. Use of screw shall be limited to weight not exceeding that which ceiling system's hanger wire supports, as allowed by manufacturer's Service or Technical Evaluation Report with respect to base metal thickness and minimum tensile strength of metal roof decking.

3. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
   a. Doc's Marketing Corp.; I-LAG Brand Eye Lag Screws, 175 SD or 750 SD (ICC ESR-3135).
   b. Or Equal.

D. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, in following size:
   1. Not less than 0.1055 inch diameter. Provide greater diameter as required for conditions indicated per ASTM C754, Table 6. See Part 3 Article "Installing Ceiling Suspension Systems" for Design Variation options.

E. Round Rod and Flat Sheet/Bar Hangers: Steel sheet, bar, or rod, length sufficient for conditions indicated on Drawings, in following size:
   1. Not less than 3/16 inch dia. rod. Provide larger size rod, rectangular sheet, or bar as required for conditions indicated per ASTM C754, Table 6. See Part 3 Article "Installing Ceiling Suspension Systems" for Design Variation options.

F. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
   1. Depth: 1-1/2 inches, unless indicated otherwise on Drawings. Do not exceed allowable spans indicated under Table 7 of ASTM C754. See Part 3 Article "Installing Ceiling Suspension Systems" for Design Variation options.

G. Furring Channels (Furring Members):
   1. Steel Studs and Tracks: ASTM C645.
      a. Minimum Base-Steel Thickness: 0.018 inch unless indicated otherwise on Drawings.
      b. Depth: As follows unless indicated otherwise on Drawings:
         1) For Spans Not Exceeding 5 ft.: 1-5/8 inches.
         2) For Spans Not Exceeding 6 ft.: 2-1/2 inches.
         3) For Spans Not Exceeding 8 ft.: 3-5/8 inches.
   2. Embossed, High Strength Steel Studs and Tracks: ASTM C645.
      a. Minimum Base-Steel Thickness: 0.015 inch unless indicated otherwise on Drawings.
      b. Depth: As follows unless indicated otherwise on Drawings:
         1) For Spans Not Exceeding 5 ft.: 1-5/8 inches.
         2) For Spans Not Exceeding 6 ft.: 2-1/2 inches.
3) For Spans Not Exceeding 8 ft.: 3-5/8 inches.

   a. Minimum Base-Steel Thickness: 0.018 inch unless indicated otherwise on Drawings.
   b. For spans not exceeding 4 ft..

4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
   a. Configuration: Asymmetrical unless hat shaped indicated on Drawings.

H. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

2.05 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Steel 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 one of the following:
   1. Asphalt-Saturated Organic Felt: ASTM D226, Type I (No. 15 asphalt felt), nonperforated.
   2. 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

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.

3.03 INSTALLATION, GENERAL

A. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

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.

3.04 INSTALLING FRAMED ASSEMBLIES

A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. For partitions, comply with spacings indicated on Partition Types Drawings.
2. For framed assemblies other than partitions, but including soffits, comply with ASTM C754, Table 1 except as follows:
   a. Tile Backing Panels: 16 inches o.c. maximum.

C. Where studs are installed directly against exterior masonry or concrete walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

D. Install studs so flanges within framing system point in same direction.

E. Install tracks 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 that penetrate 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 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.

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.

F. Direct Furring:
1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry
attachment, or powder-driven fasteners spaced 24 inches o.c.

G. Z-Shaped Furring Members:
1. Space furring members as indicated on Drawings.
2. Where insulation is shown nested in framing members, install full (uncut) width
units vertically and hold in place with Z-furring members; at inside corners cut
insulation to fit. Insulation is specified in Section 07 21 00 "Thermal Insulation."
3. Except at exterior corners, securely attach narrow flanges of furring members to
wall with concrete stub nails, screws designed for masonry attachment, or
powder-driven fasteners spaced 24 inches o.c.
4. At exterior corners, attach wide flange of furring members to wall with short
flange extending beyond corner; on adjacent wall surface, screw-attach short
flange of furring channel to web of attached channel. At interior corners, space
second member no more than 12 inches from corner.

H. 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.

3.05 INSTALLING CEILING SUSPENSION SYSTEMS

A. Installation Standard: ASTM C754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that
apply to framing installation.

B. Install suspension system components according to spacings indicated, but not greater
than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c. unless indicated otherwise on Drawings. Contractor
may submit Design Variation, at their discretion, allowed by ASTM C754, Tables
6 & 7 for each area and condition indicated.
2. Carrying Channels, Main Runners, and Main Grid Beams: 48 inches o.c. unless indicated otherwise on Drawings. Contractor may submit Design Variation, at their discretion, allowed by ASTM C754, Tables 6 & 7 for each area and condition indicated.

3. Furring Channels (Furring Members): 16 inches o.c. unless indicated otherwise on Drawings. Contractor may submit Design Variation, at their discretion, allowed by ASTM C754, Tables 1 & 2 for each area and condition indicated.

C. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

D. 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. Round Rod and Flat Sheet/Bar Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Do not attach hangers to steel roof deck except with approval of Architect.
   6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

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.
SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Tile backing panels.

B. Components used with fire-resistance-rated head of wall systems are specified under Section 07 84 43 "Joint Firestopping." Metal top runner for metal wall framing are selected under Section 09 22 16 "Non-Structural Metal Framing."

1.02 DEFINITIONS

A. Partition type are indicated on Drawings as:
   1. Types A### for Acoustic rated partitions.
   2. Types R### for Fire-Resistive-Rated partitions.
   3. Types S### for Standard partitions (neither fire-resistive- or acoustic rates).
   4. Types F### for Furred partitions.

B. Wet and Humid Spaces: Includes, but is not limited to, the following:
   1. Toilet rooms
   2. Bath rooms.
   4. Locker rooms abutting shower rooms and bath rooms.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 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.
1.05 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

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.02 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.

2.03 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard, Regular Type: ASTM C 1396/C 1396M.
   1. Thickness: As indicated on Drawing's Partition Type sheets.
   2. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
   1. Thickness: As indicated on Drawing's Partition Type sheets.
   2. Long Edges: Tapered.
C. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: As indicated on Drawing's Partition Type sheets.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Thickness: As required by fire-resistance-rated assembly indicated on Drawing's Partition Type sheets.
2. Long Edges: Tapered.

2.04 TILE BACKING PANELS

A. Coated Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.

1. Core: As indicated on Drawing's Partition Type sheets.
2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

B. Moisture- and Mold-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: As indicated on Drawing's Partition Type sheets.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.05 TRIM ACCESSORIES

A. Interior Trim for Dry Spaces: ASTM C 1047.

1. Material: Any of the following:
   a. Galvanized or aluminum-coated steel sheet.
   b. Rolled zinc.
   c. Paper-faced galvanized steel sheet

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. U-Bead: J-shaped; exposed short flange does not receive joint compound.
e. Expansion (control) joint.

B. Interior Trim for Backing Panels and Wet or Humid Spaces: ASTM C 1047.

1. Material: Any of the following:
   a. Galvanized or aluminum-coated steel sheet.
   b. Rolled zinc.

2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.
   d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   e. Expansion (control) joint.

2.06 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints 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 the following:
   a. Dry Spaces: Drying-type, all-purpose compound, except:
      1) Use setting-type taping compound for installing paper-faced metal trim accessories.
      2) Setting-type taping compound may be used at Contractor’s discretion.
   b. Wet or Humid Spaces: Setting-type sandable topping compound.
3. Fill Coat: For second coat, use the following:
   a. Dry Spaces: Drying-type, all-purpose compound, except setting-type, sandable topping may be used at Contractor’s discretion.
   b. Wet or Humid Spaces: Setting-type sandable topping compound.
4. Finish Coat: For third coat, use the following:
5. Skim Coat: For final coat of Level 5 finish, use the following:

a. Dry Spaces: Either of following:
   1) Drying-type, all-purpose compound, except setting-type, sandable topping compound may be used at Contractor's discretion.
   2) High-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

b. Wet or Humid Spaces: Setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
   1. Coated Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
   2. Moisture- and Mold-Resistant Gypsum Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.07 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 comply with ASTM C 1002 for fastening panels to steel members less than 0.033 inch thick (20 ga. ST).
   2. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Joint Sealant: Manufacturer’s standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Sealant shall have a VOC content of 250 g/L or less.

E. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."
PART 3 - EXECUTION

3.01 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.

3.02 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. 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.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 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.

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 (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods:
   a. For acoustic rated partitions Types A### comply with acoustic performance test references indicated on Drawing's Partition Types sheet.
   b. For fire-resistive-rated partitions Types R### comply with fire-resistance test references indicated on Drawing's Partition Types sheet.
   c. For standard partition Types S### and furred partition Types F### fasten base layers and face layers separately to supports with screws or fasten base layers with screws and fasten face layers with adhesive and supplementary fasteners.

3.04 APPLYING TILE BACKING PANELS

A. Coated Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at showers, tubs, and where indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Moisture- and Mold-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.05 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. Control Joints: Install control joints according to ASTM C 840 (System XIII: Control (Expansion) Joints) and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at panel edges where edge is exposed to view.
3. L-Bead: Use at panel edges stopping short of another material or abutting another material, where edge is not exposed to view, and where panel face is exposed to view.
4. U-Bead: Use at panel edges receiving sealant, and where face of panel is not exposed to view.

3.06 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 and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: At following locations:
   a. Panels that are substrate for ceramic and stone tile.
3. Level 4:
   a. At following locations:
      1) At panel surfaces that will be exposed to view unless otherwise indicated.
   b. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
4. Level 5:
   a. At following locations:
      1) At panel surfaces receiving smooth, gloss sheen paints and coatings.
   b. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
3.07 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

1.01 SUMMARY

A. Section Includes the following for interior applications:
   1. Ceramic tile.
   2. Tile backing panels.
   3. Waterproof membrane.

B. See end of Section for TILE INSTALLATION SCHEDULE(S).

1.02 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.


C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Full-size units of each type of trim and accessory for each color and finish required.

1.04 INFORMATIONAL SUBMITTALS

A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.06 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 Foreman Certification.
3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

1.07 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.

1.08 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.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations:

1. Tile: Obtain tile of each type and color or finish from:
   a. Single source or producer.
   b. Same production run and of consistent quality in appearance and physical properties for each contiguous area.

2. Obtain the following from the same manufacturer as setting materials when used in contact with each other:
   a. Waterproof membrane of following type(s):
      1) Fluid-applied membrane.
   b. Setting materials of the following type(s):
      1) Modified dry-set mortar (thinset) or latex-portland cement mortar (thinset).
      2) Medium-bed, modified dry-set mortar or medium-bed, latex-portland cement mortar.
   c. Grout materials of the following type(s):
      1) High-performance tile grout.

3. Obtain the following from a single source or producer:
   a. Portland cement mortar (thickset) installation materials.

4. Obtain each of the following products specified in this Section from a single manufacturer:
   a. Tile backing panels.

2.02 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.
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 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.

2.03 TILE PRODUCTS

A. Ceramic Tile Type WT-1 & FT-1:

1. Basis-of-Design Product(s): Subject to compliance with requirements, provide Product(s) indicated on Drawings Finish Schedule (no known equals).

   a. Comparable products shall be submitted as a substitution request in accordance with Section 01 25 00 "Substitution Procedures."

2. Trim Units: As follows unless indicated otherwise on Drawings and Finish Schedule. Coordinate trim units with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer’s standard shapes or fabricated from flat tile:

   a. External Corners for Thinset Mortar Installations: Surface bullnose or beveled.
   b. Internal Corners: Field-butted square corners.

2.04 TILE BACKING PANELS

A. Tile backing panels are specified under Section 09 29 00 "Gypsum Board."

2.05 WATERPROOF MEMBRANE

A. General: Manufacturer’s standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
1. Basis of Design Product: Subject to compliance with requirements, provide the following:
   a. Custom Building Products; RedGard Waterproofing and Crack Prevention Membrane.
   b. Or comparable product by one of the following:
      1) Laticrete International, Inc.
      2) MAPEI Corporation.

2.06 SETTING MATERIALS

   1. Cleavage Membrane: Asphalt felt, ASTM D 226/D 226M, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
   2. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.
   3. Latex Additive: Manufacturer's standard, acrylic resin, or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

B. Modified Dry-Set Mortar (Thinset) or Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
   1. Basis of Design Product: Subject to compliance with requirements, provide the following:
      a. Custom Building Product; ProLite Fortified Thin-Set.
      b. Or comparable product by one of the following:
         1) Laticrete International, Inc.
         2) MAPEI Corporation.
   2. Provide either of following:
      a. Prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
      b. Prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
   3. Application: For use with ceramic tile complying with all of the following restrictions:
      a. Tiles with no edge longer than 15 inches.
      b. Tiles weighing no more than 5 lbs/sq ft.
c. Not for use with tiles having ungauged thickness.

4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

C. Dry Set Mortar for Large and Heavy Tile (LHT Mortar) (formerly Medium-Bed, Modified Dry-Set Mortar or Medium-Bed, Latex-Portland Cement Mortar): Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness indicated.

1. Basis of Design Product: Subject to compliance with requirements, provide the following:
   a. Custom Building Products; ProLite Tile & Stone Mortar or MegaLite Crack Prevention Morter.
   b. Or comparable products by one of the following:
      1) Laticrete International, Inc.
      2) MAPEI Corporation.

2. Provide either of following:
   a. Prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
   b. Prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.

3. Application: For use with ceramic floor tile 15 inches long one edge or larger, tiles weighing 5 lbs/sq ft or heavier, and tiles with ungauged thickness.

4. For transparent or translucent glass tile use white mortar.

2.07 GROUT MATERIALS

A. High-Performance Tile Grout: ANSI A118.7.

1. Basis of Design Product: Subject to compliance with requirements, provide the following:
   a. Custom Building Products; Prism SureColor Grout.
   b. Or comparable product by one of the following:
      1) Laticrete International, Inc.
      2) MAPEI Corporation.

2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

3. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
2.08 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers’ written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.01 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 mortar bed 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.

3.02 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.03 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors consisting of tiles 8 by 8 inches or larger.
   c. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without maring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths as recommended by tile manufacturer.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

3.04 TILE BACKING PANEL INSTALLATION

A. Tile backing panel installation is specified under Section 09 29 00 "Gypsum Board."

3.05 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.06 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 according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3.07 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.

3.08 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Wood or Metal Studs or Furring:

1. Ceramic Tile Installation: TCNA W243; tile on bond coat mortar on gypsum board substrate.

   a. Ceramic Tile Type:

      1) As indicated on Drawings.

   b. Bond Coat Mortar:

      1) Dry Set Mortar for Large and Heavy Tile (LHT Mortar) (formerly Medium-Bed, Modified Dry-Set Mortar or Medium-Bed, Latex-Portland Cement Mortar).

   c. Grout:

      1) High-performance tile grout as follows:

         a) Un-sanded grout for joints 1/8 inch wide or less.
         b) Sanded grout for joints 1/8 inch wide or greater.

B. Wall and Built-up Shower Receptor Installations:

1. Ceramic Tile Installation: TCNA B420; wall tile on mortar bond coat on waterproof membrane on coated glass-mat, water-resistant gypsum backer board substrate; floor tile on bond coat mortar on cement mortar bed reinforced with wire fabric on waterproof membrane on sloped fill on floor slab/deck.

   a. Ceramic Tile Type:

      1) As indicated on Drawings.

   b. Bond Coat Mortar:
1) At Mosaic Tile: Modified dry-set mortar (thinset) or latex-portland cement mortar (thinset).
2) At Large Format Tile: Dry Set Mortar for Large and Heavy Tile (LHT Mortar) (formerly Medium-Bed, Modified Dry-Set Mortar or Medium-Bed, Latex-Portland Cement Mortar).

c. Wall Waterproof Membrane:

1) Fluid-applied membrane with 2 inch alkali-resistant glass fiber mesh tape.
2) Apply at following locations; tape joints:
   a) Seams, corners, fasteners, and other penetrations in backer board, and to protect adjacent building materials.
   b) Base flashing and other termination points.
   c) Waterproofing need not be applied to undamaged field of coated glass-mat facing.


e. Shower Receptor Waterproof Membrane: One of following:

1) Fluid-applied membrane.

f. Grout:

1) High-performance tile grout as follows:
   a) Un-sanded grout for joints 1/8 inch wide or less.
   b) Sanded grout for joints 1/8 inch wide or greater.

END OF SECTION 09 30 13
SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes suspended ceiling system(s) with the following:

1. Acoustical Panels - ACT-1.
2. Exposed suspension system for ACT-1.
3. Metal edge moldings and trim.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. 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 Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch long Samples of each type, finish, and color.

1.03 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.
   f. Tubular Skylights
5. Perimeter moldings.
1.04 CLOSEOUT SUBMITTALS
A. Maintenance Data: For finishes to include in maintenance manuals.

1.05 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Panels: Full-size panels equal to 5 percent of quantity installed.
   2. Suspension-System Components: Quantity of each exposed component equal to 5 percent of quantity installed.
   3. Impact Clips: Equal to 5 percent of quantity installed.

1.06 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.

1.07 FIELD CONDITIONS
A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS, GENERAL
A. Source Limitations:
   1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
   2. Suspension System: Obtain each type from single source from single manufacturer.
B. 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 according to ASTM E 795.

C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.02 ACOUSTICAL PANELS - ACT-1

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries; Optima 3150PB or comparable product by one of the following:

1. CertainTeed Corp.
2. Chicago Metallic Corporation.
3. Tectum Inc.
4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay; Form 2, cloth.
   a. Furnish panels made with binder containing no urea formaldehyde.

C. Color: White.

D. LR: Not less than 0.85.

E. NRC: Not less than 0.70.

F. CAC: Not less than 35.

G. AC: Not less than 180.

H. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.

I. Thickness: 3/4 inch.
J. Modular Size: 24 by 24 inches.

K. 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.

2.03 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: For securing hangers to structure.

   a. Type: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on following ICC-ES reports as appropriate for the substrate.

      1) Torque-controlled, expansion anchor; ICC-ES AC01 Expansion Anchors in Masonry Elements.
      2) Torque-controlled, expansion anchor; ICC-ES AC193 Mechanical Anchors in Concrete Elements.
      3) Torque-controlled, adhesive anchor; ICC-ES AC308 Post-Installed Adhesive Anchors Installed in Concrete Elements.
      4) Adhesive anchor; ICC-ES AC58 Adhesive Anchors Installed in Masonry Elements.

   b. Material:

      1) For Interior Locations with Dry Exposure: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
      2) For Exterior and Interior Locations with Damp Exposures, and where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
      3) For Exterior and Interior Locations with Wet Exposures: Alloy Group 2 (A4) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

   c. Adhesive Anchor Limitations: Adhesive anchors shall not be used to resist tension loads in fire-resistive rated assemblies unless approved for such use in evaluation report or approved by authorities having jurisdiction.

2. Power-Actuated Anchors: For securing hangers to structure.
a. Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70 Power-actuated Fasteners Driven into Concrete, Steel and Masonry Elements.
b. Limit use to interior locations with Dry Exposure only.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. For Interior Locations with Dry Exposure: Zinc-coated, carbon-steel wire complying with ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. For Exterior and Interior Locations with Damp or Wet Exposures:
      a. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
   3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.

D. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.04 METAL SUSPENSION SYSTEM - ACT-1

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries; Prelude 15/16” or comparable product by one of the following:
   1. CertainTeed Corp.
   2. Chicago Metallic Corporation.
   3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch wide metal caps on flanges.
   1. End Condition of Cross Runners: Override (stepped) or butt-edge type.
   2. Face Design: Flat, flush.
   3. Cap Material: Steel or aluminum cold-rolled sheet.

2.05 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer’s standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Provide manufacturer’s standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.

3.03 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA’s "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building’s structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

7. Do not attach hangers to steel deck tabs.

8. 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.

9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. 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.

2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
   a. Where use of exposed fasteners is unavoidable, use only pop rivets with heads factory finished to match moldings and trim.

D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and 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.
   b. Install panels with pattern running in one direction parallel to long axis of space.
   c. Install panels in a basket-weave pattern.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.

5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

6. Impact Clips: Install 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.

3.04 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
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Thermoset-rubber base - RB-1.
   2. Thermoplastic-rubber base - RB-1.
   3. Rubber molding accessories.

B. Product Option: Provide thermoset-rubber or thermoplastic-rubber base, either at Contractor's discretion.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.

C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

D. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.03 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Furnish not less than 25 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.04 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.
1.05 FIELD 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. After installation and 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.

PART 2 - PRODUCTS

2.01 THERMOSET-RUBBER BASE <Insert drawing designation>

A. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:
   a. Style A, Straight: Provide in areas with carpet.
   b. Style B, Cove: Provide in areas with resilient flooring.

B. Thickness: 0.125 inch.

C. Height: 4 inches.

D. Outside Corners: Job formed.

E. Inside Corners: Job formed.

F. Colors: Match Architect's sample.

2.02 THERMOPLASTIC-RUBBER BASE - RB - 1

A. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

2. Style and Location:
   a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient flooring.

B. Thickness: 0.125 inch.

C. Height: 4 inches.

D. Lengths: Coils in manufacturer's standard length.

E. Outside Corners: Job formed.

F. Inside Corners: Job formed.

G. Colors: Match Architect's sample.

2.03 RUBBER MOLDING ACCESSORY

A. Description:

1. Rubber cap for cove carpet.
2. Rubber nosing for carpet.
3. Rubber nosing for resilient flooring.

B. Description:

1. Carpet and Tile or Sheet Flooring Joiner: For transitions between carpet and ceramic tile, resilient tile and resilient sheet provide one or more of the following products as required to fit transition profile and dimension conditions:
   
a. Roppe; #50 Tile/Carpentry Joiner 7/32”.
b. Roppe; #60 Tile/Carpentry Joiner 3/8”.
c. Roppe; #56 Tile/Carpentry Joiner 1/2”.

2. Carpet Edge for Glue-Down Applications. For transitions between carpet unfinished slab or deck provide one or more of the following products as required to fit transition profile and dimension conditions:

   a. Roppe; #42 Custom Carpet Edging 3/16” Undercut.
b. Roppe #43 Custom Carpet Edging 1/4” Undercut.
c. Roppe; #38 Glue-Down Carpet Edge 1/4”.
d. Roppe #40 Carpet Edge Guard 9/32”.
e. Roppe; #39 Glue-Down Carpet Edge 5/16”.

3. Reducer Strip for Resilient Floor Covering. For transitions between resilient flooring (tile and sheet) and unfinished slab or deck provide one or more of the following products as required to fit transition profile and dimension conditions:

   a. Roppe; #21 Reducer Strip 0.080”.
b. Roppe; #22 Reducer Strip 1/8”.
c. Roppe; #48 Reducer Strip 3/32”.
d. Roppe; #23 Reducer Strip 3/16”.
e. Roppe; #25 Reducer Strip 5/16”.
f. Roppe; #26 Reducer Strip 3/8”.
g. Roppe; #20 Transitional Reducer 7/16”.
h. Roppe; #49 Transitional Reducer 9/16”.

C. Locations: Provide rubber molding accessories in areas indicated on Drawings.

D. Colors and Patterns: Match Architect's sample.

2.04 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less and 60 g/L or less for rubber stair treads.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
   
a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   
b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.
H. Job-Formed Corners:

1. **Outside Corners**: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Form without producing discoloration (whitening) at bends.

2. **Inside Corners**: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Miter or cope corners to minimize open joints.

3.04 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Tightly adhere to substrates throughout length of each piece.
2. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13
SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Modular carpet tile - CPT-1.

B. Related Requirements:

1. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's writing installation recommendations for each type of substrate.

B. LEED2009 - Sustainable Design Submittals:

1. Laboratory Test Reports: For flooring products, indicating compliance with requirements for testing and product requirements of CRI's "Green Label Plus" testing program.

C. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Type of installation.
3. Pattern type, location, and direction.
4. Type, color, and location of insets and borders.
5. Transition details to other flooring materials.

D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.


1.03 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

B. Sample Warranty: For special warranty.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 10 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.07  DELIVERY, STORAGE, AND HANDLING
   A. Comply with CRI 104 Section 4.0 "Storage and Handling."

1.08  FIELD CONDITIONS
   A. Comply with CRI 104 Section 7.0 "Site Conditions" for temperature, humidity, and ventilation limitations.
   B. 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.

PART 2 - PRODUCTS

2.01  CARPET TILE - CPT-1
   A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawing.
   B. Fiber Type: Encore®BCF (with recycled content).
   C. Primary Backing/Backcoating: Manufacturer’s standard composite materials.
   D. Secondary Backing: Manufacturer's standard material.
   E. Backing System: Nexus® Modular.
   F. Size: 18 by 36 inches.
   G. Applied Soil-Resistance Treatment: Manufacturer's standard material.
   H. Antimicrobial Treatment: Manufacturer’s standard material.

2.02  CARPET TILE - CPT-2
   A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
   B. Primary Backing/Backcoating: Manufacturer’s standard composite materials.
   C. Secondary Backing: Manufacturer’s standard material.
   D. Backing System: Nexus® Modular.
   E. Size: 18 by 36 inches.
2.03 CARPET TILE - CPT-3

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.

B. Primary Backing/Backcoating: Manufacturer's standard composite materials.

C. Secondary Backing: Manufacturer's standard material.

D. Size: 18 by 36 inches.

E. Applied Soil-Resistance Treatment: Manufacturer's standard material.

F. Antimicrobial Treatment: Manufacturer's standard material.

2.04 INSTALLATION ACCESSORIES

A. Metal Edge/Transition Strips: Extruded aluminum with clear anodized finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

END OF SECTION 09 68 13
SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates.
   1. Steel and iron.

B. See EXTERIOR PAINTING SCHEDULE on Sheets 01-A631, 03-A631 & 04-A631.

1.02 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.04 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.

1.05 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 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. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.

B. Products (As Scheduled): Subject to compliance with requirements provide products listed in the Exterior Painting Schedule at end of this Section. Products are listed (with some exceptions) by MPI number and shall be selected from the "MPI Approved Products Lists" (see www.paintinfo.com/mpi/approved/Manufactory_index.shtml). Equivalent products not included in the "MPI Approved Products Lists" shall be submitted as substitution requests.

2.02 PAINT, GENERAL

A. MPI Standards: Unless indicated otherwise, products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists," except if approved by a substitution request.
B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content, General: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction.

D. Colors: As indicated on Drawings Paint Schedule.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
D. Bare Steel Substrates: Remove rust, loose mill scale, and residual coatings if any. Clean using methods recommended in writing by paint manufacturer but not less than SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning or SSPC-SP 11, Power Tool Cleaning to Bare Metal.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 (Shop, Field, and Maintenance Painting of Steel) for touching up shop-primed surfaces.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. 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.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
   a. Equipment, including panelboards and switch gear.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Tanks that do not have factory-applied final finishes.
3.04 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.

3.05 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates.

1. Water-Based Light Industrial Coating System MPI EXT 5.1B/C/M/N/R:
   a. Prime Coat: One of following:
      1) Primer, zinc rich, inorganic, MPI #19 for 5.1B.
      2) Primer, alkyd, anti-corrosive for metal, MPI #79 for 5.1C.
      3) Primer, epoxy, water based, anti-corrosive, for metal, MPI #301 for 5.1M.
      4) Primer, epoxy, anti-corrosive MPI #101 for 5.1N & 5.1R.
      5) Shop primer specified in Section where substrate is specified.
   b. Intermediate Coat:
      1) For 5/1B: Light industrial coating, exterior, water based, matching topcoat. Apply where Premium Grade system is indicated.
      2) For 5.1C/M/N: Light industrial coating, exterior, water based, matching topcoat. Application required.
      3) For 5.1R: Epoxy, high build, low gloss MPI #108. Application required.
   c. Topcoat: One of following matching gloss level indicated.
      1) Light industrial coating, exterior, water based (MPI Gloss Level 3), MPI #161.
      2) Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
      3) Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6), MPI #164.
SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates.

1. Concrete.
   a. Non-traffic bearing surfaces.
2. Concrete masonry units (CMUs).
3. Steel and iron.
5. Plastic.

B. See INTERIOR PAINTING SCHEDULE on Sheets 01-A631, 03-A631, & 04-A631.

1.02 DEFINITIONS

A. MPI Gloss Level 1 (Flat): Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2 (Velvet-Like): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3 (Eggshell-Like): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4 (Satin-Like): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7 (High Gloss): More than 85 units at 60 degrees, according to ASTM D 523.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

1.04 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.

1.05 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 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. Benjamin Moore & Co.
   2. PPG Paints.
   3. Pratt & Lambert.
B. Products (As Scheduled): Subject to compliance with requirements provide products listed in the Interior Painting Schedule at end of this Section. Products are listed (with some exceptions) by MPI number and shall be selected from the "MPI Approved Products Lists" (see www.paintinfo.com/mpi/approved/Manufacturer_index.shtml). Equivalent products not included in the "MPI Approved Products Lists" shall be submitted as substitution requests.

2.02 PAINT, GENERAL

A. MPI Standards: Unless indicated otherwise, products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists," except if approved by a substitution request.

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

D. Colors: As indicated on Drawings Paint Schedule.

1. Ten percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Concrete Masonry Units (CMUs): 12 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Concrete Masonry Unit (CMU) Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Bare Steel Substrates: Remove rust, loose mill scale, and residual coatings, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
1. Substrates Not Subject to Wetting by Condensation, Dampness, or Humidity: SSPC-SP 2, Hand Tool Cleaning or SSPC-SP 3, Power Tool Cleaning as required to achieve a clean surface.

2. Substrates Subject to Wetting by Condensation, Dampness, or Humidity: SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning or SSPC-SP 11, Power Tool Cleaning to Bare Metal.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 (Shop, Field, and Maintenance Painting of Steel) for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. 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.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Occupied Spaces: Paint the following work where exposed:

   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.04 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.

3.05 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces.

1. High-Performance Architectural Latex System MPI INT 3.1C:
   a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat. Apply where Premium Grade system is indicated.
   c. Topcoat: One of following matching gloss level indicated.
      1) Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.
      2) Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.
      3) Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.
      4) Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

B. CMU Substrates.

1. High-Performance Architectural Latex System MPI INT 4.2D/P:
   a. Primer/Block Filler: One of following:
1) Block filler, latex, interior/exterior, MPI #4 for 4.2D.
2) Primer, alkali resistant, water based, MPI #3 for 4.2P.

b. Intermediate Coat: Latex, interior, high performance architectural, matching
topcoat. Apply where Premium Grade system is indicated.

c. Topcoat: One of following matching gloss level indicated:

1) Latex, interior, high performance architectural (MPI Gloss Level 2),
   MPI #138.
2) Topcoat: Latex, interior, high performance architectural (MPI Gloss
   Level 3), MPI #139.
3) Topcoat: Latex, interior, high performance architectural (MPI Gloss
   Level 4), MPI #140.
4) Topcoat: Latex, interior, high performance architectural, semi-gloss
   (MPI Gloss Level 5), MPI #141.

C. Steel Substrates.

1. High-Performance Architectural Latex System MPI INT 5.1R/RR:

   a. Prime Coat: One of following:

      1) Alkyd, quick dry, for metal, MPI #76 for 5.1R.
      2) Alkyd, anti-corrosive, for metal, MPI #79 for 5.1RR.
      3) Shop primer specified in Section where substrate is specified.

   b. Intermediate Coat: Latex, interior, high performance architectural, matching
topcoat. Apply where Premium Grade system is indicated.

   c. Topcoat: One of following matching gloss level indicated:

      1) Latex, interior, high performance architectural (MPI Gloss Level 2),
         MPI #138.
      2) Latex, interior, high performance architectural (MPI Gloss Level 3),
         MPI #139.
      3) Latex, interior, high performance architectural (MPI Gloss Level 4),
         MPI #140.
      4) Latex, interior, high performance architectural, semi-gloss (MPI Gloss
         Level 5), MPI #141.

2. Epoxy-Modified Latex System MPI INT 5.1K:

   a. 1st Prime Coat: One of following:

      1) Rust-inhibitive, water based MPI #107.
      2) Shop primer specified in Section where substrate is specified.

   b. 2nd Prime Coat (Required): Rust-inhibitive, water based MPI #107.


   d. Topcoat: One of following matching gloss level indicated:
1) Epoxy-modified latex, interior, semi-gloss (MPI Gloss Level 5), MPI #215.
2) Epoxy-modified latex, interior, gloss (MPI Gloss Level 6), MPI #115.

3. Water-Based Dry-Fall System MPI INT 5.1C/CC/Z:
   a. Prime Coat: One of following:
      1) Alkyd, quick dry, for metal, MPI #76 for 5.1C.
      2) Alkyd, anti-corrosive, for metal, MPI #79 for 5.1CC.
      3) Quick dry, for shop application, MPI #275 for 5.1Z.
      4) Shop primer specified in Section where substrate is specified.
   b. Topcoat: One of following matching gloss level indicated:
      1) Dry fall, latex, flat, MPI #118.
      2) Dry fall, water based, for galvanized steel, flat (MPI Gloss Level 1), MPI #133.
      3) Dry fall, latex (MPI Gloss Level 3), MPI #155.
      4) Dry fall, water based, for galvanized steel, (MPI Gloss Level 3), MPI #131.
      5) Dry fall, latex (MPI Gloss Level 5), MPI #226.
      6) Dry fall, water based, for galvanized steel, (MPI Gloss Level 5), MPI #158.

D. Galvanized-Metal Substrates.

1. High-Performance Architectural Latex System MPI INT 5.3M:
   a. Prime Coat: One of following:
      1) Primer, galvanized, water based, MPI #134.
      2) Shop primer specified in Section where substrate is specified.
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat. Apply where Premium Grade system is indicated.
   c. Topcoat: One of following matching gloss level indicated:
      1) Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.
      2) Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.
      3) Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.
      4) Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

2. Water-Based Dry-Fall System MPI INT 5.3H:
   a. Prime Coat: One of following:
1) Dry fall, water based, for galvanized steel, matching topcoat.
2) Shop primer specified in Section where substrate is specified.

b. Topcoat: One of following matching gloss level indicated:
   1) Dry fall, water based, for galvanized steel, flat (MPI Gloss Level 1), MPI #133.
   2) Dry fall, water based, for galvanized steel, (MPI Gloss Level 3), MPI #131.
   3) Dry fall, water based, for galvanized steel, semi-gloss (MPI Gloss Level 5), MPI #158.

E. Plastic Substrates.
1. High-Performance Architectural Latex System MPI INT 6.8A/AA:
   a. Prime Coat: One of following:
      1) Primer, bonding, solvent based, MPI #69 for 6.8A.
      2) Primer, bonding, water based, MPI #17 for 6.8AA.
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat. Apply where Premium Grade system is indicated.
   c. Topcoat: One of following matching gloss level indicated:
      1) Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.
      2) Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.
      3) Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.
      4) Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

F. Gypsum Board Substrates.
1. High-Performance Architectural Latex System MPI INT 9.2B:
   a. Prime Coat: Primer sealer, latex, interior, MPI #50.
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat. Apply where Premium Grade system is indicated.
   c. Topcoat: One of following matching gloss level indicated:
      1) Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.
      2) Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.
      3) Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.
4) Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

2. Epoxy-Modified Latex System MPI INT 9.2F:
   a. Prime Coat: Primer sealer, latex, interior, MPI #50.
   b. Intermediate Coat: Epoxy-modified latex, matching topcoat. Apply where Premium Grade system is indicated.
   c. Topcoat: One of following matching gloss level indicated:
      1) Epoxy-modified latex, interior, semi-gloss (MPI Gloss Level 5), MPI #215.
      2) Epoxy-modified latex, interior, gloss (MPI Gloss Level 6), MPI #115.

END OF SECTION 09 91 23
SECTION 09 96 00 - HIGH-PERFORMANCE (EPOXY) COATINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems - systems with one or more epoxy resin components - on the following exterior substrates.

1. Exterior Substrates.
   a. Steel and iron.

B. See EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE at end of Section.

1.02 DEFINITIONS

A. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees, according to ASTM D 523.

B. MPI Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees, according to ASTM D 523.

C. MPI Gloss Level 7 (High Gloss): More than 85 units at 60 degrees, according to ASTM D 523.

D. SRA: Slip Resistant Additive.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.

B. Sustainable Design Submittals:

   1. Product Data: For paints and coatings, indicating VOC content.

C. Samples for Initial Selection: For each type of topcoat product indicated.

D. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.04 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.

1.05 FIELD CONDITIONS
A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F, unless indicated otherwise on manufacturer's product data.
B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.01 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:
   2. Benjamin Moore & Co.
   3. Comex Industrial Coatings; Comex Group.
   4. Corotech Coatings; Benjamin Moore & Co.
   5. Devoe Paint Company; AkzoNobel.
   7. Dulux (formerly ICI Paints); a brand of AkzoNobel.
   8. H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.
   9. HEMPEL A/S.
   10. PPG Architectural Finishes, Inc.
B. Products (As Scheduled): Subject to compliance with requirements provide products listed in the Exterior High-Performance Coating Schedule at end of this Section. Products are listed (with some exceptions) by MPI number and shall be selected from the "MPI Approved Products Lists" (see www.paintinfo.com/mpi/approved/Manufactory_index.shtml). Equivalent products not included in the "MPI Approved Products Lists" shall be submitted as substitution requests.

2.02 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Unless indicated otherwise, products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists," except if approved by a substitution request.

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Pretreatment Wash Primers: 420 g/L.
7. Floor Coatings: 100 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

D. Colors: As indicated on Drawings Paint Schedule.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and the following manuals applicable to substrates and coating systems indicated.
   2. For Renovation Projects: Recommendations in "MPI Maintenance Repainting Manual."

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Bare Steel and Iron Substrates: Remove rust, loose mill scale, and residual coatings, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. Substrates Not Subject to Wetting by Condensation, Dampness, or Humidity: SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning or SSPC-SP 11, Power Tool Cleaning to Bare Metal.
2. Exterior Substrates and Substrates Subject to Wetting by Condensation, Dampness, or Humidity: SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.


E. Shop-Primed Steel and Iron Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 (Shop, Field, and Maintenance Painting of Steel) for touching up shop-primed surfaces.

3.03 APPLICATION

A. Apply high-performance coatings according to manufacturer’s written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.

2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.04 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, 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 coated surfaces.

3.05 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel and Iron Substrates.

1. Pigmented Polyurethane over Primer System MPI EXT 5.1G/H/J/L/P/T (Note: MPI EXT 5.1J & 5.1P Premium Grades are specified as Budget Grades and will not be accepted as Premium Grade systems.):

   a. Premium Grade System for MPI EXT 5.1G, 5.1H, 5.1L, & 5.1T only:
      
      1) Prime Coat: One of following:
         
         a) Primer, zinc rich, epoxy, MPI #20 for 5.1G.
         b) Primer, epoxy, anti-corrosive, for metal, MPI #101 for 5.1H.
         c) Primer, zinc rich, inorganic, MPI #19 for 5.1L.
         d) Epoxy, high build, self-priming, MPI #120 for 5.1T.
         e) Shop primer specified in Section where substrate is specified.

      2) 1st Intermediate Coat: One of following:
         
         a) Epoxy, high build, low gloss, MPI #108 for 5.1G & 5.1L.
         b) Epoxy, gloss, MPI #77 for 5.1H.
         c) Not required for 5.1T, provide 2nd intermediate coat.

      3) 2nd Intermediate Coat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

      4) Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

END OF SECTION 09 96 00
SECTION 09 96 56.13 - EPOXY COATINGS FOR WASH BAY WALLS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems - systems with one or more epoxy resin components - on concrete and masonry substrates of walls, ceilings, and horizontal non-traffic bearing surfaces, including incidental metal substrates a part of surfaces.

1.02 REFERENCES


B. SSPC - The Society for Protective Coatings.

1. SSPC-PA 1, Shop, Field, and Maintenance Painting of Steel.
2. SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning
3. SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.
D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.04 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.

1.05 FIELD CONDITIONS
A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F, unless indicated otherwise on manufacturer's product data.
B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.01 EPOXY COATINGS, GENERAL
A. Material Compatibility:
   1. Materials for use within coating system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a coating system, products shall be recommended in writing by topcoat manufacturers for use in coating system and on substrate indicated.
   3. Products shall be of same manufacturer for each coat in a coating system.

2.02 EPOXY COATINGS FOR WASH BAYS
A. Epoxy Wall System: Smooth, epoxy resin coating system formulated to produce a chemical resistant, seamless surface on walls, ceilings, and horizontal non-traffic bearing surfaces of material type indicated on Drawings.
B. Basis-of-Design Product: Subject to compliance with requirements, provide Tennant Co. (Tennant); Tennant Glaze Wall System using products indicated below or comparable products by another manufacturer.
2. Benjamin Moore & Co.
3. Comex Industrial Coatings; Comex Group.
4. Corotech Coatings; Benjamin Moore & Co.
5. Devoe Paint Company; AkzoNobel.
7. Dulux (formerly ICI Paints); a brand of AkzoNobel.
8. H&C Decorative Concrete Products; a brand of Sherwin-Williams Co.
9. HEMPEL A/S.
10. PPG Architectural Finishes, Inc.
13. Tnemec Inc.

C. System Characteristics:

1. Nominal System Thickness: 18 mils (0.45 mm).

D. Patching Material:

1. Basis-of-Design Product: Tennant; Eco-PT Topcoat.
2. Resin: 100 percent solids epoxy.
3. Thickness of Coat (Dry/Wet): As required for conditions encountered; and as a filler for concrete masonry units (CMU).

E. Primer:

1. Basis-of-Design Product: Tennant; Eco-MPE.
2. Resin: 99 percent solids epoxy.
3. Thickness of Coat (Dry/Wet): 4 mils (0.10 mm).

F. Intermediate Coat:

1. Basis-of-Design Product: Tennant; Eco-PT Topcoat.
2. Resin: 100 percent solids epoxy.
3. Thickness of Coat (Dry/Wet): 6 mils (0.15 mm).

G. Topcoat:

1. Basis-of-Design Product: Tennant; Eco-URE/OP.
2. Resin: Epoxy.
3. Thickness of Coat (Dry/Wet): 8 mils (0.20 mm).

H. System Physical Properties: Provide resinous epoxy system with the following minimum or better physical property requirements when tested according to test methods indicated:
1. Bond Strength: Either of following:
   a. 100 percent substrate failure when tested according to ASTM D 4541 on CMU, gypsum board or cement board substrates.
   b. 100 percent of failure of 400 psi concrete substrate when tested according to ASTM D 7234.

2. Hardness: Not less than 80 when tested according to ASTM D 2240, Shore D.

3. Temperature Resistance: To 200 deg F (93 deg C).

4. Abrasion Resistance (Topcoat): 90.0 mg. maximum weight loss according to ASTM D 4060 (using CS-17 Taber abrasion wheel, 1,000 gram load, 1,000 revolutions).

2.03 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.

2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Clay Masonry: 12 percent.
3. Concrete Masonry Units (CMUs): 12 percent.
C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION
A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, 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.
   1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches.
   2. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.
   3. Clean surfaces using a proprietary prepackaged acid etching solution in accordance with manufacturer's written recommendations.

E. Concrete Masonry Unit (CMU) Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
   1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi at 6 to 12 inches.

F. Bare Steel and Iron Substrates: Remove rust, loose mill scale, and residual coatings, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.
G. Shop-Primed Steel and Iron Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 (Shop, Field, and Maintenance Painting of Steel) for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

I. Aluminum Substrates: Remove loose surface oxidation.

3.03 APPLICATION

A. Apply high-performance coatings according to manufacturer’s written instructions.
   1. Use applicators and techniques suited for coating and substrate indicated.
   2. Coat surfaces behind movable equipment same as similar exposed surfaces.
   3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.04 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, 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 coated surfaces.

END OF SECTION 09 96 56.13
PART 1 - GENERAL

1.01 SUMMARY
A. Section includes static-control floor coating system for interior concrete slabs; includes the following:
   1. Static-control concrete sealer/undercoat.
   2. Static-control topcoat.
   3. Concrete cleaner.
   4. Grounding strips.
B. Related Requirements:
   1. Section 03 30 00 "Cast-In-Place Concrete."

1.02 DEFINITIONS
A. Qualified Applicator: A firm or individual experienced in applying coating systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

1.03 REFERENCES
   1. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   4. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
B. ANSI/ESD - Electrostatic Discharge Association:
   1. ANSI/ESD S20.20-2014 For the Development of an Electrostatic Discharge Control Program for - Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices).

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to static-control floor coatings including, but not limited to, the following:
   a. Examination and preparation of substrates to receive static-control floor coating system.
   b. Installation including application, curing, protection, and coordination with other Work.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product. Include physical properties, electrical properties, and application instructions.

B. Sustainable Design Submittals:

1. Product Data for Credit IEQ 4.2: For floor coating products, documentation including printed statement of VOC content.
2. Laboratory Test Reports: For floor coating products, indicating compliance with requirements for low-emitting materials.

C. Product Schedule: For static-control floor coatings. Use same designations indicated on Drawings.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator; a letter of approval from manufacturer of static-control floor coating system stating applicator is qualified to apply products furnished for Project.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for static-control floor coating system. (Test reports not required for Basis of Design product.)

C. Field quality-control reports.

1.07 QUALITY ASSURANCE

A. Applicator Qualifications: A qualified applicator who employs workers for this Project who are competent in techniques required by manufacturer for static-control floor coating system.
1. Engage an applicator who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

1.08 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging with labels clearly identifying product name, manufacturer, batch or dye lot numbers and SDS sheets.

B. Storage: Store materials in accordance with manufacturer's instructions. Keep containers sealed until ready for use.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.09 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 60 deg F or more than 80 deg F, in spaces to receive static-control floor coating system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain primary coating materials, including concrete cleaner, undercoat, and topcoat, from single source from single manufacturer. Obtain secondary materials, including grounding strips, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.02 COATINGS, GENERAL

A. Material Compatibility: Materials for use within static-control floor coating system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

B. Static-Control Properties: Provide static-control coatings with static-control properties indicated as determined by testing identical products for compliance verification per following test method by an independent testing and inspecting agency:

1. Electrical Resistance: Less than 1.0e+09 ohms per ANSI/ESD S20.20-2014, Section 8.2 Personal Grounding, Table 2, under Compliance Verification, Test Method ANSI/ESD TR53 for both Footwear Section and Flooring Section.
C. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.03 STATIC-CONTROL FLOOR COATING SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide United SCP Inc. (United); static-control coating system using products indicated below or equal by another manufacturer.

B. Static-Control Concrete Sealer/Undercoat:
   2. Formulation: Enhanced urethane.
   5. Slip Resistance per ASTM D 2047: 0.65 minimum.
   6. Abrasion Resistance per ASTM D968-17: 6,480 grams.
   7. Number of Coats: Two.

C. Static-Control Topcoat:
   2. Formulation: Urethane/acrylic blend, strippable.
   5. Slip Resistance per ASTM D 2047: 0.5 minimum.
   6. Abrasion Resistance per ASTM D968-17: 6,480 grams.
   7. Number of Coats: One.

D. Concrete Cleaner: As recommended in writing by static-control floor coating system manufacturer.

E. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor coating system to ground connection.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Applicator 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 application of static-control floor coating system.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion and electrical continuity of static-control floor coating system.

1. Repair cracked and eroded concrete in accordance with coating manufacturer's instructions. Remove and repair unsound substrates.

B. Concrete Substrates: Prepare according to ASTM F 710 and clean concrete substrates using concrete cleaner specified.

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 static-control floor coating system and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   a. Mask off a 36 inch by 36 inch test area. Apply static-control floor coating system in accordance with "Application" Article below. Allow coating system to cure for at least 24 hours. Test coating system bond strength to substrate per manufacturer's written instructions. Test area to verify static-control properties specified under Part 2 Article "Coating, General." Contact manufacturer should results exceed 1.0e+09 ohms.

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 according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 9 lb of water/1000 sq. ft. in 24 hours.

C. Protection: At abutting surfaces not receiving coating provide surface-applied protection before applying static-control floor coating system.

3.03 APPLICATION

A. Apply static-control floor coating system according to manufacturer's written instructions.
B. Grounding Strips: Install in accordance with manufacturer's written instructions. Provide not less than one strap for each 2,000 sq. ft. of coated flooring.

C. Do not add thinners to coating products unless approved in writing by manufacturer.

D. Sealer/Undercoat: Apply 2 coats at spreading rates recommended in writing by manufacturer. Allow first coat to cure for at least 1 hour before applying second coat.
   1. Allow second coat to cure before for at least 1 hour before subjecting to foot traffic.
   2. Allow second coat to cure for at least 1 hour before applying topcoat. Protect second coat from traffic prior to application of topcoat.

E. Topcoat: Apply 1 coat to cured sealer/undercoat at spreading rate recommended in writing by manufacturer. Allow coating to dry for at least 1 hour before subjecting to light foot traffic; allow not less than 48 hours prior to subjecting floor to wheeled traffic.

3.04 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to test electrical resistance of static-control floor coating for compliance with requirements.
   1. Arrange for testing after static-control floor coating has fully cured and after ground connections are completed.
      a. Allow floor coating to cure for not less than 10 days prior to testing.
   2. Test floor coating to verify static-control properties specified under Part 2 Article "Coating, General."

B. Static-control floor coating will be considered defective if it does not pass tests and inspections.

C. Owner's testing agency will prepare test and inspection reports.

D. Prepare test and inspection reports.

3.05 PROTECTION

A. Protect static-control floor coating from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by floor coating manufacturer.

END OF SECTION 09 97 23.13
SECTION 10 11 00 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Rail support systems for visual display board assemblies.
   2. Modular support systems for visual display board assemblies.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Shop Drawings: For visual display units.
   1. Include plans, elevations, sections, details, and attachment to other work.
   2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
   3. Include sections of typical trim members.

C. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.03 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.

1.04 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.
1.05 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.

1.06 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: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
   1. Face Sheet Thickness: 0.021 inch uncoated base metal thickness.
   2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.

B. Size
   1. Width: 120 inches.
   2. Height: 48 inches.

C. Marker Tray: Clear anodized aluminum, supported by stainless-steel clips.
2.02 HALF TACKBOARD/HALF MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

   1. Face Sheet Thickness: 0.021 inch uncoated base metal thickness.

B. Manufacturer's Standard Core: Minimum 1/4 inch (6 mm) thick, with manufacturer's standard moisture-barrier backing.

C. Tackboard Panels:

   1. Facing: 1/4-inch-thick.
   2. Core: Manufacturer's standard.

D. Size

   1. Width: 72 inches.
   2. Height: 42 inches.

E. Marker Tray: Clear anodized aluminum, supported by stainless-steel clips.

2.03 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish with surface-burning characteristics indicated.

C. Hardboard: ANSI A135.4, tempered.

D. Particleboard: ANSI A208.1, Grade M-1, that complies with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.04 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.

2.05 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.01 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.

3.02 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.
3.03 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Factory-Fabricated Visual Display Board Assemblies: Adhere to wall surfaces with egg-size adhesive gobs at 16 inches o.c., horizontally and vertically.

3.04 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 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Cutout dimensional characters.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For 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 other installers, and accessories.
   3. Show message list, typestyles, graphic elements, and layout for each sign at least quarter size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
   1. Include representative Samples of available typestyles and graphic symbols.

D. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

E. Delegated-Design Submittal: For dimensional cutout characters to comply with performance requirements and design criteria.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.
1.05 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.

1.06 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

2.01 DIMENSIONAL CHARACTERS

A. Delegated-Design Manufacturer: Arapahoe Sign Arts; Contact Wade Pugsley 303-859-7121.

B. Cutout Characters to be confirmed by Adams County and Architect: Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows.

1. Sheet or Plate Aluminum Characters:
   a. Character Height: Confirmed by Adams County and Architect.
   b. Thickness: 0.25 inch.
   c. Finishes:
      1) Integral Aluminum Finish: Clear anodized.
   d. Mounting: Projecting studs.
   e. Typeface: Confirmed by Adams County and Architect.

2.02 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.03 ACCESSORIES

A. Fasteners and Anchors: Manufacturer’s standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:
   a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
   b. Fastener Heads: For nonstructural connections, use flathead screws and bolts with tamper-resistant Allen-head, spanner-head or one-way-head slots unless otherwise indicated.
4. Sign Mounting Fasteners:
   a. Concealed Studs: Concealed (blind), threaded studs 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.
   b. 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.
   c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

B. Adhesive: As recommended by sign manufacturer.

   1. Adhesives shall have a VOC content of 70 g/L or less.

C. Two-Face Tape: Manufacturer’s standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
2.04 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 dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish to be clear anodized aluminum color unless otherwise indicated.
2. Stainless-Steel Brackets: Factory finish brackets with No. 4 finish unless otherwise indicated.

2.05 GENERAL FINISH REQUIREMENTS

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

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.06 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Delegated-Design Installer: Arapahoe Sign Arts; Contact Wade Pugsley 1-303-859-7121.

B. 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.

C. Mounting Methods:
   1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. 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. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.

5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.03 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 14 23 - PANEL SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Panel signs.

1.02 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.03 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.
   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
   1. Include representative Samples of available typestyles and graphic symbols.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.05 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer and manufacturer.
B. Sample Warranty: For special warranty.

1.06 CLOSEOUT SUBMITTALS
A. Maintenance Data: For signs to include in maintenance manuals.

1.07 FIELD CONDITIONS
A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.08 WARRANTY
A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Deterioration of finishes beyond normal weathering.
   b. Deterioration of embedded graphic image.
   c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SIGNS
A. Delegated-Design Manufacturer: Arapahoe Sign Arts; Contact Wade Pugsley 303-859-7121.
B. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Mounting: Manufacturer’s standard method for substrates indicated.
2. Surface Finish and Applied Graphics:
   a. Integral Sheet Color: As selected by Architect from full range of industry colors.
3. Text and Typeface: typeface as selected by Architect and Adams County from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.

4. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

2.02 PANEL-SIGN MATERIALS

A. Steel Materials:

1. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

2.03 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. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.

2. Exposed Metal-Fastener Components, General:

   a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
   b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant Allen-head, spanner-head or one-way-head slots unless otherwise indicated.

3. Sign Mounting Fasteners:

   a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.

4. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

B. Adhesive: As recommended by sign manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
2.04 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.

4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

5. Internally brace signs for stability and for securing fasteners.

6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.05 GENERAL FINISH REQUIREMENTS

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

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.06 METALLIC-COATED STEEL FINISHES

A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A 780/A 780M.
B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

2.07 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, and prepare for coating according to coating manufacturer's written instructions.

1. For Baked-Enamel or Powder-Coat Finish: After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.


C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Delegated-Design Installer: Arapahoe Sign Arts; Contact Wade Pugsley 1-303-859-7121.

B. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Install signs so they do not protrude or obstruct according to the accessibility standard.

3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. 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.

2. Shim-Plate Mounting: Provide 1/8-inch-thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using method specified above.

D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.03 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 23
SECTION 10 14 23.13 - ROOM-IDENTIFICATION SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY
   A. Section includes room-identification signs that are directly attached to the building.

1.02 UNIT PRICES
   A. Work of this Section is affected by unit prices specified in Section 01 22 00 "Unit Prices."

1.03 DEFINITIONS
   A. Accessible: In accordance with the accessibility standard.

1.04 COORDINATION
   A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
   B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.05 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: For room-identification 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 other installers, and accessories.
      3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
   C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
      1. Include representative Samples of available typestyles and graphic symbols.
   D. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.06 INFORMATIONAL SUBMITTALS
A. Sample Warranty: For special warranty.

1.07 CLOSEOUT SUBMITTALS
A. Maintenance Data: For signs to include in maintenance manuals.

1.08 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
   2. Tools: One set(s) of specialty tools for assembling signs and replacing variable sign components.

1.09 QUALITY ASSURANCE
A. Installer Qualifications: Manufacturer of products.

1.10 FIELD CONDITIONS
A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.11 WARRANTY
A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of finishes beyond normal weathering.
      b. Deterioration of embedded graphic image.
      c. Separation or delamination of sheet materials and components.
   2. Warranty Period: Five years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in ICC A117.1.

2.02 ROOM-IDENTIFICATION SIGNS

A. Delegated-Design Manufacturer: Arapahoe Sign Arts; Contact Wade Pugsley 303-859-7121.

B. Room-Identification Sign: Sign system with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
   1. Mounting: Manufacturer’s standard method for substrates indicated with .
   2. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect and Adams County from manufacturer’s full range.

2.03 SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209 , alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.04 ACCESSORIES

A. Fasteners and Anchors: Manufacturer’s standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
   1. Use concealed fasteners and anchors unless indicated to be exposed.
   2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
   3. Sign Mounting Fasteners:
      a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.

B. Adhesive: As recommended by sign manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less.
2.05 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. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:

1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner.

2.06 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.

2.07 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Delegated-Design Installer: Arapahoe Sign Arts; Contact Wade Pugsley 1-303-859-7121.

B. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

C. Accessibility: Install signs in locations on walls.

D. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
   a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
   b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.02 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 23.13
SECTION 10 21 13.15 - STAINLESS-STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY
A. Section includes stainless-steel toilet compartments configured as toilet enclosures or urinal screens.

1.02 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 toilet compartments.

B. Shop Drawings: For toilet compartments.
   1. Include plans, elevations, sections, details, and attachment details.
   2. Show locations of cutouts for compartment-mounted toilet accessories.
   3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
   4. Show locations of centerlines of toilet fixtures.
   5. Show locations of floor drains.
   6. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.

C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
   1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

1.03 CLOSEOUT SUBMITTALS
A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.04 PROJECT CONDITIONS
A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.
PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.02 STAINLESS-STEEL TOILET COMPARTMENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Hadrian Manufacturing Inc.; stainless steel standard ceiling hung partition and Hadrian Manufacturing Inc.; stainless steel wall mounted screen or comparable products by one of the following:

1. Ampco, Inc.
2. Bradley Corporation; Mills Partitions.

B. Toilet-Enclosure Style: Overhead braced.

C. Urinal-Screen Style: Wall hung flat panel Overhead braced Post to ceiling.

D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Provide with no-sightline system. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least 250 lbf, when tested according to ASTM F 446, without deformation of panel.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

E. Urinal-Screen Construction:

1. Flat-Panel Urinal Screen: Matching panel construction.

F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:
1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch.
2. Panels: Manufacturer's standard thickness, but not less than 0.031 inch.
3. Doors: Manufacturer's standard thickness, but not less than 0.031 inch.
4. Flat-Panel Urinal Screens: Thickness matching the panels.

G. Pilaster Shoes: Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

H. Urinal-Screen Post: Manufacturer's standard post design of 1-3/4-inch-square, aluminum tube with satin finish; with shoe matching that on the pilaster.

I. Brackets (Fittings):
   1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel aluminum.

J. Stainless-Steel Finish: No. 4 bright, directional polish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.03 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
   1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.
   2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
   5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.04 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221.

C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

D. Stainless-Steel Castings: ASTM A 743/A 743M.

2.05 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes at posts to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

   1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 INSTALLATION

A. General: Comply with manufacturer’s written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer’s recommended anchoring devices.

1. Maximum Clearances:
   a. Pilasters and Panels: 1/2 inch.
   b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
   a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer’s written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.03 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer’s written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13.15
SECTION 10 22 13 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.01 SUMMARY
   A. Section Includes:
      1. Heavy-duty wire mesh partitions.

1.02 DEFINITIONS
   A. Intermediate Crimp: Wires pass over one and under the next adjacent wire in both
directions, with wires crimped before weaving and with extra crimps between the
intersections.
   B. Lock Crimp: Deep crimps at points of the intersection that lock wires securely in
place.

1.03 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings:
      1. Include plans, elevations, sections, details, and attachments to other work.
      2. Indicate clearances required for operation of doors.
   C. Samples for Initial Selection: For units with factory-applied color finishes.
   D. Samples for Verification: 12-by-12-inch panel constructed of specified frame members
and wire mesh. Show method of finishing members at intersections.
   E. Delegated-Design Submittal: For wire mesh partitions indicated to comply with
performance requirements and design criteria, including analysis data signed and
sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.
   B. Welding certificates.
1.05 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For wire mesh partition hardware to include in maintenance manuals.

1.06 DELIVERY, STORAGE, AND HANDLING
   A. Deliver wire mesh items with cardboard protectors on perimeters of panels and doors and with posts wrapped to provide protection during transit and Project-site storage. Use vented plastic.
   B. Inventory wire mesh partition door hardware on receipt, and provide secure lockup for wire mesh partition door hardware delivered to Project site.
      1. Tag each item or package separately with identification, and include basic installation instructions with each item or package.
   C. Deliver keys to Owner by registered mail or overnight package service.

1.07 FIELD CONDITIONS
   A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 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. Acorn Wire & Iron Works, LLC.
   5. Folding Guard Corporation.
   7. Indiana Wire Products, Inc.
  10. King Wire Partitions, Inc.
  11. Miller Wire Works, Inc.
  12. Newark Wire Works Inc.
  13. R. J. Donaldson, Inc.
  14. SpaceGuard Products.
2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design wire mesh units.

B. Structural Performance: Wire mesh units shall withstand the effects of gravity loads.

C. Seismic Performance: Wire mesh units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.03 MATERIALS

A. Steel Wire: ASTM A 510.

B. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.

C. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.

E. Panel-to-Panel Fasteners: Manufacturer’s standard steel bolts, nuts, and washers.

F. Post-Installed 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 E 488/E 488M, conducted by a qualified independent testing agency.

   1. Material for Interior Locations: Carbon-steel components are zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

G. Power-Driven Fasteners: ICC-ES AC70.

H. Seismic Bracing: Angles with legs not less than 1-1/4 inch wide, formed from 0.040-inch-thick, metallic-coated steel sheet; with bolted connections and 1/4-inch-diameter bolts.


2.04 HEAVY-DUTY WIRE MESH PARTITIONS

A. Mesh: 0.192-inch-diameter, intermediate-crimp steel wire woven into 2-inch diamond mesh.
B. Vertical and Horizontal Panel Framing: 1-1/2-by-3/4-by-1/8-inch cold-rolled steel channels; with holes for 3/8-inch diameter bolts not more than 12 inches o.c.

C. Horizontal Panel Stiffeners: Two cold-rolled steel channels, 1 by 1/2 by 1/8 inch, bolted or riveted toe to toe through mesh.

D. Top Capping Bars: 3-by-1-inch steel channels.

E. Posts for 90-Degree Corners: 1-1/2-by-1-1/2-by-1/8-inch steel angles or tubes or 2-by-2-by-0.075-inch cold-rolled steel angles or tubes, with holes for 3/8-inch diameter bolts aligning with bolt holes in vertical framing; with 1/4-inch steel base plates.

F. Line Posts: 3-inch-by-4.1-lb or 3-1/2-by-1-1/4-by-1/8-inch steel channels; with 1/4-inch steel base plates.

G. Floor Shoes: Metal, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.

H. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch steel channels, banded with 1-1/2-by-1/8-inch flat steel bar cover plates on four sides, and with 1/8-inch thick angle strike bar and cover on strike jamb.
   1. Hinges: Full-surface type, 3-1/2-by-3-1/2-inch steel, three per door; bolted, riveted, or welded to door and jamb framing.
   2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
   3. Cylinder Lock: Mortise type with cylinder specified in Section 08 71 00 "Door Hardware"; operated by key outside and lever inside; mounted in lower section of door.
   4. Inactive Leaf Hardware: Cane bolt at bottom and chain bolt at top.

I. Accessories:
   1. Sheet Metal Base: 0.060-inch thick, steel sheet.
   2. Adjustable Filler Panels: 0.060-inch thick steel sheet, capable of filling openings from 2 to 12 inches.
   3. Wall Clips: Manufacturer's standard, cold-rolled steel sheet; allowing up to 1 inch of adjustment.

J. Finish: Enamel finish or Powder-coated finish unless otherwise indicated.
   1. Color: As selected by Architect from manufacturer's full range.

2.05 FABRICATION

A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
1. Fabricate wire mesh items to be readily disassembled.
2. Welding: Weld corner joints of framing and finish sand.

B. Heavy-Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.

1. Mesh: Securely clinch mesh to framing.
2. Framing: Fabricate framing with mortise and tenon corner construction.
   a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
   b. Fabricate partition and door framing with slotted holes for connecting adjacent panels.

3. Fabricate wire mesh partitions with 3 to 4 inches of clear space between finished floor and bottom horizontal framing.
4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
5. Doors: Align bottom of door with bottom of adjacent panels.
   a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.
6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

2.06 STEEL AND IRON FINISHES

A. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

B. Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard enamel finish, suitable for use indicated, with a minimum dry film thickness of 2 mils.
   1. Color and Gloss: As selected by Architect from manufacturer's full range.

C. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-on powder-coat finish, suitable for use indicated, with a minimum dry film thickness of 2 mils.
   1. Color and Gloss: As selected by Architect from manufacturer's full range.
PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Examine floors for suitable conditions where wire mesh items will be installed.

C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 WIRE MESH PARTITIONS ERECTION

A. Anchor wire mesh partitions to floor with 3/8-inch- diameter postinstalled expansion anchors at 12 inches o.c. through anchor clips located at each post and corner. Shim anchor clips as required to achieve level and plumb installation.

1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.

B. Anchor wire mesh partitions to floor with 3/8-inch- diameter postinstalled expansion anchors at 12 inches o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.

1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.

C. Anchor wire mesh partitions to walls at 12 inches o.c. through back corner panel framing and as follows:

1. For concrete and solid masonry anchorage, use expansion anchors.

D. Secure top capping bars to top framing channels with 1/4-inch- diameter "U" bolts spaced not more than 28 inches o.c.

E. Provide line posts at locations indicated or, if not indicated, as follows:

1. For partitions that are 7 to 9 feet high, spaced at 15 to 20 feet o.c.
2. For partitions that are 10 to 12 feet high, located between every other panel.
3. For partitions that are more than 12 feet high, located between each panel.

F. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.
G. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.

H. Install doors complete with door hardware.

I. Weld or bolt sheet metal bases to doors.

J. Bolt accessories to wire mesh partition framing.

3.03 ADJUSTING AND CLEANING

A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Remove and replace defective work, including doors and framing that are warped, bowed, or otherwise unacceptable.

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

END OF SECTION 10 22 13
SECTION 10 22 39 - FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Manually operated, acoustical panel partitions, paired panel operation.

1.02 DEFINITIONS
A. NIC: Noise Isolation Class.
B. NRC: Noise Reduction Coefficient.
C. STC: Sound Transmission Class.

1.03 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: For operable panel partitions.
   1. Include plans, elevations, sections, attachment details.
   2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
C. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing.
   1. Include Samples of accessories involving color selection.
D. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:
   1. Panel Cap-Trimmed Edge Material: Not less than 3 inches long.
   2. Hardware: One of each exposed door-operating device.
   3. Marker/Projection Surface: Manufacturer’s standard-size unit, not less than 3 inches square.

1.04 INFORMATIONAL SUBMITTALS
A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Partition track, track supports and bracing, switches, turning space, and storage layout.
2. Suspended ceiling components.
3. Structural members to which suspension systems will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling including the following:
   a. Lighting fixtures.
   b. HVAC ductwork, outlets, and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Smoke detectors.
   f. Access panels.
6. Plenum and acoustical barriers.

B. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

C. Product Certificates: For each type of operable panel partition.
   1. Include approval letter signed by manufacturer acknowledging Owner-furnished panel facing material complies with requirements.

D. Product Test Reports: For each operable panel partition, for tests performed by a qualified testing agency.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
      a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
      b. Seals, hardware, track, track switches, carriers, and other operating components.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.
1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Faulty operation of operable panel partitions.
   b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUALLY OPERATED, ACOUSTICAL PANEL PARTITIONS, PAIRED PANEL OPERATION

A. Operable Acoustical Panels: Manually operated, acoustical panel partition with paired panel operation; including panels, seals, finish facing, suspension system, and accessories.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Modernfold, Inc.; Acousti-Seal® 932 with Designtex Luma 111873-589 fabric or comparable product by one of the following:
   b. CURTITION; KWIK-Wall.
   c. FolDoor.
   d. Hufcor, Inc.
   e. KWIK-WALL Company.
   f. Moderco Inc.
   g. Panelfold Inc
   h. Modernfold Inc
   i. Hufcor, Inc.
   j. KWIK-WALL Company.
   k. Moderco Inc.
   l. Panelfold Inc.

B. Performance Requirements:

1. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
a. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.

b. Noise-Reduction Requirements: Operable panel partition assembly, identical to partition tested for STC, tested for sound-absorption performance according to ASTM C 423, and rated for not less than the NRC indicated.

c. Noise-Isolation Requirements: Installed operable panel partition assembly, identical to partition tested for STC, tested for NIC according to ASTM E 336, determined by ASTM E 413, and rated for 10 dB less than STC value indicated.

2. Fire-Test-Response Characteristics: Provide panels with finishes complying with the following as determined by testing identical products by a testing and inspecting agency acceptable to authorities having jurisdiction:

a. Marker/Projection Surface Facings:
   1) Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a) Flame-Spread Index: 25 or less.
      b) Smoke-Developed Index: 450 or less.
   2) Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.

E. STC: Not less than 50.

F. NRC: Not less than 0.90.

G. Panel Weight: 8 lb/sq. ft. maximum.

H. Panel Thickness: Minimum dimension of 3 inches.

I. Panel Materials:
1. Steel Frame: Steel sheet, manufacturer's standard nominal minimum thickness for uncoated steel.
2. Steel Face/Liner Sheets: Tension-leveled steel sheet, manufacturer's standard minimum nominal thickness for uncoated steel.
3. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; ASTM B 221 for extrusions; manufacturer's standard strengths and thicknesses for type of use.
   a. Frame Reinforcement: Manufacturer's standard steel or aluminum.
4. Gypsum Board: ASTM C 1396/C 1396M.

J. Seals:

1. Description: Seals that produce operable panel partitions complying with performance requirements and the following:
   a. Manufacturer's standard seals unless otherwise indicated.
   b. Seals made from materials and in profiles that minimize sound leakage.
   c. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
2. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous, resilient acoustical seal.
3. Horizontal Top Seals: Continuous-contact, resilient seal exerting uniform constant pressure on track.
4. Horizontal Bottom Seals:
   a. Fixed: Manufacturer's standard continuous-contact seal exerting uniform constant pressure on floor.

K. Panel Closure: Manufacturer's standard unless otherwise indicated.

1. Initial Closure: Resilient, bulb-shaped acoustical seal.
2. Final Closure: Constant-force, lever-operated mechanical closure expanding from panel edge to create a constant-pressure acoustical seal.

L. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

1. Hinges: Manufacturer's standard.

M. Panel Finish Facings:
1. Description: Finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer’s written instructions.
   a. Apply one-piece, seamless facings free of air bubbles, wrinkles, blisters, and other defects, with edges tightly butted, and with no gaps or overlaps. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
   b. Where facings with directional or repeating patterns or directional weave are indicated, mark facing top and attach facing in same direction.
   c. Match facing pattern 72 inches above finished floor.

2. Fabric Wall Covering: Manufacturer’s standard fabric Designtex Luma 111873-589, from same dye lot, treated to resist stains.

3. Cap-Trimmed Edges: Protective perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing, finished as follows:
   a. Steel, Painted: Finished with manufacturer’s color as selected by Architect from manufacturer’s full range.
   b. Aluminum: Finished with manufacturer’s standard clear anodic finish.

4. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.

N. Suspension System:

1. Tracks: Steel or aluminum mounted directly to overhead structural support, designed for operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
   a. Panel Guide: Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.
   b. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.

2. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
3. Track Accessories: As required for operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified.
   a. Center carrier stop.

4. Aluminum Finish: Mill finish or manufacturer’s standard, factory-applied, decorative finish unless otherwise indicated.

5. Steel Finish: Manufacturer’s standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine flooring, floor levelness, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.

B. Install panels in numbered sequence indicated on Shop Drawings.

C. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

D. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

E. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals. Perform test and make adjustments before NIC testing.

3.03 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform tests and inspections.

   1. Noise Isolation Class (NIC) Testing:
      a. Extent: Testing agency shall randomly select one operable panel partition installation(s) for testing.
b. Methodology: Perform testing of installed operable panel partition for noise isolation according to ASTM E 336, determined by ASTM E 413, and rated for not less than NIC indicated. Adjust and fit partitions to comply with NIC test method requirements.

B. An operable panel partition installation will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.04 ADJUSTING

A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust to operate smoothly and easily, without binding or warping.

C. Verify that safety devices are properly functioning.

3.05 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include six months’ full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operable-partition operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 10 22 39
SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Corner guards.
      a. Surface-mounted, stainless-steel corner guards.

1.02 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection 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 materials out of direct sunlight.
   3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.02 CORNER GUARDS

A. Surface-Mounted, Stainless-Steel Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
   1. Material: Stainless-steel sheet, Type 430.
      a. Thickness: Minimum 0.0625 inch (16 ga.).
      b. Finish: Directional satin, No. 4.
   2. Wing Size: Nominal 2-1/2 by 2-1/2 inches.
   4. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.
2.03 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Quality: Fabricate components with uniformly tight seams and joints and 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.

2.04 FINISHES

A. Protect 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.

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Examine walls to which wall and door 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 wall and door protection attached with adhesive, 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.

3.02 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.
3.03 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, 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.

B. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.
2. 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 apart.
3. Adjust end and top caps as required to ensure tight seams.

3.04 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 LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
   a. Toilet tissue (roll) dispenser, surface mounted.
   b. Waste receptacle.
   c. Combination towel (roll) dispenser/large waste receptacle, semirecessed mounted.
   d. Liquid-soap dispenser, horizontally oriented, surface mounted.
   e. Grab bar with concealed fastener mounting flanges.
   f. Sanitary napkin vendor, semirecessed.
   g. Sanitary-napkin disposal unit.
   h. Seat-cover dispenser.
   i. Mirror unit.

2. Public-use shower room accessories.
   a. Shower curtain rod.
   b. Shower curtain.
   c. Folding shower seat.
   d. Soap dish.
   e. Robe hook.
   f. Grab bar with concealed fastener mounting flanges.

3. Warm-air dryers.
   a. High-speed warm-air dryer.

4. Childcare accessories.

5. Underlavatory guards.
   a. Pliable plastic guard.

6. Custodial accessories.
   a. Utility shelf.
   b. Mop and broom holder.
   c. Paper towel (roll) dispenser.
   d. Liquid soap dispenser.
1.02 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

B. Samples: Full size, for each exposed product and for each finish specified.
   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.
   2. Identify accessories using designations indicated.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.05 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: 15 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue (Roll) Dispenser, Surface Mounted (TA-01):

2. Description: Double-roll dispenser.
5. Capacity: Designed for 10-inch- diameter tissue rolls.

B. Combination Towel (Roll) Dispenser/Large Waste Receptacle, Semirecessed Mounted (TA-02):

2. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle.
5. Minimum Waste Receptacle Capacity: 12 gal., 45.5 L.
7. Lockset: Tumbler type for towel dispenser compartment and waste receptacle.

C. Combination Towel (Roll) Dispenser/Large Waste Receptacle, Surface Mounted (TA-20):

2. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle.
5. Minimum Waste Receptacle Capacity: 12 gal., 45.5 L.
7. Lockset: Tumbler type for towel dispenser compartment and waste receptacle.

D. Automatic Liquid-Soap Dispenser (TA-03):

1. Basis-of-Design Product: Rubbermaid Commercial Products; Oneshot Lotion Dispenser Low Profile, Polished Chrome (SKU - FG402241).
2. Description: Automatic dispenser with infrared sensor to detect presence of hands; battery powered; designed for dispensing antibacterial soap in liquid or lotion form.
7. Low Battery Indicator: LED indicator.
8. Include plastic refill lotion container.

E. Grab Bar with Concealed Fastener Mounting Flanges (TA-04):
   3. Material: Stainless steel, 0.05 inch thick.
   a. Finish: Smooth, No. 4 finish (satin).
   5. Configuration and Length: As indicated on Drawings.

F. Sanitary Napkin Vendor, Semirecessed (TA-05):
   3. Capacity: 100 Tokens.
   5. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).

G. Sanitary-Napkin Disposal Unit (TA-06):
   3. Door or Cover: Self-closing, disposal-opening cover.
   5. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Seat-Cover Dispenser (TA-09):
   5. Lockset: Tumbler type.

I. Mirror Unit (TA-07):
2. Frame: Stainless-steel channel.
   a. Corners: Manufacturer's standard.
   a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
   b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size:
   a. Width: 24 inches.
   b. Height: 36 inches.

2.02 PUBLIC-USE SHOWER ROOM ACCESSORIES

A. Shower Curtain Rod (TA-16):
   2. Description: 1-1/4-inch OD; fabricated from nominal 0.05-inch- thick stainless steel.
   4. Finish: Stainless steel, No. 4 finish (satin).

B. Shower Curtain (TA-16):
   2. Size: Minimum 6 inches wider than opening by 72 inches high.
   3. Material: Vinyl, minimum 0.006 inch thick, opaque, matte.
   5. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
   6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

C. Folding Shower Seat (TA-08):
   2. Configuration: L-shaped seat, designed for wheelchair access.
3. **Seat**: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.

4. **Mounting Mechanism**: Stainless steel, No. 4 finish (satin).

5. **Dimensions**:
   a. Width: 33 inches.
   b. Depth: 20-15/16 inches.
   c. Height: 13-7/8 inches.

D. **Soap Dish (TA-12)**:
   1. **Basis-of-Design Product**: Bobrick Washroom Equipment, Inc.; Recessed Heavy-Duty Soap Dish (B-4380).
   2. **Description**: Without washcloth bar.
   3. **Mounting**: Recessed.
   4. **Material and Finish**: Stainless steel, No. 4 finish (satin).

E. **Robe Hook (TA-17)**:
   1. **Basis-of-Design Product**: Bobrick Washroom Equipment, Inc.; Heavy-Duty Clothes Hook with Concealed Mounting (B-2116).
   2. **Description**: Single-prong unit.
   3. **Material and Finish**: Stainless steel, No. 4 finish (satin).

F. **Grab Bar with Concealed Fastener Mounting Flanges (TA-10)**:
   1. **Basis-of-Design Product**: Bobrick Washroom Equipment, Inc.; 1-1/4 inches (32mm) Diameter Stainless Steel Grab Bars with Snap Flange (B-5806 Series).
   2. **Mounting**: Flanges with concealed fasteners.
   3. **Material**: Stainless steel, 0.05 inch thick.
      a. **Finish**: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
   4. **Outside Diameter**: 1-1/4 inches.
   5. **Configuration and Length**: As indicated on Drawings.

2.03 **WARM-AIR DRYERS**

A. **High-Speed Warm-Air Dryer (TA-11)**:
   1. **Basis-of-Design Product**: Xlerator Hand Dryer; XL-SB.
   2. **Description**: High-speed, warm-air hand dryer for rapid hand drying.
   3. **Mounting**: Surface mounted.
   4. **Operation**: Electronic-sensor activated with operation time of 10 to 20 seconds.
   5. **Cover Material and Finish**: Stainless steel, No. 4 finish (satin).
   6. **Electrical Requirements**: 110-120 V, 4.3-4.5 A, 1240-1450W.
2.04 CHILD CARE ACCESSORIES

A. Diaper-Changing Station, Surface Mounted (TA-19):
   1. Basis-of-Design Product: Koala Kare Products; KB200-SS Horizontal Wall Mounted Baby Changing Station with Stainless Steel Veneer.
   2. Description: Vertical unit that opens by folding down from stored position and with child-protection strap.
      a. Engineered to support minimum of 250-lb static load when opened.
   3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
   5. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer’s standard color.

2.05 CUSTODIAL ACCESSORIES

A. Utility Shelf with Mop and Broom Holder (TA-18):
   2. Description: With exposed edges turned down not less than 1/2 inch and supported by brackets welded to shelf underside.
   3. Size: 34 inches long by 13 inches deep.
   4. Material and Finish: Not less than nominal 0.05-inch- thick stainless steel, No. 4 finish (satin).

B. Paper Towel (Roll) Dispenser (TA-13):
   2. Description: Lever-actuated mechanism permits controlled delivery of paper rolls in preset lengths per stroke.

C. Liquid-Soap Dispenser (TA-22):
   2. Description: Designed for dispensing soap in lather form.
   4. Capacity: 1,000 mL.
7. Refill Indicator: Window type.

2.06 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.


F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.07 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.01 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 ASTM F 446.
3.02 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer’s written instructions.

END OF SECTION 10 28 00
SECTION 10 41 16.13 - FIRE DEPARTMENT KEYED ACCESS CONTROL SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY
   A. Section includes:
      1. Fire Department key storage box ("knox box").

1.02 COORDINATION
   A. Key Storage Box: Coordinate locations with Owner and local Fire Department.

1.03 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.

1.04 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For fire department keyed access control specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.01 FIRE DEPARTMENT KEY STORAGE BOX
   A. General: Heavy-duty, UL Rated, high-security, factory finished metal box designed to store building keys for Fire Department access.

      1. Lock: Commerce City fire Department registered UL listed Medeco lock cylinder.
      2. Door Type: Side hinged.
      3. Mounting: Surface or recessed mounted as directed by Owner and as suitable for mounting substrate encountered. (Note: Attachment to Fire Prevention Bureau Requirement No. 75, dated August 1, 2002 requires recessed only mounted boxes, obtain approval for surface mounted boxes.)
      4. Dimensions:
         a. Outside Box: Approximately 5 inches wide by 4 inches high by 3 inches deep.
         b. Mounting Flange for Recessed Box: Approximately 7 inches by 7 inches.
5. Color. As selected by Owner from manufacturer's standard factory finished colors.
   a. For box color other than red (e.g. black, silver) identify with the word "FIRE."
      1) Location: Applied to box door.
      2) Application Process: Silk-screened, decals, or pressure-sensitive vinyl letters.
      3) Lettering Color: Reflective red.
      4) Lettering Height: Minimum 3/4 inch.
      5) Lettering Style: Sans serif, Arial or similar, all caps.
      6) Orientation: Horizontal.


   B. Fasteners for Surface Mounting: Grade 8 zinc plated steel carriage bolt not less than 5/16 inch diameter and length as required to allow 2 full threads showing after nuts are securely threaded and tightened. Include zinc plated washers and nuts.

   C. Recessed Mounting Kit: Steel box assembly with integral box mounting bolts and concrete or masonry anchors, designed to recess storage box. Provide only kits supplied by manufacturer of storage box.

PART 3 - EXECUTION

3.01 EXAMINATION

   A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance.

      1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to installation and performance of products.

   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FIRE DEPARTMENT KEY STORAGE BOX

   A. Mount at main entry door of each building; verify location with Owner and local Fire Department.

   B. Mounting Height and Proximity: Bottom of key storage box shall be located not less than 36 inches and not more than 60 inches above adjacent floor or walking surface. Mount within 10 horizontal feet of entry door.
C. Surface Mounting: Fasten key box to surface of wall with not less than 5 carriage bolts through solid blocking located in wall. Locate head of carriage bolt on interior side of building with head bearing on solid metal material. Locate threaded end of bolt and nut on interior side of key box.

D. Recessed Mounting: Incorporate recessed mounting kit into masonry or concrete wall during wall construction. Install key box in recessed mount after walls are substantially completed and cleaned.

E. Apply elastomeric sealant to top and side joints between key box and mounting substrate in accordance with requirements of Section 07 92 00 "Joint Sealants." Leave 3/8 inch long open gap in bottom joint for drainage.

3.03 ADJUSTING AND CLEANING

A. Confirm that locks and box doors engage accurately and securely without forcing or binding.

B. After completing installation of exposed, factory-finished keyed access control specialties, inspect exposed finishes and repair damaged finishes.

END OF SECTION 10 41 16.13
SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fire-Protection Cabinet - FPC-1: Non-security type for portable fire extinguishers; semirecessed.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Samples for Initial Selection: For each type of exposed finish required.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.

F. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.03 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.04 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of following components indicated are accommodated:

1. Fire extinguishers.

B. Coordinate sizes and locations of following with wall depths:
1. Semirecessed fire-protection cabinets.

PART 2 - PRODUCTS

2.01 FIRE-PROTECTION CABINET - FPC-1

A. Cabinet: Non-security type, suitable for the following:
   1. Fire extinguisher.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. JL Industries, Inc.; a division of the Activar Construction Products Group.
   2. Larsens Manufacturing Company.
   3. Potter Roemer LLC.

C. Cabinet Construction: Nonrated.

D. Cabinet Material:
   1. Aluminum sheet:
      a. Finish: Baked enamel or powder coat.
      b. Color: As selected by Architect from full range of industry colors and color densities.

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
   1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

F. Cabinet Trim Material:
   1. Same material and finish as door.

G. Door Style:
   1. Fully glazed panel, frameless.

H. Accessories:
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
3. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.

4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
   a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
      1) Location: Applied to cabinet glazing.
      2) Application Process: Decals.
      3) Lettering Color: White.
      4) Orientation: Vertical.

I. Materials:
   1. Aluminum Sheet: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5; in finish(es) specified.

2.02 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.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.03 GENERAL FINISH REQUIREMENTS


B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where the following will be installed:
   1. Semirecessed fire-protection cabinets.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare recesses for the following as required by type and size of cabinet and trim style:
   1. Semirecessed fire-protection cabinets.

3.03 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated.
   1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

3.04 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer’s written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13
SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:
   1. Portable, hand-carried fire extinguishers.
   2. Mounting brackets for fire extinguishers.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of the following product(s). Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes.
   1. Portable, hand-carried fire extinguishers.
   2. Mounting brackets for fire extinguishers.

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.

1.03 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.05 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.06 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

2.01 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Amerex Corporation.
   b. Ansul Incorporated.
   c. Badger Fire Protection.
   d. Buckeye Fire Equipment Company.
   e. Fire End & Croker Corporation.
   f. Guardian Fire Equipment, Inc.
   g. JL Industries, Inc.; a division of the Activar Construction Products Group.
   h. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
   i. Larsens Manufacturing Company.
   j. Moon American.
   k. Nystrom Building Products.
   l. Pem All Fire Extinguisher Corp.
   m. Potter Roemer LLC.
   n. Pyro-Chem; Tyco Safety Products.
   o. Strike First Corporation of America.

2. Valves: Manufacturer’s standard.
3. Handles and Levers: Manufacturer’s standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Pressurized, AFFF-Foam Type: UL-rated 2-A:10-B, 1.6-gal. nominal capacity, with AFFF foam in stainless-steel container; with pressure-indicating gage.

C. Multipurpose Dry-Chemical Type: UL-rated of nominal capacity and container type indicated below, filled with monoammonium phosphate-based dry chemical. Either of following:
1. Manufacturer's Standard Enameled-Metal Container: UL-rated 1-A:10-B:C, 2.5-lb nominal capacity.
5. Manufacturer's Standard Enameled-Metal Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity.
7. Enameled-Steel Container: UL-rated 1-A:10-B:C, 2.5-lb nominal capacity.

2.02 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Amerex Corporation.
   b. Ansul Incorporated.
   c. Badger Fire Protection.
   d. Buckeye Fire Equipment Company.
   e. Fire End & Croker Corporation.
   f. Guardian Fire Equipment, Inc.
   g. JL Industries, Inc.; a division of the Activar Construction Products Group.
   h. Larsens Manufacturing Company.
   i. Nystrom Building Products.
B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Contracting Officer.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.


PART 3 - EXECUTION

3.01 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.

3.02 INSTALLATION

A. Fire Extinguishers: Install in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. Mounting Brackets: Fasten to surfaces, square and plumb, at locations indicated, at following heights:

   1. Fire extinguishers weighing 40 lb or less: 54 inches above finished floor to top of fire extinguisher.
   2. Fire extinguishers weighing more than 40 lb: 36 inches above finished floor to top of fire extinguisher.

END OF SECTION 10 44 16
SECTION 10 51 13 - METAL LOCKERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   2. Locker benches.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of metal locker.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: For metal lockers.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Show locker trim and accessories.
   3. Include locker identification system and numbering sequence.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

D. Samples for Verification: For the following products, in manufacturer's standard size:
   1. Lockers and equipment.
   2. Locker benches.

1.03 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.05 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. Full-size units of the following metal locker hardware items equal to 5 percent of amount installed for each type and finish installed, but no fewer than five units:
   a. Identification plates.
   b. Hooks.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

B. Master and Control Keys:
   1. Lockers: Deliver to Owner by registered mail or overnight package service.

C. Combination Control Charts:
   1. Locker Combination Padlocks Deliver to Owner by registered mail or overnight package service.
   2. Locker Built-in Combination Locks Deliver to Owner by registered mail or overnight package service.

1.07 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.08 COORDINATION

A. 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.

1.09 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures.
   b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.

3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 MANUFACTURERS
   A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.

2.02 PERFORMANCE REQUIREMENTS
   A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.03 KNOCKED-DOWN CORRIDOR LOCKERS
   A. Doors: One piece; fabricated from 0.060-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
      1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches 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: Vented panel as follows:
         a. Louvered Vents: No fewer than three louver openings at top and bottom for double-tier lockers.
   B. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
      1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch nominal thickness, with single bend at sides.
      2. Backs and Sides: 0.024-inch nominal thickness, with full-height, double-flanged connections.
      3. Shelves: 0.024-inch nominal thickness, with double bend at front and single bend at sides and back. See Drawings for shelf locations.
   C. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
   D. 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. **Hinges:** Manufacturer's standard, steel, continuous or knuckle type.

E. **Recessed Door Handle and Latch:** Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. **Multipoint Latching:** Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.
   
   a. **Latch Hooks:** Equip doors 48 inches and higher with three latch hooks and 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.
   
   b. **Latching Mechanism:** Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

F. **Locks:** Combination padlocks.

G. **Identification Plates:** Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

H. **Hooks:** Manufacturer's standard ball-pointed type hooks, aluminum or steel; zinc plated.

I. **Coat Rods:** Manufacturer's standard.

J. **Continuous Zee Base:** Fabricated from manufacturer's standard thickness, but not less than 0.060-inch nominal-thickness steel sheet.

   1. **Height:** 4 inches.

K. **Continuous Sloping Tops:** Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.

   1. **Closures:** Vertical -end type.
   2. Sloping-top corner fillers, mitered.

L. **Recess Trim:** Fabricated from 0.048-inch nominal-thickness steel sheet.

M. **Filler Panels:** Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.

N. **Boxed End Panels:** Fabricated from 0.060-inch nominal-thickness steel sheet.

O. **Materials:**
1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A40 zinc-iron, alloy (galvannealed) coating designation.

P. Finish: Baked enamel or powder coat.

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

2.04 LOCKER BENCHES

A. Provide bench units with overall assembly height of 17-1/2 inches.

B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.

2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

C. Freestanding Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top, complete with fasteners, and as follows:

1. Aluminum: 1/8-inch-thick by 3-inch-wide channel or 1/4-inch-thick by 3-inch-wide bar stock, shaped into trapezoidal or inverted-T form; with nonskid pads at bottom.
   a. Finish: Clear anodic finish.

2. Stainless Steel: 1/8-inch-thick by 3-inch-wide channel or 1/4-inch-thick by 3-inch-wide bar stock, shaped into trapezoidal form; with nonskid pads at bottom.
   a. Finish: No. 4B.

D. Materials:

1. Stainless Steel: ASTM A 666, Type 304.
2. Composite Wood Products: Products shall be made without urea formaldehyde.

2.05 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:
   1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.

D. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site or preassembly at plant prior to shipping.

E. 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.

F. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.

G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
   1. Sloping-top corner fillers, mitered.

H. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

I. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

J. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

K. Boxed End Panels: Fabricated with 1-inch wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
   1. Provide one-piece panels for double-row (back-to-back) locker ends.

L. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
   1. Provide one-piece panels for double-row (back-to-back) locker ends.
PART 2 - ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.
   1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
   2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.01 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.

3.02 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
   1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches 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.
   3. Anchor back-to-back metal lockers to floor.

B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment:
   1. Attach hooks with at least two fasteners.
   2. Attach door locks on doors using security-type fasteners.
   3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
b. Attach plates to upper shelf of each open-front metal locker, centered, with at least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

E. Freestanding Locker Benches: Place benches in locations indicated on Drawings.

3.03 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.04 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13
SECTION 10 56 00 - STORAGE EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:

1. 1090 Rack, tool, wall mounted (Ref. Part 2.01)
2. 1098 Board, peg, tool (Ref. Part 2.02)
3. 1099 Board, peg, tool, wall mounted (Ref. Part 2.03)
4. 1381 Platform, work, stationary (Ref. Part 2.04)
5. 1458 Rack, bulk storage, eight foot (Ref. Part 2.05)
6. 1536 Rack, pallet, ten foot, two tier (Ref. Part 2.06)
7. 1537 Rack, pallet, twelve foot, two tier (Ref. Part 2.07)
8. 1632 Carousel, storage, tire, 44 inch (Ref. Part 2.08)
9. 1688 Shelving unit, eight shelf (Ref. Part 2.09)
10. 1950 Cabinet, flammable materials, large (Ref. Part 2.10)

B. Installation of equipment with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Utilities to be roughed in at location recommended by manufacturer.

1.02 QUALITY ASSURANCE

A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years’ experience supplying specified equipment.

1.03 SUBMITTALS

A. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

2. Restrict submitted material to pertinent data. For instance, do not include manufacturer’s complete catalog when pertinent information is contained on a single page.
3. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, shall be at the expense of the contractor.

B. Operations and Maintenance Manual:

1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
3. Description of system and components.
4. Schematic diagrams of electrical, plumbing, and compressed air system.
5. Manufacturer’s printed operating instructions.
6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

1.04 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.05 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer’s recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
E. All parts shall be readily available locally in the United States.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

PART 2 - PRODUCTS

2.01 RACK, TOOL, WALL MOUNTED

Equipment Identifier: 1090

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

   a. Monkey Bar Storage
   b. Rexburg, ID (888) 984-4872
   c. Model No.: 09023-U with brackets

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Rubbermaid, Winchester, VA (540) 667-8700
   b. ---

B. Capacities/Dimensions:

1. Overall dimensions:

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<thead>
<tr>
<th>Dimensions (inches)</th>
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<tbody>
<tr>
<td>Length</td>
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<tr>
<td>---------</td>
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<tr>
<td>Equipment</td>
</tr>
</tbody>
</table>
2. Load capacity: 40 to 60 pounds per hook
3. 51 inch bar load capacity: 200 pounds
4. Number of Double hooks (per bar): Five

C. Features/Performance/Construction:
1. Mounting brackets shall be made of 3/32 inches thick steel.
2. Two mounting brackets shall be spaced at 48 inches on center.
3. Hook hanger bar shall be constructed of 1 by 1 inch tube.
4. Double hooks shall be made from 3/16 inch thick solid rod.
5. Use manufacturer supplied wall anchors when mounting to wooden studs, otherwise, contractor shall provide appropriate anchors for mounting conditions.

D. Accessories:

| 1. Skinny hook: 5 inch Monkey No. 09033-U |

E. Finish: All parts shall be powder coated for protection. Hooks shall be rubber coated to increase grip.

2.02 BOARD, PEG, TOOL, WALL MOUNTED
Equipment Identifier: 1098

A. Manufacturer’s Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

| a. Kennedy Manufacturing Company |
| b. Van Wert, OH (419) 238-2442 |
| c. Model No.: 50004UGY |

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
a. Modern Metal Products, Owatonna, MN (507) 451-7714
b. Triton Products, Solon, OH (440) 248-5480

B. Capacities/Dimensions:
1. Overall dimensions, nominal:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>72</td>
<td>1/2</td>
<td>36</td>
</tr>
</tbody>
</table>

C. Features/Performance/Construction:
1. The panels shall be steel reinforced with square hole perforations. Flanged panels shall be reinforced to support heavy loads.

2. Panels shall be capable of being attached to any surface that can support the weight of heavy tools (fasteners not included).

3. Panels shall be manufactured of chip resistant material that will withstand abuse over time.

4. Individual panels shall be 18 by 36 inches and be assembled so that the complete length of the four-panel system shall be 72 inches.

5. Hooks, clips, and accessories shall be heavy-duty steel and capable of locking onto the panel.

6. The tool board system shall include the following (60 piece set) items:
   a. Single hooks, 33 each
   b. Double hooks, nine each
   c. Pliers hooks, four each
   d. Spring clips, 10 each
   e. Screwdriver unit, one each
   f. Wrench rack, one each
   g. Hex key unit, one each

D. Finish: Gray, durable chip-resistant baked on finish
2.03 BOARD, PEG, TOOL, WALL MOUNTED
设备标识符: 1099

A. 制造商的参考:

1. 主制造商: 规格基于在此标识的制造商名称和型号来确定最低可接受的质量、特点、性能和构造。

   a. Kennedy Manufacturing Company
   b. Van Wert, OH (419) 238-2442
   c. 模型号: 50004UGY

2. 替代制造商: 遵循这些规格和文件要求的情况下, 可以考虑由其他制造商生产的设备, 包括以下制造商, 可认为是等同的。

   a. Modern Metal Products, Owatonna, MN (507) 451-7714
   b. Triton Products, Solon, OH (440) 248-5480

B. 容量/尺寸:

1. 总体尺寸, 标称:

<table>
<thead>
<tr>
<th>尺寸 (英寸)</th>
<th>长度</th>
<th>宽度</th>
<th>高度</th>
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<tbody>
<tr>
<td>设备</td>
<td>36</td>
<td>1/2</td>
<td>72</td>
</tr>
</tbody>
</table>

C. 特性/性能/构造:

1. 板条应为钢制并带有方形孔。固定边板应加强以支撑重型负载。

2. 板条应能附着于任何能支持重型工具的表面 (紧固件不包括在内)。

3. 板条应为一种耐磨材料, 能承受长期的滥用。

4. 单个板条应为18 by 36英寸，并且应单独装配成全长为72英寸的四板系统。

5. 挂钩、夹子和附件应为重型钢制且能够固定在面板上。
6. The tool board system shall include 60 single hooks. Kennedy manufacturing company part No. 99823.

D. Finish: Gray, durable chip-resistant baked on finish

2.04 PLATFORM, WORK, STATIONARY
Equipment Identifier: 1381

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

   a. Ultra Fiberglass Systems
   b. Milwaukee, WI (414) 461-5051
   c. Model No.: Washbay Platform with handrail

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   b. Unarco, Lewisville, TX (800) 243-4622

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>684</td>
<td>36</td>
<td>114</td>
</tr>
</tbody>
</table>

2. Decking load capacity: 100 pounds per square foot
3. Stair width: 36 inches
4. Rail height: 42 inches
5. Platform height: 114 inches
6. Platform length: Reference equipment layout drawings

C. Features/Performance/Construction:
1. Decking:
   b. Legs and grating supports: 4 by 1/4 inch wide flange beam dark gray (ISO-FR).
   d. Grating (supplied by Ultra) 1-1/2 by 1-1/2 inch by 1-1/2 inch green grit top molded grating
   e. Mechanical fasteners: 18-8 stainless steel bolts.
   f. Decking shall be an open grating material (1-1/2 by 1-1/2 inch square openings) mounted on a structure capable of supporting 100 per square foot.

2. Stairs:
   c. Treads (supplied by Ultra): 1-1/2 inch thick.
   d. Mechanical fasteners: 18-8 stainless steel bolts.
   e. Stairs shall include closed risers and hand rails constructed of steel. Stair width shall be 36 inches wide, self-supporting and mounted to the floor and adjacent wall with standard anchoring hardware.

3. Railing:
   c. M-shaped toe plate: 4 inch, safety yellow
   d. Mechanical fasteners: 3/16 inch diameter 316 stainless steel rivets

4. Work platform:
   a. Work platform shall be constructed of fiber reinforced polymer composite (FRP) and in two portions and manufactured to have a deck height of 10 feet.
b. Work platform shall have a guardrail located around three sides with opening for the stair landing at one edge.

c. Posts for the work platform shall be 2 inch by 1/8 inch square tube safety yellow (ISO-FR) for top and mid rail.


e. M-shaped toe plate: 4 inch, safety yellow.

f. Mechanical fasteners: 3/16 inch diameter 316 stainless steel rivets.

g. Work platform shall fasten to wall using 1/2 inch diameter 316 stainless steel, 4 inch long epoxy concrete anchors.

5. Legs:

a. Anchors: 1/2 inch diameter 316 stainless steel, 4 to 5 inch long epoxy concrete anchors.

b. Leg material: 4 by 4 by 1/4 inch fiberglass wide flange beam.

c. Angle clips shall be provided by the manufacture at the bottom of each leg if floor is sloped. If there is a large slope to floor the manufacture will size legs longer to allow room to trim on site.

D. Accessories:

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<tr>
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<tbody>
<tr>
<td>1</td>
<td>Floor anchors: 1/2 inch diameter 316 stainless steel, 5 inch long epoxy concrete anchors</td>
</tr>
<tr>
<td>2</td>
<td>Wall anchors: 1/2 inch diameter 316 stainless steel, 4 inch long epoxy concrete anchors</td>
</tr>
</tbody>
</table>

2.05 RACK, BULK STORAGE, EIGHT FOOT

Equipment Identifier: 1458

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.
a. Equiplo  
b. Tatamy, PA (610) 253-2775  
c. Model No.: 1028 D82S starter and 1028 D82A add-on with accessories

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Lyon Workspace Products, Aurora, IL (630) 892-8941  
b. Republic Storage System, Canton, OH (216) 438-5800

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>96</td>
<td>24</td>
<td>96</td>
</tr>
</tbody>
</table>

2. Unit Weight: 420 pounds

3. Beams:
   a. Capacity: 2,630 pounds per pair of beams
   b. Dimensions:
      1) Length: 96 inches
      2) Width: 3-5/8 inches
      3) Depth: 2 inches overall front to back
   c. Number of beams per rack section: Eight total (four pairs)

4. Uprights:
   a. Capacity: 1,550 pounds per section
   b. Dimensions:
      1) Width: 1-3/4 inches
2) Depth, nominal: 24 inches

3) Height: 96 inches

c. Number of uprights per rack section: Two minimum

C. Features/Performance/Construction:

1. Beams:
   a. Construction: Beams shall be solid shaped welded heavy gauge steel with heavy beam clips MIG-welded to beam ends.
   b. Attachment: Beam clips shall have three beam hooks each for insertion into upright slots.
   c. Supports: Tie bars for each pair of beams shall fit into slots in beams. There shall be a minimum of two supports provided for each pair of beams.

2. Uprights:
   a. Construction: Upright posts shall be heavy duty 1-3/4 by 1-13/16 inch welded 14 gauge steel with tubular steel cross and diagonal members.
   b. Adjustment: Upright posts shall have tapered slots on 1-1/2 inch centers for vertical beam adjustment.
   c. Row ends: An extra upright frame shall be provided at end of each row to complete frame.

3. Decking:
   a. Construction: Decking shall be 20 gauge rib shaped.
   b. Capacity: Decking shall have a capacity of 2,778 pounds but load is limited to support capacity of beams and uprights.

4. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Accessories:

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anchor (left ends): Equipto No. 190319A</td>
</tr>
<tr>
<td>2.</td>
<td>Anchor (right ends): Equipto No. 190320A</td>
</tr>
<tr>
<td>3.</td>
<td>Anchor (center): Equipto No. 190317A</td>
</tr>
</tbody>
</table>
E. Finish: Durable enamel in Owner’s choice of manufacturer’s standard colors

2.06 RACK, PALLET, TEN FOOT, TWO TIER
Equipment Identifier: 1536

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.

   a. Lyon Workspace Products
   b. Aurora, IL (630) 892-8941
   c. Model No.: Uprights 36M120, Beams S120, Decking WD5836H with accessories

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Interlake Mecalux, Melrose Park, IL (877) 632-2589
   b. Lista International, Holliston, MA (508) 429-1350

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
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<tr>
<th>Dimensions (inches)</th>
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<tbody>
<tr>
<td>Length</td>
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</tr>
<tr>
<td>a. Equipment</td>
</tr>
</tbody>
</table>

2. Beams (Lyon No. S120)(six per rack):

   a. Capacity: 8,920 pounds per pair of beams

   b. Beam dimensions:

      1) Length: 120 inches
      2) Width: 6 inches with an integrated 1-5/8 inch step for decking
      3) Thickness: 2-3/4 inches
c. Installed beam height from finished floor:
   1) Top beams: 120 inches
   2) Second beams: 60 inches
   3) Verify beam heights with Owner prior to installation

3. Uprights (Lyon No. 36M120)(two per rack):
   a. Capacity: 20,600 to 29,800 pounds per pair of uprights (based on evenly distributed load)
   b. Upright dimensions:
      1) Thickness: 3 inches
      2) Depth: 36 inches
      3) Height: 120 inches

4. Decking (Lyon No. WD5836H) (four per rack):
   a. Capacity: 2,500 pounds
   b. Decking dimensions:
      1) Width: 58 inches
      2) Depth: 36 inches

C. Features/Performance/Construction:

1. Beams:
   a. Construction: Beams shall be welded, step-type, heavy gauge steel box channel.
   b. Attachment: High tensile studs, three each on each end shall engage tapered keyhole slots in uprights. Integral safety catch automatically snaps and locks into place when beam is properly seated.

2. Uprights:
   a. Construction: Continuously MIG welded, heavy gauge steel box section uprights shall have deep channel cross and diagonal K-brace members.
   b. Adjustment: Tapered keyhole slots on 2 inch centers shall be provided for vertical beam adjustments.
c. Base plate: Heavy gauge steel shall be LAP welded to upright with holes for anchoring to floor.

d. Row ends: An extra upright frame shall be provided to finish each row as indicated on equipment drawings.

3. Decking: Heavy duty waterfall decking shall have 2-1/2 inches by 4 inches six gauge wire mesh with 14 gauge steel channels.

4. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Accessories:

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<table>
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<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Upright anchors: Lyon No. 25163</td>
</tr>
</tbody>
</table>

E. Finish: Durable enamel in Owner’s choice of manufacturer’s standard colors

2.07 RACK, PALLET, TWELVE FOOT, TWO TIER

Equipment Identifier: 1537

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>a.</td>
<td>Lyon Workspace Products</td>
</tr>
<tr>
<td>b.</td>
<td>Montgomery, IL (630) 892-8941</td>
</tr>
<tr>
<td>c.</td>
<td>Model No.: Uprights 48M120, beams SOS144, decking FFWD4648H</td>
</tr>
</tbody>
</table>

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>Unarco Materials Handling, Lewisville, TX (972) 436-5581</td>
</tr>
<tr>
<td>b.</td>
<td>Lista, Holliston, MA (508) 429-1350</td>
</tr>
</tbody>
</table>

B. Capacities/Dimensions:

1. Overall Dimensions:
2. Uprights:
   a. Capacity: Minimum 20,600 pounds per pair of uprights at 96 inch spacing
   b. Thickness: 3 inches wide by 3 inches deep

3. Beams:
   a. Minimum capacity: 9,370 pounds per pair of beams
   b. Dimensions:
      1) Length: 144 inches
      2) Thickness: 4-3/10 inches
   c. Installed beam height from finished floor:
      1) Top beams: 96 inches
      2) Remaining beam level: 48 inch spacing
      3) Verify beam heights with Owner prior to installation

4. Decking:
   a. Width: 48 inches
   b. Depth: 48 inches
   c. Number of channels: Three
   d. Capacity: 3,000 pounds
   e. Panels per shelf: Two

C. Features/Performance/Construction:

1. Beams:
   a. Construction: Beams shall be welded, step-type, .075 gauge steel box channel.
b. Attachment: High tensile studs, four each on each end shall engage tapered keyhole slots in uprights. Integral safety catch automatically snaps and locks into place when beam is properly seated.

2. Uprights:
   a. Construction: Continuously MIG welded, heavy gauge steel box section uprights shall have deep channel cross and diagonal K-brace members.
   b. Adjustment: Tapered keyhole slots on 2 inch centers shall be provided for vertical beam adjustments.
   c. Base plate: Heavy gauge steel shall be LAP welded to upright with holes for anchoring to floor.
   d. Row ends: An extra upright frame shall be provided to finish each row as indicated on equipment drawings.

3. Decking:
   a. Wire mesh: Continuously MIG welded, 2-1/2 by 4 inches by 6 gauge
   b. Support channels: 13 gauge steel

4. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Finish: Durable enamel in Owner’s choice of manufacturer’s standard colors

2.08 CAROUSEL, STORAGE, TIRE, 44 INCH
Equipment Identifier: 1632

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

| a. Vidir Vertical Storage Systems
| b. Lebanon, PA (717) 270-1000
| Model No.: HT54162-0563-12 OR HT54193-0663-12 OR
| c. HT54225-0763-12 OR HT54256-0863-12 OR HT54288-0963-12 OR HT54319-1063-12

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS,
equipment produced by other manufacturers, including the following, may be considered as equal.

B. Capacities/Dimensions:

1. Overall dimensions, nominal:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
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<tbody>
<tr>
<td>a. Equipment</td>
<td>143</td>
<td>112</td>
<td>337</td>
</tr>
</tbody>
</table>

2. Lift drive motor: Dual 2.0 HP motor/gearbox drive system

3. Carrier quantity: Eight

4. Carrier width: 11 feet, 11 inches

5. Maximum tire size: 44 inch diameter

6. Minimum tire quantity: 104 (based upon 11 inch tire)

7. Maximum overall weight capacity: 13,000 pounds

8. Maximum tire carrier weight capacity: 1,000 pounds

9. Off-balance Load lift capacity: 1,950 pounds

10. Lifting speed: 26-1/2 feet per minute

C. Features/Performance/Construction:

1. The unit shall have a tire restrictor bar to prevent larger tires than recommended to be loaded.

2. Manufacturer shall provide two tire ends per carrier to secure partial loads.

3. Front and rear shall be of 2 inch wire mesh.

4. Side panels shall be fully shielded.

5. Provide seismic bracing and anchoring to meet any local, state, and national codes and provisions.

D. Controls: single speed forward/reverse, security keypad

E. Accessories:
1. Seismic bracing: Vidir No. 301-1003

F. Utility Requirements:

1. Electrical:

<table>
<thead>
<tr>
<th>Connection Requirements</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>460</td>
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<tr>
<td>Phase</td>
<td>3</td>
</tr>
<tr>
<td>HP</td>
<td>4</td>
</tr>
<tr>
<td>Amps</td>
<td>15</td>
</tr>
</tbody>
</table>

b. Connection Type: Provide disconnect

G. Finish: Durable enamel in owner’s choice of manufacturer’s standard colors

2.09 SHELVING UNIT, EIGHT SHELF
Equipment Identifier: 1688

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

   a. Equipto
   b. Tatamy, PA (610) 253-2775
   c. Model No.: 773-8S starter with 773-8A add on with accessories

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Lyon Workspace Products, Montgomery, IL (630) 892-8941
   b. Burroughs Corporation, Kalamazoo, MI (800) 748-0227

B. Capacities/Dimensions:

1. Overall dimensions, nominal:
<table>
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<tr>
<th>Dimensions (inches)</th>
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<tr>
<td>Length</td>
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<tr>
<td>a. Equipment</td>
</tr>
</tbody>
</table>

2. Number of shelves: Eight
3. Shelf capacity: 1170 pounds per shelf
4. Installed height from finished floor, nominal:
   a. Bottom shelf: 4-1/2 inches
   b. Top shelf: 84 inches
   c. Space remaining bottom six shelves evenly, approximately 12 inches center to center, and the top two shelves 10-1/2 inches center to center
5. Weight: 176 pounds

C. Features/Performance/Construction:
1. Shelf construction shall be double flange 18 gauge steel and double flanged box-formed edges on all four sides.
2. Uprights shall be double flanged uprights with tapered bracket slots punched on 1-1/2 inch centers for vertical shelf adjustment.
3. Shelf fastening shall consist of slip-in shelf brackets which reinforce and securely lock shelf into place in all four corners.
4. Units shall share common end panels with adjoining units. Back-to-back units shall be joined with common upright joints.

D. Accessories:

| 1. Anchors, floor: Equipto No. 190317A, for seismic bracing (one each per unit) |
| 2. Anchors, floor: Equipto No. 190319A LH for seismic bracing per add on |
| 3. Anchors, floor: Equipto No. 190320A RH for seismic bracing per add on |

E. Finish: Durable enamel in owner’s choice of manufacturer’s standard colors

2.10 CABINET, FLAMMABLE MATERIALS, LARGE
Equipment Identifier: 1950
A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.

<table>
<thead>
<tr>
<th>A. Equipto</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Tatamy, PA (610) 253-2775</td>
</tr>
<tr>
<td>c. Model No.: FSC45S</td>
</tr>
</tbody>
</table>

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

| a. Lyon Workspace Products, Montgomery, IL (630) 892-8941 |
| b. Justrite Manufacturing Co., Des Plaines, IL (847) 298-9250 |

B. Capacities/Dimensions:

1. Overall dimensions, nominal:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
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<tbody>
<tr>
<td>Length</td>
</tr>
<tr>
<td>a. Equipment</td>
</tr>
</tbody>
</table>

2. Weight, nominal: 360 pounds

3. Storage capacity: up to nine 5 gallon containers, 350 pounds per shelf

C. Features/Performance/Construction:

1. Cabinet shall comply with NFPA combustible liquids Code No. 30 and OSHA safety requirements.

2. Construction shall consist of double wall 18 gauge sheet steel with 1-1/2 inch air space between inner and outer walls.

3. Cabinet shall have a 2 inch pan-type bottom.

4. Two screened flame arrester vents per cabinet, one each at left side bottom and right side top, shall be threaded for and provided with 2 inch NPT steel plugs.

5. Electrical ground connections shall be provided.
6. A spring-loaded fusible link with 165 degree Fahrenheit melting point shall actuate self-closing double swinging doors mounted with full-length piano hinges. Doors shall be provided with three-point latch mechanism and key lock.

7. Two each adjustable shelves shall be provided between 5-3/8 inches from top and 7-5/16 inches from bottom on 1-5/8 inch centers.

8. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Accessories:

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<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anchors, floor: Equipto No. 190317A for seismic bracing (four each per unit)</td>
</tr>
</tbody>
</table>

E. Finish: Durable lead-free high gloss enamel in safety yellow with "FLAMMABLE - KEEP FIRE AWAY" in minimum 4 inch bright red letters across doors.

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 TESTING

A. After final installation is complete and prior to authorizing payment, specified equipment shall be checked with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.04 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.05 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner’s maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. 1632 Carousel, storage, tire, 44 inch; 1 hour (minimum)

B. Obtain, from technical representative, a list of Owner’s personnel trained in equipment operations and maintenance.

END OF SECTION 10 56 00
SECTION 10 75 16 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes ground-set flagpoles made from aluminum.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles.

1. Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
2. Include section, and details of foundation system.

C. Delegated-Design Submittal: For flagpoles.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.
2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design flagpole assemblies.

B. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
   1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is indicated on Structural Drawings.
   2. Base flagpole design on polyester, nylon, or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.03 ALUMINUM FLAGPOLES

A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
   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. Acme/Lingo Flagpoles LLC.
      b. American Flagpole; a Kearney-National Inc. company.
      c. Baartol Company.
      d. Concord Industries, Inc.
      e. Eder Flag Manufacturing Company, Inc.
      f. Ewing Flagpoles.
      g. Morgan-Francis Flagpoles and Accessories.
      h. Pole-Tech Company Inc.
      i. U.S. Flag & Flagpole Supply, LP.

B. Exposed Height: 25 feet and 28 feet.

C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
   1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch wall thickness with 3/16-inch steel bottom plate and support plate; 3/4-inch-diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
1. Flashing Collar: Same material and finish as flagpole.

2.04 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
   1. 0.063-inch spun aluminum, finished to match flagpole.

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

2.05 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

C. Sand: ASTM C 33/C 33M, fine aggregate.

D. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Section 07 92 00 "Joint Sealants."

2.06 ALUMINUM FINISHES


PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

E. Place concrete, as specified in Section 03 30 00 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

F. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.02 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer’s written instructions.

B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 10 75 16
SECTION 11 11 00 - VEHICLE SERVICE EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:

1. 7241 Fluid management system, wireless (Ref Part 2.01)
2. 7510 Pump, air piston, 55 gallon (CG), with hoist (Ref Part 2.02)
3. 7520 Pump, air piston, 10:1 ratio (ATF, EO1, EO2, GO, HO) (Ref Part 2.03)
4. 7530 Pump, diaphragm, mixing (EC, WWF) (Ref Part 2.04)
5. 7531 Pump, diaphragm, non-mixing (DEF) (Ref Part 2.05)
6. 7540 Pump, diaphragm, used fluid evacuation (UO) (Ref Part 2.06)
7. 7541 Pump, diaphragm, used fluid evacuation (UC) (Ref Part 2.07)
8. 7700 Reel banks, general (Ref Part 2.08)
9. 7710 Reel bank (CA) (Ref Part 2.09)
10. 7730 Reel bank (DEF, EC, WWF) (Ref Part 2.10)
11. 7750 Reel bank (ATF, CA, EC, EO2, WWF) (Ref Part 2.11)
12. 7780 Reel bank (ATF, CA, CG, EC, EO1, GO, HO, WWF) (Ref Part 2.12)
13. 7901 Tank, double wall, polyethylene, 120 gallon (WWF) (Ref Part 2.13)
14. 7950 Tank, double wall, cube, 120 gallon (EC, UC) (Ref Part 2.14)
15. 7970 Tank, double wall, cube, 500 gallon (ATF, EO1, EO2, GO, HO) (Ref Part 2.15)
16. 7975 Tank, double wall, cube, 1,000 gallon (UO) (Ref Part 2.16)
17. 7995 Receiver, 25 gallon, portable (UC) (Ref Part 2.17)
18. 7996 Receiver, 25 gallon, portable (UO) (Ref Part 2.18)
B. Roughing-in installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

1.02 RELATED SECTIONS

A. Section 11 11 13 - Compressed Air Vehicle Service Equipment

1.03 QUALITY ASSURANCE

A. Manufacturer’s Representative:

1. Installation: Provide a qualified manufacturer’s representative at site to supervise work related to equipment installation, check out, and start up.

2. Training: Provide a qualified manufacturer’s representative to provide training to Owner’s maintenance personnel in operation and maintenance of specified equipment.

1.04 SUBMITTALS

A. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

2. Restrict submitted material to pertinent data. For instance, do not include manufacturer’s complete catalog when pertinent information is contained on a single page.

B. Operations and Maintenance Manual:

1. Submit Operations and Maintenance Manuals in accordance with Division 1 - General Requirements of these specifications.

2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.

3. Description of system and components.

4. Schematic diagrams of electrical, plumbing, and compressed air system.

5. Manufacturer’s printed operating instructions.

6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information shall indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings: Submit Shop Drawings in accordance with of Division 1 - General Requirements of these specifications.
1.05 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.06 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer’s recommended preventive maintenance schedule.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.08 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer’s name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter’s Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer’s plant.

C. Provide air receivers meeting requirements of ASME Code for Unfired Pressure Vessels and carry ASME approval stamp.
PART 2 - PRODUCTS

2.01  FLUID MANAGEMENT SYSTEM, WIRELESS
Equipment Identifier: 7241

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standard of quality, performance, features and construction.

   a. Graco, Inc.
   b. Minneapolis, MN (800) 533-9655
   c. Model No.: Pulse fluid management system with accessories

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITALS equipment produced by other manufacturers may be considered as equal.

   a. Balcrank Products, Weaverville, NC (828) 645-4261

B. General Description

1. The Pulse Total Fluid Management System shall be designed to manage and control lubricating oils, engine coolant, and DEF mixtures for vehicle and equipment service applications. All service fluid inventories shall be managed from the original bulk tank supply, to the dispensing of the service fluid into the vehicle, and back to the used fluid container.

2. Dispense and tank level information shall be communicated with 2.4 GHZ (U.S.) frequency RF wireless technology to extender(s), remote extender(s), then the Pulse Hub to any PC via the local network connection. The system components shall include meters, tank level monitors (TLM’s), Extender(s), Remote Extender(s), Pulse software. The Contractor shall supply all operator computer or server equipment, including monitor.


C. Features/Performance/Construction:

1. Meters:

   a. Provide meters throughout the facility to accommodate all dispensing locations for the following: ATF, EC, EO, GO, HO.
b. The meter shall allow a metered dispense of service fluids with a maximum working pressure of 1,500 PSI, and flow range up to 8 GPM. The meter shall be capable of both manual and preset metered dispense in both English and Metric units including pints, quarts, gallons and liters. The preset dispense mode also capable of a “Top-Off” function.

c. Delivery kits: Each commodity hose shall be fitted with the dispensing control as listed.

1) Automatic transmission fluid (ATF): Electronic in-line style english metered totalizing dispenser (up to 8 GPM) with flexible extension, set to dispense in quarts to 0.01 increments, Graco Model No. 25M319.

2) Engine coolant, mixed (EC): Electronic in-line style english metered totalizing dispenser (up to 8 GPM) with flexible extension, set to dispense in pints to 0.01 increments, Graco Model No. 25M320.

3) Engine oil (EO1, EO2): Electronic in-line style english metered totalizing dispenser set to dispense (up to 8 GPM) with rigid extension, set to dispense in quarts to 0.01 increments, Graco Model No. 25M319.

4) Gear oil (GO): Electronic in-line style english metered totalizing dispenser with rigid extension, set to dispense (up to 8 GPM) in pints to 0.01 increments, Graco Model No. 25M326.

5) Hydraulic oil (HO): Electronic in-line style english metered totalizing dispenser with rigid extension, set to dispense (up to 8 GPM) in pints to 0.01 increments, Graco Model No. 25M319.

d. The meter shall operate on batteries.

e. Meter accuracy shall be ± 0.5 percent with a repeatability of ± 0.15 percent. Specification based on 2.5 GPM flow at 70 degrees F with 10-weight oil, and 1 gallon dispensed.

f. Meter shall have at least three levels of security. System monitoring, PIN code, and Parts Room Authorization.

g. Meter shall be programmed using Graco Pulse Software or equal.

h. Meter shall be equipped with a Quick-Close™, drip-less dispense nozzle. The nozzle shall operate automatically, so that it will dispense service fluid when the trigger is pulled. The valve shall automatically stop when the trigger is released. After dispense,
the nozzle shall close with less than one turn preventing oil from dripping from the valve.

i. Meter can be programmed to allow a Technician to enter Work Orders at the meter, at the PC or both. A meter can display multiple work orders. Meters to have an unobstructed RF range from 300 to 500 feet and an obstructed RF range from 100 to 300 feet. Meter to meet FCC, and Industry Canada (IC) standards.

j. Each dispensing kit shall include an inlet swivel cover, impact boot, meter filter/strainer and meter o-rings.

2. Tank level monitors (TLMs):
   a. Provide TLMs at the tank locations to accommodate all bulk fluids to be monitored, including: ATF, EC, EO, GO, HO, WWF, UC, UO.
   b. TLMs shall wirelessly provide tank level and volume information for both new and used non-pressurized oil tanks in an operating range from 0 to 30 feet and accuracy of +0.5 percent of total length.
   c. TLMs shall operate on batteries and fit a standard 2 inch NPT bung fitting, Graco Model No. 25M449.
   d. TLM shall meet IPX5 environmental protection class standards for indoor and outdoor use.
   e. TLM’s shall be capable of being used with vertical walled tanks, and cylindrical tanks.
   f. Vertical tanks maximum volume shall be limited to 999,999 gallons or liters with a maximum height of 30 feet (9 meters). Cylindrical tanks maximum volume shall be limited to 999,999 gallons or liters with a maximum diameter of 30 feet (9 meters) and of unlimited length.
   g. TLM’s shall be intrinsically safe EXI for use in Class I, Division 1, Group D hazardous locations, when used with batteries. Ambient temperature ranges -22 to 149 degrees F. Temperature code T2D. The Pulse TLM shall not to be used with fluids with an auto ignition flash point below 419 degrees F (215 degrees C), like gasoline, diesel fuel, and other flammable liquids.
   h. TLM’s shall communicate battery life, tank level, and tank volume information via RF wireless signal to the Extender(s) and Remote Extender(s).
   i. Graco Pulse software or equal shall be used to program all TLMs.
j. TLM’s shall have an unobstructed RF range from 300 to 500 feet, and an obstructed RF range from 250 to 300 feet based on building construction and RF environment.

k. TLM totally unobstructed RF range shall be at least 1/4 mile (1,320 feet).

l. TLM’s shall be able to be configured with up to a total of 15 Network and extender IDs.

m. Shall meet FCC, Industry Canada (IC), UL, cUL standards, and all Australian broadcast standards.

n. Each tank requiring a TLM shall also be equipped with an air solenoid valve, Graco Model No. 215407.

3. Extender(s) and Remote Extender(s):
   a. Extender(s) (Graco Model No. 17F885) and Remote Extender(s) (Graco Model No. 17F878) shall transmit and receive signal to and from meters, PAC’s and TLM’s via RF and/or hard-wire.
   b. Extender(s) and Remote Extender(s) shall communicate to PC via intranet connections. The software shall be capable of supporting up to 15 Extender(s) and Remote Extender(s).
   c. The Hub(s) shall be configurable with up to a total of 15 Extender(s) and Remote Extender ID’s.
   d. Extender(s) and Remote Extender(s) shall include a wall/ceiling bracket for mounting
   e. Extender(s) and Remote Extender(s) shall be powered by a 120 VAC plug-in transformer.

4. Pump air controls (PACs):
   a. Provide PACs at the pump locations to accommodate all bulk fluids to be monitored, including: ATF, EC, EO, GO, HO.
   b. For new Bulk fluids, PACs shall supply air to the wall or tank mounted pumps only when the software authorizes the fluid dispense, Graco Model No. 24Z676.
   c. PACs shall include a wall bracket for mounting.
   d. PACs shall be powered by a 120 VAC plug-in transformer.
5. Full line operating software:
   a. Software shall have at least three security levels, system monitoring, pin code, and parts room authorization, Graco Model No. 24Z978.
   b. Software shall be able to configure meters and TLMs to measure in English or Metric measurements.
   c. Work orders and job numbers shall be entered at the PC, the meter, or both if desired. Work orders screen access shall be password protected. Work orders at the meter shall be controlled using the pin code or parts room authorization security features.
   d. All software configuration and programming screens shall be available only to the System Administrator via a password.
   e. All users’ security access is controlled to either basic, Work Orders, or System Administrator.
   f. Software shall create a customized fluid list, if desired.
   g. TLMs shall be programmed to report levels to the PC automatically up to 10 times per day.
   h. Meter security shall be able to be changed and programmed from meter to meter.
   i. Software shall be able to e-mail suppliers (i.e., oil distributor, used oil vendor) pre-configured reports automatically or on a scheduled basis.
   j. Report section of software shall be able to generate customized reports by allowing exporting of reports to .csv Excel file or .txt text file.
   k. Report section of software shall have a utility that can import or export programmed information to CD media, or other drives.

6. Provide all components necessary so that the system is complete and operational.
D. Utility Requirements:

1. Electrical:

<table>
<thead>
<tr>
<th>Connection Requirements</th>
<th>Hub</th>
<th>Pump Air</th>
<th>Extender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Amps</td>
<td>3</td>
<td>0.6</td>
<td>3</td>
</tr>
</tbody>
</table>

b. Connection Type: Provide standard grounded receptacle

2.02 PUMP, AIR PISTON, 55 GALLON (CG), WITH HOIST

Equipment Identifier: 7510

A. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standard of quality, performance, features and construction.

   a. Graco, Incorporated
   b. Minneapolis, MN (612) 623-6000
   c. Model No.: 226018

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Balcrank Corporation, Inc., Weaverville, NC (828) 645-4261
   b. Samson, Swannanoa, NC (828) 686-8511

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>a. Equipment</td>
</tr>
<tr>
<td>24</td>
</tr>
</tbody>
</table>

2. Products: Chassis grease (CG)

3. Maximum fluid pressure: 4,000 PSI
4. Air motor diameter: 4-1/4 inches
5. Operating range: 40 to 80 PSI
6. Maximum continuous duty flow rate: 3.35 pounds per minute
7. Material outlet: 3/8 inch NPT(F)
8. Material inlet: Slotted

C. Features/Performance/Construction:

1. Provide pneumatic operated piston pump, Graco No. 205395 operable with maximum air pressure of 150 PSI.

2. Provide complete assembly with the following standard compressed air line accessories:
   a. Combination air filter-regulator, 3/4 inch, Graco No. 246948
   b. Bleed type air shut-off valve 3/4 inch, Graco No. 110226 to relieve air trapped between air motor and valve.
   c. Lubricator, 3/4 inch NPT, Graco No. 214849
   d. Air and product valves
   e. Provide compressed air runaway valve, Graco No. 224040 before product fluid pump to eliminate unregulated fluid flow in the event of a product pipe break.

3. Air motor shall be a non-corrosive design with no metal-to-metal contact compatible with product being delivered.

4. Provide base, Graco No. 205339; inductor plate, Graco No. 205699; elevator, Graco No. 204385; and carriage support system for chassis grease.

5. Provide complete assembly complete with the following standard fluid line accessories:
   a. Hose and fitting kit suitable for product, Graco No. 205102
   b. Fluid drain valve to assist in relieving fluid pressure in the pump, hoses, and dispensing valve, Graco No. 205528
   c. Pump grounding wires to reduce the risk of static sparking, Graco No. 222011

6. Provide fluid shut-off valve, 3/4 inch, Parker No. V500HP-12 for isolating oil dispense lines.
7. Provide wishbone support assembly, Graco No. 204461

D. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Plumbing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Compressed Air:</td>
</tr>
<tr>
<td>Connection (inches)</td>
</tr>
<tr>
<td>Volume (CFM)</td>
</tr>
<tr>
<td>Capacity (PSI)</td>
</tr>
</tbody>
</table>

2.03 PUMP, AIR PISTON 10:1 RATIO (ATF, EO1, EO2, GO, HO)

Equipment Identifier: 7520

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer’s name and model to establish acceptable standard of quality, performance, features and construction.

| a. Graco, Inc. |
| b. Minneapolis, MN (800) 533-9655 |
| c. Model No.: 425 Fire-Ball |

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

| a. Balcrank Corporation, Inc., Weaverville, NC (828) 645-4261 |
| b. Lincoln Industrial, St Louis, MO (314) 679-4200 |

B. Capacities/Dimensions:

1. Overall pump dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
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</thead>
<tbody>
<tr>
<td>Length</td>
</tr>
<tr>
<td>a. Equipment</td>
</tr>
</tbody>
</table>

2. Products: Automatic transmission fluid (ATF), engine oil (EO1, EO2), gear oil (GO), hydraulic oil (HO)
3. Maximum fluid pressure: 1,800 PSI
4. Maximum air inlet pressure: 180 psi
5. Air motor effective diameter: 4-1/4 inches
6. Max continuous pump speed: 5.2 GPM
7. Air consumption at 100 PSI: 25 CFM
8. Air inlet: 1/2 inch NPT (F)
9. Fluid outlet: 3/4 inch NPT(F)
10. Fluid inlet: 1-1/2 inch NPT(F)

C. Features/Performance/Construction:

1. Provide pneumatic operated piston pump operable within the pressure range of 40 PSI to 180 PSI.
2. Air motor shall be a non-corrosive design with no metal-to-metal contact compatible with product being delivered.
3. Provide with complete and operable assembly for connection to both compressed air and lube system including the following:
   a. Lube system components:
      1) Provide adapters for mounting on storage tanks.
      2) Provide product valves compatible with product being delivered.
      3) Provide hose and fitting kit suitable for product being delivered.
      4) Provide thermal relief valves for the pumping system. Provide connection from pump back to product tank for proper drain back of fluid in piping riser line and pump
      5) Provide suction tube properly sized for tank of product being delivered.
      6) Provide lower level cut-off valve.
   b. Compressed air components:
      1) Provide combination air filter, regulator and pressure gauge, 3/4 inch NPT.
      2) Provide air lubricator, 3/4 inch NPT.
3) Provide hose and fitting kit for air connection to the pump.

4) Provide compressed air runaway valve before product fluid pump to eliminate unregulated fluid flow in the event of a product pipe break.

5) Provide air valves as required.

D. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Plumbing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Compressed Air:</td>
</tr>
<tr>
<td>Connection (inches)</td>
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<tr>
<td>Volume (CFM)</td>
</tr>
<tr>
<td>Capacity (PSI)</td>
</tr>
</tbody>
</table>

2.04 PUMP, DIAPHRAGM, MIXING (EC, WWF)
Equipment Identifier: 7530

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer’s name and model to establish minimal acceptable standards of quality, performance, features and construction.

| a. Graco |
| b. Minneapolis, MN (612) 623-6000 |
| c. Model No.: 647016 with accessories |
| d. Reference Service Equipment Layout Drawings Tank with wall mounted diaphragm pump and water tank detail |

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

| a. Balcrank Corporation., Weaverville, NC (828) 645-4261 |
| b. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4300 |

B. Capacities/Dimensions:

1. Overall dimensions:
Dimensions (inches)

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>14-3/4</td>
<td>10-3/4</td>
<td>16</td>
</tr>
</tbody>
</table>

2. Products: Engine coolant (EC) and windshield washer fluid (WWF)

3. Pump ratio: 1:1

4. Maximum air pressure: 100 PSI

5. Free flow rate: 50 GPM

6. Air consumption: 64 CFM

7. Fluid outlet: 1 inch NPT(M)

8. Fluid inlet: 1 inch NPT(M)

C. Features/Performance/Construction:

1. Provide pneumatic operated diaphragm pump operable with maximum air pressure of 100 PSI.


3. Pump shall handle engine coolant, windshield washer fluid, water.

4. Pump shall be aluminum/TPE (UL listed)

5. Provide pneumatic pump with complete and operational assembly including the following:

   a. Compressed air system:

      1) Provide a combination filter/regulator (3/4 inch NPT) (Graco No. 106148).

      2) Lubricator (3/4 inch NPT).

      3) Provide connection from pump back to product tank for proper drain back of fluid in piping riser line and pump.

      4) Provide a quick connect air coupler (Graco No. 110119).

      5) Provide a quick connect air nipple (Graco No. 110196).

      6) Provide (2) bleed type air shut off valve as required (Graco No. 110225).
b. Fluid system:

1) Provide compressed air runaway valve before product fluid pump to eliminate unregulated fluid flow in the event of a product pipe leak (Graco No. 247436).

2) Provide pressure relief kit to prevent over pressurization of system due to thermal expansion of fluid (Graco No. 238428).

3) Provide a grounding wire and clamp (Graco No. 222011).

4) Provide (2) suction hose kits compatible with fluid in system (Graco No. 236054).

6. Provide a wall bracket for mounting pump on wall above tank (Graco No. 24C637).

7. Provide dual inlet manifold for mixing water and fluids together (Graco No. 24D147).

8. Provide 30 gallon drum with a float valve.

D. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Plumbing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Domestic Water:</td>
</tr>
<tr>
<td>Connection (inches)</td>
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<tr>
<td>b. Compressed Air:</td>
</tr>
<tr>
<td>Connection (inches)</td>
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<tr>
<td>Volume (CFM)</td>
</tr>
<tr>
<td>Capacity (PSI)</td>
</tr>
</tbody>
</table>

2.05 PUMP, DIAPHRAGM, NON-MIXING (DEF)
Equipment Identifier: 7531

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer’s name and model to establish minimal acceptable standards of quality, performance, features and construction.
a. Graco, Inc.
b. Minneapolis, MN (866) 361-5929
c. Model No.: 647016 for water/antifreeze, 647731 for OH

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.

| a. Balcrank Corporation., Weaverville, NC (828) 645-4261 |
| b. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4200 |

B. Capacities/Dimensions:

1. Products: Diesel exhaust fluid (DEF)
2. Pump ratio: 1:1
3. Maximum free flow rate: 50 GPM
4. Air consumption: 67 CFM
5. Fluid outlet: 1 inch NPT(F)
6. Fluid inlet: 1 inch NPT(F)

C. Features/Performance/Construction:

1. Provide pneumatic operated diaphragm pump operable with maximum air pressure of 100 PSI.
2. Pump shall be aluminum TPE (UL listed) for water/anti-freeze and windshield washer fluid.
3. Provide pneumatic pump with complete and operational assembly including the following:

   a. Compressed air system:

      1) Provide a combination filter/regulator (3/4 inch NPT). Graco No. 246948
      2) Provide connection from pump back to product tank for proper drain back of fluid in piping riser line and pump.
      3) Provide a quick connect air coupler. Graco No. 110199
      4) Provide a quick connect air nipple. Graco No. 110196
5) Provide bleed type air shut off valve as required. Graco No. 110225

b. Fluid system:

1) Provide compressed air runaway valve before product fluid pump to eliminate unregulated fluid flow in the event of a product pipe leak. Graco No. 224040

2) Provide pressure relief kit to prevent over pressurization of system due to thermal expansion of fluid. Graco No. 238428

3) Provide a grounding wire and clamp. Graco No. 222011

4) Provide a suction hose kit compatible with fluid in system. Graco No. 236054

4. Provide a mounting bracket for mounting pump. Graco No. 24C637

D. Utility Requirements:

1. Plumbing:

   a. Compressed Air:

      | Connection (inches) | Volume (CFM) | Capacity (PSI) |
      |---------------------|--------------|---------------|
      | 1/2                 | 67           | 100           |

2.06 PUMP, DIAPHRAGM, USED FLUID EVACUATION (UO)
Equipment Identifier: 7540

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer’s name and model to establish acceptable standards of quality, performance, features and construction.

   a. Graco, Inc.
   b. Minneapolis, MN (800) 533-9655
   c. Model No.: 24E166 with accessories

   d. Reference Equipment Drawings: Service Equipment Layout Plan
2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.

<table>
<thead>
<tr>
<th>a. Balcrank Corp., Weaverville, NC (828) 645-4261</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Lincoln Industrial, St. Louis, MO (314) 679-4200</td>
</tr>
</tbody>
</table>

B. Capacities/Dimensions:

1. Products: Used oil
2. Pump ratio: 1:1
3. Maximum fluid outlet pressure: 100 PSI
4. Maximum fluid working pressure: 100 PSI
5. Maximum free flow rate: 50 GPM
6. Continuous duty delivery: 15.81 to 23.8 GPM
7. Air inlet: 1/2 inch NPT(F)
8. Fluid outlet: 1 inch NPT(F)
9. Fluid inlet: 1 inch NPT(F)
10. Tank overfill gauge: 2 NPT

C. Features/Performance/Construction:

1. Diaphragm pump shall provide 100 PSI air pressure for pump size and capacity as scheduled.
2. Pump shall be provided in complete assembly, including the following:
   a. Wall bracket accessory kit, Graco Model No. 24C637; includes lock nut, cylindrical damper, wall mount bracket, and washer.
   b. Air installation kit, Graco Model No. 240684, includes 1/4 inch coupler and fitting, 1/8 inch air regulator, 1/4 inch air filter, 1/4 x 1/8 inch nipple, 30 inch air hose, 1/4 inch NPT x 1/4 inch npsm, 1/8 inch air pressure gauge, 1/2 inch bushing.
   c. Grounding wire and clamp, Graco Model No. 238909.
   d. Drum style adapter kit, Graco Model No. 240832, includes elbow, nipple, valve, male and female camlock couplers.
e. Air muffler, Graco Model No. 112182.

f. Combination filter regulator, \(\frac{3}{4}\) inch NPT, Graco Model No. 106148.

g. Air pressure gauge, Graco No. 104655.

h. Fluid installation kit, Graco Model No. 240685, includes swivel union, 4 foot coupled fluid hose, short nipple, y-strainer, 10 foot coupled fluid hose, ball valve, and elbow

i. Wye strainer, Graco Model No. 101078

j. 10 foot fluid hose, Graco No. 111010

k. Provide label “USED OIL” on pump to identify product (minimum 1 inch lettering)


4. Pump shall handle oil, hydraulic oil, automatic transmission fluid, antifreeze, windshield washer fluid, water, or fuel.

5. Pump shall have a monitoring system that shuts off the pump via solenoid valve when the used fluid tank is full.

a. Monitoring system shall notify users with a strobe light and an audible alarm system.

1) Manufacturer: BJ Enterprises, (636) 825-7200

2) Monitoring system power supply and solenoid valve: BJE Model No. 007-580, one each

3) Strobe light: BJE Model No. 007-695, one each

b. Audible alarm shall draw 10 to 50 milliamps.
D. Utility Requirements:

1. Electrical:
   a. Connection Requirements Strobe Unit
      | Voltage | 120 |
      | Phase  | 1   |
      | Amps   | 2   |
   b. Connection Type
      Provide standard grounded receptacle

2. Plumbing:
   a. Compressed Air:
      | Connection (inches) | 1/2 |
      | Volume (CFM)        | 64  |
      | Capacity (PSI)      | 100 |

2.07 PUMP, DIAPHRAGM, USED FLUID EVACUATION (UC)
    Equipment Identifier: 7541

A. Manufacturer’s Reference:
   1. Prime manufacturer: Specifications are based on equipment identified by manufacturer’s name and model to establish acceptable standards of quality, performance, features and construction.
      a. Graco, Inc.
      b. Minneapolis, MN (800) 533-9655
      c. Model No.: 24E166 with accessories
   2. Alternate manufacturers: Contingent upon compliance with these specification and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
      a. Balcrank Corp., Weaverville, NC (828) 645-4261
      b. Lincoln Industrial, St. Louis, MO (314) 679-4200

B. Capacities/Dimensions:
   1. Products: Used coolant
2. Pump ratio: 1:1
3. Maximum fluid outlet pressure: 100 PSI
4. Maximum fluid working pressure: 100 PSI (7.0 bar, 0.7 MPa)
5. Maximum free flow rate: 50 GPM
6. Continuous duty delivery: 15.81 to 23.8 GPM
7. Air inlet: 1/2 inch NPT(F)
8. Fluid outlet: 1 inch NPT(F)
9. Fluid inlet: 1 inch NPT(F)

C. Features/Performance/Construction:

1. Diaphragm pump shall provide 100 PSI air pressure for pump size and capacity as scheduled.
2. Pump shall be provided in complete assembly, including the following:
   a. Wall bracket accessory kit, Graco Model No. 24C637; includes lock nut, cylindrical damper, wall mount bracket, and washer.
   b. Air installation kit, Graco Model No. 240684, includes 1/4 inch coupler and fitting, 1/8 inch air regulator, 1/4 inch air filter, 1/4 x 1/8 inch nipple, 30 inch air hose, 1/4 inch NPT x 1/4 inch npsm, 1/8 inch air pressure gauge, 1/2 inch bushing.
   c. Grounding wire and clamp, Graco Model No. 238909.
   d. Drum style adapter kit, Graco Model No. 240832, includes elbow, nipple, valve, male and female camlock couplers.
   e. Air muffler, Graco Model No. 112182.
   f. Combination filter regulator, ¾ inch NPT, Graco Model No. 106148.
   g. Air pressure gauge, Graco No. 104655.
   h. Fluid installation kit, Graco Model No. 240685, includes swivel union, 4 foot coupled fluid hose, short nipple, y-strainer, 10 foot coupled fluid hose, ball valve, and elbow
   i. Wye strainer, Graco Model No. 101078
   j. 10 foot fluid hose, Graco No. 111010
k. Provide label “USED COOLANT” on pump to identify product (minimum 1 inch lettering)


4. Pump shall handle oil, hydraulic oil, automatic transmission fluid, anti-freeze, windshield washer fluid, water, or fuel.

5. Pump shall have a monitoring system that shuts off the pump via solenoid valve when the used fluid tank is full.

   a. Monitoring system shall notify users with a strobe light and an audible alarm system.

      1) Manufacturer: BJ Enterprises, (636) 825-7200
      2) Monitoring system power supply and solenoid valve: BJE Model No. 007-580, one each
      3) Strobe light: BJE Model No. 007-695, one each

   b. Audible alarm shall draw 10 to 50 milliamps.

D. Utility Requirements:

1. Electrical:

   a. Connection Requirements Strobe Unit

      | Connection | Requirements | Strobe Unit |
      |------------|--------------|-------------|
      | Voltage    | 120          |
      | Phase      | 1            |
      | Amps       | 2            |

   b. Connection Type Provide standard grounded receptacle

2. Plumbing:

   a. Compressed Air:

      | Connection (inches) | 1/2  |
      | Volume (CFM)        | 64   |
      | Capacity (PSI)      | 100  |

2.08 REEL BANKS, GENERAL
Equipment Identifier: 7700

A. Manufacturer’s Reference:
1. **Prime manufacturer:** Specifications are based on equipment identified by manufacturer's name and model to establish acceptable standards of quality, performance, features and construction.

   a. Graco, Inc.
   b. Minneapolis, MN (844) 241-9497
   c. Model No.: XD Series

2. **Alternate manufacturers:** *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS equipment produced by other manufacturers, including the following, *may be considered as equal.*

   a. Lincoln Industrial Corporation, St. Louis, MO (314) 679-4200
   b. Balcrank Corporation, Weaverville, NC (828) 645-4261

**B. General Description:** High performance, heavy duty hose reels. Reels are available for the following products:

1. **Automatic transmission fluid (ATF):** Graco No. HSM65B
2. **Compressed air (CA):** Graco No. HSL56B
3. **Chassis grease (CG):** Graco No. HSH55B
4. **Diesel exhaust fluid (DEF):** Graco No. HSDD5B
5. **Engine coolant (EC):** Graco No. HSL65B
6. **Engine oil (EO1, EO2):** Graco No. HSM65B
7. **Gear oil (GO):** Graco No. HSM65B
8. **Hydraulic oil (HO):** Graco No. HSM65B
9. **Windshield washer fluid (WWF):** Graco No. HSL56B

**C. Capacities/Dimensions:**

1. **Overall reel dimensions, XD20 series (ATF, CA, CG, EC, EO, GO, HO, WWF) nominal:**
   a. **Length:** 20 inches
   b. **Width:** 7-1/2 inches
   c. **Height:** 25-1/2 inches
2. Overall reel dimensions, XD30 series (DEF), nominal:
   a. Length: 22-1/8 inches
   b. Width: 9 inches
   c. Height: 27-5/8 inches

3. Reel fluid inlet:
   a. CA, WWF: 1/2 inch NPSM (M)
   b. CG: 1/2 inch NPT(M)
   c. ATF, EC, EO, GO, HO: 1/2 inch NPSM(M)
   d. DEF: 3/4 inch BSPP(M)

4. Hose:
   a. CA, WWF:
      1) Length: 65 feet
      2) Inside diameter: 3/8 inch
      3) Working pressure: 300 PSI
   b. CG:
      1) Length: 50 feet
      2) Inside diameter: 3/8 inch
      3) Working pressure: 4,000 PSI
   c. DEF:
      1) Length: 50 feet
      2) Inside diameter: 3/4 inch
      3) Working pressure: 50 PSI
   d. ATF, EO, GO, HO:
      1) Length: 50 feet
      2) Inside diameter: 1/2 inch
      3) Working pressure: 2,000 PSI
e. **EC:**
   1) Length: 50 feet
   2) Inside diameter: 1/2 inch
   3) Working pressure: 300 PSI

**D. Features/Performance/Construction:**

1. **Reels:**
   a. **Construction:** Frames, discs, and drum shall be fabricated of heavy gauge steel.
   b. **Double pedestal arm:** Reel frame shall have double pedestal arms that are welded and gusseted.
   c. **Hose guide arm:** Reel hose guide arm shall be adjustable with nylon rollers on all four sides of roller assembly at hose opening.
   d. **Rewind mechanism:** Reel spring shall be enclosed and fastened to reel drum with a reinforcing clip.
   e. **Bearings and ratchet latch:** Reel shall have permanently lubricated bearings and extra large ratchet latch with audible hose position lock.

2. **Ball stop:** Adjustment of hose extension length shall be permitted by ball stop:
   a. 3/8 inch hose, Graco No. 218341, (one per hose reel) (CA, CG, WWF)
   b. 1/2 inch hose, Graco No. 218341, (one per hose reel) (ATF, EC, EO1, EO2, GO, HO)
   c. 3/4 inch hose, Graco No. 237873, (one per hose reel) (DEF)

3. **Hose covers and tubes:** Chassis grease hose shall have Buna-N PVC tube and Buna-N PVC cover. All other commodity hoses shall have Buna N nitrile tube with nitrile PVC cover.

4. **Delivery kits:** Each commodity hose shall be fitted with the dispensing control as listed. (Refer to Fluid Management System for additional delivery kits).
   a. CA: Quick disconnect air coupler with necessary adapter fitting, Industrial Interchange Series 3/8 and/or 1/2 inch female.
b. CG: High pressure control valve with knurled grip body, 1/4 inch, Graco No. 242056 with taper nose coupler and extension; “Z” swivel, Graco No. 202577.

c. DEF: Dispense nozzles with swivel, Graco No. 24F529 and in-line meter, Graco No. 24H293.

d. WWF: Bib control valve with thumb acting trigger, Graco No. 180685 and in-line meter, Graco No. 239824.

5. Inlet hose kit: Each commodity reel shall be fitted with the inlet hose kit as listed.

   a. CA, WWF: 1/2 inch ID by 24 inches, medium pressure hose and fittings, rated for 2,000 PSI, Graco No. 218549, (one each)
   
   b. CG: 3/8 inch ID by 24 inches, high pressure hose and fittings, rated for 4,000 PSI, Graco No. 218550, (one each)
   
   c. ATF, EC, EO, GO, HO: 1/2 inch ID by 24 inches, medium pressure hose and fittings, rated for 2,000 PSI, Graco No. 218549, (one each)
   
   d. DEF: 3/4 inch ID by 24 inches, medium pressure hose and fittings, rated for 1,250 PSI, Graco No. 124875, (one each)
   
6. Mounting bracket: Graco No. 204741, one per three reels

7. Identification labels: Each commodity reel shall have a 3/4 by 4-1/4 inch metal identification label indicating the commodity, attached adjacent to each hose guide arm roller assembly. Label kits including label and mounting hardware as listed for each commodity.

   a. ATF: Graco No. 218673
   
   b. CA: Graco No. 218675
   
   c. CG: Graco No. 218671
   
   d. DEF: Provide a fabricated identification label similar to the other specified commodities.
   
   e. EC: Similar to Graco No. 218677
   
   f. EO: Similar to Graco No. 218670
   
   g. GO: Similar to Graco No. 216870
   
   h. HO: Graco No. 218674
   
   i. WWF: Provide a fabricated identification label similar to the other specified commodities.
8. Mounting channel supply as required for specific reel bank:
   a. One reel: Graco No. 24A219
   b. Two reels: Graco No. 24A220
   c. Three reels: Graco No. 24A221
   d. Six reels: Graco No. 24A222

E. Utility Requirements: Contractor shall provide process piping from product pumps to point of connection for each reel specified herein.

F. Finish: Durable enamel in manufacturer’s standard color

2.09 REEL BANK (CA)
   Equipment Identifier: 7710
   A. Reel bank shall consist of one each (CA) reel as delineated in part 2.08 REEL BANKS, GENERAL of this specification section.

2.10 REEL BANK (DEF, EC, WWF)
   Equipment Identifier: 7730
   A. Reel bank shall consist of one each (EC) reel, one each (DEF) reel, and one each (WWF) reel as delineated in part 2.08 REEL BANKS, GENERAL of this specification section.

2.11 REEL BANK (ATF, CA, EC, EO2, WWF)
   Equipment Identifier: 7750
   A. Reel bank shall consist of one each (ATF) reel, one each (CA) reel, one each (EC) reel, one each (EO) reel, and one each (WWF) reel as delineated in part 2.08 REEL BANKS, GENERAL of this specification section.

2.12 REEL BANK (ATF, CA, CG, EC, EO1, GO, HO, WWF)
   Equipment Identifier: 7780
   A. Reel bank shall consist of one each (ATF) reel, one each (CA) reel, one each (CG) reel, one each (EC) reel, one each (EO) reel, one each (GO) reel, one each (HO) reel, and one each (WWF) reel as delineated in part 2.08 REEL BANKS, GENERAL of this specification section.

2.13 TANK, DOUBLE WALL, POLYETHYLENE, 120 GALLON (WWF)
   Equipment Identifier: 7901
   A. Manufacturer’s Reference:
      1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimum acceptable standards of quality, features, performance, and construction.
2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.

| a. Snyder Industries, Inc. | b. Lincoln, NB (402) 467-5221 | c. Model No.: 5700102N45 |


B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
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<tbody>
<tr>
<td>a. Equipment</td>
<td>34</td>
<td>---</td>
<td>51</td>
</tr>
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</table>

2. Fill opening: 11-3/8 inches

3. Dry weight: 100 pounds

4. Full weight: 1,100 pounds

5. Capacity: 120 gallons

C. Features/Performance/Construction:


2. The components of the system shall be assembled and tested at the factory and shall be covered under warranty.

3. The aboveground, double wall tank shall be equipped with at least one 11-3/8 inch diameter opening.

4. Primary and secondary storage tanks shall be polyethylene with a UL94HB rating. Secondary enclosure shall provide a minimum of 138 gallon secondary containment.
D. Accessories:

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<thead>
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<tbody>
<tr>
<td>1.</td>
<td>120 gallon liquid level gauge: Snyder No. 35902047</td>
</tr>
<tr>
<td>2.</td>
<td>Seismic restraint: Snyder No. 34700428</td>
</tr>
<tr>
<td>3.</td>
<td>2 inch PVC bulkhead fitting: Snyder No. 34200015</td>
</tr>
</tbody>
</table>

E. Finish: Durable plastic in manufacturer’s standard colors

2.14 TANK, DOUBLE WALL, CUBE, 120 GALLON (EC, UC)
Equipment Identifier: 7950

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimum acceptable standards of quality, features, performance, and construction.

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>a.</td>
<td>Containment Solutions</td>
</tr>
<tr>
<td>b.</td>
<td>Conroe, TX (936) 756-7731</td>
</tr>
<tr>
<td>c.</td>
<td>Model No.: LC120DW with accessories</td>
</tr>
</tbody>
</table>

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

<p>| | |</p>
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<thead>
<tr>
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<tbody>
<tr>
<td>a.</td>
<td>Dynafab Corp., Houston, TX (281) 590-5467</td>
</tr>
<tr>
<td>b.</td>
<td>Highland Tank and Manufacturing, Stoystown, PA (814) 893-5701</td>
</tr>
</tbody>
</table>

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
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<tbody>
<tr>
<td>a. Equipment</td>
<td>38</td>
<td>34</td>
<td>37</td>
</tr>
</tbody>
</table>

2. Capacity: 120 gallons.

3. Dry weight: 485 pounds, approximately 1490 pounds, filled.
C. Features/Performance/Construction:

1. Above ground used oil collection and fluid storage systems shall be constructed in accordance with national, state, and locally recognized Above Ground Storage Tank standards, including: Uniform Fire Code Article 79, Nation Fire Protection Association 30, 30A, and 31, Underwriters Laboratory Standard 142.

2. The components of the system shall be assembled and tested at the factory and shall be covered under warranty.

3. The above ground double wall tank shall be designed and UL listed as an atmospheric tank with a maximum working pressure of 1 PSI.

4. The primary and secondary storage tanks shall have passed a proof of design hydrostatic pressure test of 25 PSI.

5. The above ground double wall tank shall be equipped with nine NPT openings including two for primary and secondary emergency venting as required by UL-142.

6. Primary tank enclosure:
   a. Primary storage tank shall be rectangular in design and constructed with ASTM A-569 or A-36 carbon steel with continuous welds.
   b. Primary storage tank shall be constructed and pressure tested (minimum 3 PSI) in accordance with UL-142 standards and carry the appropriate marking.
   c. Tank enclosure shall be supported by two 4-inch high steel support feet channels with internal anchoring holes to maintain ground clearance. Tank shall be equipped with a minimum of two lifting lugs.

7. Secondary tank enclosure:
   a. Secondary storage tank shall be a rectangular design constructed with ASTM A-569 or A-36 carbon steel with continuous welds and listed by Underwriters Laboratories as secondary containment.
   b. Secondary enclosure shall provide a minimum of 110 percent secondary containment.
   c. Secondary enclosure shall be equipped with a 2 inch monitoring port and a 4 or 6 or 8 inch emergency vent port as required by Underwriters Laboratories.
d. Secondary storage tank shall be constructed and pressure tested (minimum 3 PSI) in accordance with UL-142 standards and carry the appropriate marking.

8. Installation of tank shall include seismic bracing and anchoring to meet all local, state, and federal codes and provisions.

9. Double float tank gauge that is calibrated by gallons or inches (Scully No. 20000402).

10. Spill box, 7 gallon, welded to tank with 1/2 inch drain (Containment Solutions No. SBB002).

11. Venting:
   a. Primary-
      1) Primary working vent: 2 inch NPT(M) (Containment Solutions No. 20000601).
      2) Primary emergency vent: 4 inch NPT(M) (Containment Solutions No. 20000596).
   b. Secondary-
      1) Secondary working vent: 2 inch NPT(M) (Containment Solutions No. 20000601).
      2) Secondary emergency vent: 4 inch NPT(M) (Containment Solutions No. 20000596).

12. Anchor clips: Anchor tank to floor (Containment Solutions No. ACB005).

D. Accessories:

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<tbody>
<tr>
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</tr>
<tr>
<td>1. [For used fluid tanks] Tank monitoring system with alarm: BJ Enterprises (800) 457-0748, Model No. 007 (one each)</td>
<td></td>
</tr>
</tbody>
</table>
E. Utilities:

1. Electrical:

<table>
<thead>
<tr>
<th>Connection Requirements</th>
<th>Tank Monitor</th>
<th>FMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Amps</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

b. Connection Type

Provide standard grounded receptacle

2. Mechanical:

a. Venting:

| Connection (inches) | 2 |

F. Finish: Durable enamel in manufacturer’s standard color

2.15 TANK, DOUBLE WALL, CUBE, 500 GALLON (ATF, EO1, EO2, GO, HO)
Equipment Identifier: 7970

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimum acceptable standards of quality, features, performance, and construction.

<table>
<thead>
<tr>
<th>Company</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containment Solutions, Incorporated</td>
<td>Conroe, TX (800) 537-4730</td>
</tr>
<tr>
<td>c. Model No.: LC500DW with accessories</td>
<td></td>
</tr>
</tbody>
</table>

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

<table>
<thead>
<tr>
<th>Company</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Containment, McGaheysville, VA (800) 522-4980</td>
<td></td>
</tr>
</tbody>
</table>

B. Capacities/Dimensions:

1. Overall dimensions:
2. Capacity: 500 gallons.

3. Dry weight: 1,350 pounds, approximately 5,525 pounds filled.

C. Features/Performance/Construction:

1. Above ground used oil collection and fluid storage systems shall be constructed in accordance with national, state, and locally recognized Above Ground Storage Tank standards, including: Uniform Fire Code, Article 79, National Fire Protection Association Sections 30, 30A, and 31, and Underwriters Laboratory Standard 142.

2. The components of the system shall be assembled and tested at the factory and shall be covered under warranty.

3. The above ground double wall tank shall be designed and UL listed as an atmospheric tank with a maximum working pressure of one (1) PSI.

4. The primary and secondary storage tanks shall have passed a proof of design hydrostatic pressure test of 25 PSI.

5. The above ground double wall tank shall be equipped with nine NPT openings including two for primary and secondary emergency venting as required by UL-142.

6. Primary tank enclosure:
   a. Primary storage tank shall be rectangular in design and constructed with ASTM A-569 or A-36 carbon steel with continuous welds.
   b. Primary storage tank shall be constructed and pressure tested (minimum 3 PSI) in accordance with UL-142 standards and carry the appropriate marking.
   c. Tank enclosure shall be supported by two 4-inch high steel support feet channels with internal anchoring holes to maintain ground clearance. Tank shall be equipped with a minimum of two (2) lifting lugs.

7. Secondary tank enclosure:
   a. Secondary storage tank shall be a rectangular design constructed with ASTM A-569 or A-36 carbon steel with continuous welds and listed by Underwriters Laboratories as secondary containment.
b. Secondary enclosure shall provide a minimum of 110 percent secondary containment.

c. Secondary enclosure shall be equipped with a 2 inch monitoring port and an emergency vent port as required by Underwriters Laboratories.

d. Secondary storage tank shall be constructed and pressure tested (minimum 3 PSI) in accordance with UL-142 standards and carry the appropriate marking.

8. Installation of tank shall include seismic bracing and anchoring to meet all local, state, and federal codes and provisions.

9. Double float tank gauge, calibrated by gallons or inches (Scully No. 20000413).

10. Spill box, 7 gallon, welded to tank with 1/2 inch drain (Containment Solutions No. SBB002).

11. Venting:
   a. Primary-
      1) 2 inch NPT(M) working vent (Containment Solutions No. 20000601).
      2) 4 inch NPT(M) tank emergency vent (Containment Solutions No. 20000596). Vent through roof for used fluids.
   b. Secondary-
      1) 2 inch NPT(M) working vent (Containment Solutions No. 20000601).
      2) 6 inch NPT(M) containment emergency vent.

12. Anchor Clips: Anchor tank to floor (Containment Solutions No. ACB005).

D. Finish: Shop primed in manufacturer’s standard color

2.16 TANK, DOUBLE WALL, CUBE, 1,000 GALLON (UO)
   Equipment Identifier: 7975

A. Manufacturer’s Reference:
   1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimum acceptable standards of quality, features, performance, and construction.
2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Containment Solutions</td>
<td>Conroe, TX (936) 756-7731</td>
</tr>
<tr>
<td>c. Model No.: LC1000DW with accessories</td>
<td></td>
</tr>
<tr>
<td>a. Atlantic Containment, McGaheysville, VA (800) 522-4980</td>
<td></td>
</tr>
<tr>
<td>b. Highland Tank, Stoystown, PA (814) 893-5701</td>
<td></td>
</tr>
</tbody>
</table>

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>112</td>
<td>48</td>
<td>61</td>
</tr>
</tbody>
</table>

2. Capacity: 1,000 gallons

3. Dry weight: 2,400 pounds. Approximately 10,750 pounds filled.

C. Features/Performance/Construction:

1. Above ground used oil collection and fluid storage systems shall be constructed in accordance with national, state, and locally recognized *Above Ground Storage Tank* standards, including: Uniform Fire Code, Nation Fire Protection Association 30, 30A, and 31, The Uniform Fire Code Article 79, Underwriters Laboratory Standard 142.

2. The components of the system shall be assembled and tested at the factory and shall be covered under warranty.

3. The above ground double wall tank shall be designed and UL listed as an atmospheric tank with a maximum working pressure of one PSI.

4. The primary and secondary storage tanks shall have passed a proof of design hydrostatic pressure test of 25 PSI.

5. The above ground double wall tank shall be equipped with nine NPT openings including two for primary and secondary emergency venting as required by UL-142.
6. Primary tank enclosure:
   a. Primary storage tank shall be rectangular in design and constructed with ASTM A-569 or A-36 carbon steel with continuous welds.
   b. Primary storage tank shall be constructed and pressure tested (minimum 3 PSI) in accordance with UL-142 standards and carry the appropriate marking.
   c. Tank enclosure shall be supported by two four-inch high steel support feet channels with internal anchoring holes to maintain ground clearance. Tank shall be equipped with a minimum of two (2) lifting lugs.

7. Secondary tank enclosure:
   a. Secondary storage tank shall be a rectangular design constructed with ASTM A-569 or A-36 carbon steel with continuous welds and listed by Underwriters Laboratories as secondary containment.
   b. Secondary enclosure shall provide a minimum of 110 percent secondary containment.
   c. Secondary enclosure shall be equipped with a 2 inch monitoring port and an emergency vent port as required by Underwriters Laboratories.
   d. Secondary storage tank shall be constructed and pressure tested (minimum 3 PSI) in accordance with UL-142 standards and carry the appropriate marking.

8. Installation of tank shall include seismic bracing and anchoring to meet all local, state, and federal codes and provisions.

9. Level gauge that is calibrated by gallons or inches (Krueger No. 20000693 or equal)

10. Venting:
   a. Primary:
      1) 2 inch NPT(M) Working vent, Containment Solutions No. 20000601
      2) 6 inch NPT(M), Emergency vent, Morrison Brothers No. 244OM-0200AV
   b. Secondary:
      1) 2 inch NPT(M), Working vent, Containment Solutions No. 20000601.
2) 6 inch NPT(M), Emergency vent

11. Spill box: 7 gallon, welded to tank, with ½ inch drain, Containment Solutions No. SBB002

12. Anchor clips: Anchor tank to floor. Containment Solutions No. ACB005

D. Accessories:

<p>| | |</p>
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</table>
|   | (For used fluid tanks) Tank monitoring system with alarm: BJ Enterprises: Model No. 007 (one each per tank)

E. Utility Requirements:

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
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<tr>
<td>a.</td>
<td>Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
<td>120</td>
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<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>Amps</td>
<td>2</td>
</tr>
<tr>
<td>b.</td>
<td>Connection Type</td>
</tr>
</tbody>
</table>

F. Finish: Durable enamel in manufacturer’s standard color

2.17 RECEIVER, 25 GALLON, PORTABLE (UC)

Equipment Identifier: 7995

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>Graco, Incorporated</td>
</tr>
<tr>
<td>b.</td>
<td>Minneapolis, MN (800) 533-9655</td>
</tr>
<tr>
<td>c.</td>
<td>Model No.: 248632</td>
</tr>
</tbody>
</table>
2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may be considered as equal.*


**B. Capacities/Dimensions:**

1. **Overall dimensions:**

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
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</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
</tr>
<tr>
<td>a. Equipment</td>
</tr>
</tbody>
</table>

2. Dry weight: 54 pounds

3. Fluid inlet/inspection port size: 3 inch buttress

4. Capacity: 25 gallons

5. Fluid outlet fitting size: 3/4 inch NPT

6. Collection funnel size: 24 by 24 inches

**C. Features/Performance/Construction:**

1. Unit shall be constructed of polyethylene.

2. Unit shall include a 3/4 inch gravity feed drain valve and a quick disconnect method of suction-evacuation from the top of the unit.

3. Unit shall be mounted on semi-pneumatic, synthetic rubber wheels and polyurethane front casters.

4. Unit shall contain a funnel assembly capable of extending to 69 inches.

5. Unit shall be dent, rust, and corrosion resistant.

6. Unit shall be capable of handling coolant at temperatures below 30 degrees F to above 105 degrees F.

7. Tank shall be equipped with tool holders and sight gauge.

8. Tank shall be equipped with a removable filter to prevent debris from entering the tank.
D. Finish: Polyethylene complete with necessary markings to readily identify contents.

2.18 RECEIVER, 25 GALLON, PORTABLE (UO)
Equipment Identifier: 7996

A. Manufacturer’s Reference:
   1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.
      a. Graco, Incorporated.
      b. Minneapolis, MN (800) 533-9655
      c. Model No.: 238866
   2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
      a. Balcrank Corporation, Weaverville, NC (828) 645-4261
      b. Samson, Swannanoa, NC (828) 686-8511

B. Capacities/Dimensions:
   1. Overall dimensions:
      
      | Dimensions (inches) |
      |----------------------|
      | Length  | Width  | Height |
      |---------|--------|--------|
      | a. Equipment | 24     | 24     | 45     |

   2. Fluid inlet/inspection port size: 3 inch buttress
   3. Fluid outlet fitting size: 3/4 inch NPT
   4. Collection funnel size: 22 by 24 inches
   5. Capacity: 25 gallons
   6. Dry weight: 54 pounds

C. Features/Performance/Construction:
   1. Unit shall be constructed of polyethylene.
2. Unit shall include a gravity feed drain valve and suction-evacuation from the top of the unit.

3. Unit shall be mounted on semi-pneumatic, synthetic rubber wheels and polyurethane front casters.

4. Unit shall contain a funnel assembly capable of extending to 69 inches.

5. Unit shall be dent, rust, and corrosion resistant.

6. Unit shall be capable of handling oil at temperatures of below 30 degrees F to above 120 degrees F, with a maximum oil temperature of 220 degrees F.

7. Tank shall be equipped with tool holders and a sight gauge.

8. Tank shall be equipped with a removable filter to prevent debris from entering the tank.

D. Finish: Polyethylene complete with necessary markings to readily identify contents

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

B. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.
3. Anchorage: Attach equipment as detailed or directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

4. Fluid storage tanks:
   a. Tank shall be seismically braced and anchored to meet all local, state, and federal codes and provisions.
   b. Used oil tank shall be vented to the outside of the building.
   c. Remove support feet channels prior to final installation.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.04 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.05 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner’s maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. 7421 Fluid management system, wireless; 8 hours (minimum)
2. 7510 Pump, air piston, 55 gallon (CG), with hoist; 1 hours (minimum)
3. 7520 Pump, air piston, 10:1 ratio (ATF, EO1, EO2, GO, HO); 1 hours (minimum)
4. 7530 Pump, diaphragm, mixing (EC, WWF); 1 hours (minimum)
5.  7531  Pump, diaphragm, non-mixing (DEF); 1 hours (minimum)
6.  7970  Tank, double wall, cube, 500 gallon (ATF, EO1, EO2, GO, HO); 1 hours (minimum)
7.  7975  Tank, double wall, cube, 1,000 gallon (UO); 1 hours (minimum)
8.  7995  Receiver, 25 gallon, portable (UC); 1 hours (minimum)
9.  7996  Receiver, 25 gallon, portable (UO); 1 hours (minimum)

B. Obtain, from technical representative, a list of Owner’s personnel trained in equipment operations and maintenance.

END OF SECTION 11 11 00
SECTION 11 11 13 - COMPRESSED AIR VEHICLE SERVICE EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:

1. 8020 Compressor, air, reciprocating, 5 HP, vertical receiver (Ref Part 2.01)
2. 8027 Compressor, air, reciprocating, duplex 5 HP, horizontal receiver, small (Ref Part 2.02)
3. 8236 Compressor, air, reciprocating, Duplex 30 HP (x2), horizontal (large) receiver (Ref Part 2.03)
4. 8504 Dryer, air, refrigerated, non-cycling, 25 CFM (Ref Part 2.04)
5. 8508 Dryer, air, refrigerated, non-cycling, 50 CFM (Ref Part 2.05)
6. 8535 Dryer, air, refrigerated, non-cycling, 250 CFM (Ref Part 2.06)

C. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

D. Piping, wiring, and switching between equipment and utilities.

1.02 REFERENCES

A. ASME Code for Unfired Pressure Vessels

1.03 DEFINITIONS

A. Actual Air: Air delivered at air-compressor outlet. Flow rate is compressed air delivered and measured in acfm.

B. Standard Air: Free air at 68 deg and 1 atmosphere (before compression or expansion and measured in scfm).

1.04 QUALITY ASSURANCE

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.
B. Manufacturer’s Representative:

1. Installation: Provide a qualified manufacturer’s representative at site to supervise work related to equipment installation, check out, and start up. Training: Provide a qualified manufacturer’s representative to provide training to Owner’s maintenance personnel in operation and maintenance of specified equipment.

1.05 STANDARD AND REGULATORY REQUIREMENTS

A. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic, fire, and racking codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.06 SUBMITTALS

A. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

2. Restrict submitted material to pertinent data. For instance, do not include manufacturer’s complete catalog when pertinent information is contained on a single page. Include certified data for each unit and accessory system indicating the following:

   a. Air compressor performance curves at summer design condition
   b. Intercooler performance at summer design condition
   c. Air dryer performance at 38 degrees F, dew point at 175 PSIG

3. Indicate components, assembly, dimensions, weights and loadings, required clearances, location and size of field connections, intake air filter outline, blow-off silencer outline, main motor drive data, aftercoolers, control panel, and electrical pneumatic schematics.

4. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories shall be a cause for rejection.

B. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. **Vibration Isolation Base Details:** Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

3. Include diagrams for power, signal, and control wiring.

C. **Operations and Maintenance Manual:**

1. Assemble and provide copies of manual 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

2. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.

3. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:
   a. Description of system and components.
   b. Schematic diagrams of electrical, plumbing and compressed air systems.
   c. Manufacturer's printed operating instructions.
   d. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information shall indicate that preventive maintenance is not a condition for validation of warranties.
   e. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

1.07 **INFORMATIONAL SUBMITTALS**

A. Field quality-control reports.

1.08 **PRODUCT SUBSTITUTIONS**

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.
1.09 WARRANTY

A. Warrant work specified herein for at least one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer’s recommended preventive maintenance schedule.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

   1. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

B. Provide equipment and material specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.11 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer’s name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter’s Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer’s plant.

C. Provide air receivers meeting requirements of ASME Code for Unfired Pressure Vessels and carry ASME approval stamp.

1.12 GENERAL REQUIREMENTS FOR AIR COMPRESSORS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Description: Factory-assembled, -wired, -piped, and -tested; electric-motor-driven; air-cooled; continuous-duty air compressors, dryers, and receivers that deliver air of quality equal to intake air.

C. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2 and UL 508.
1. Enclosure: NEMA ICS 6, Type 12 control panel unless otherwise indicated.


3. Control Voltage: 120-V ac or less, using integral control power transformer.


5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.

6. Automatic control switches to alternate lead-lag air compressors for duplex air compressors.

7. Instrumentation: Include discharge-air and receiver pressure gages, air-filter maintenance indicator, hour meter, air-compressor discharge-air and coolant temperature gages, and control transformer.

8. Controls shall interface with building automation system.

D. Receivers: Steel tank constructed according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1. Pressure Rating: At least as high as highest discharge pressure of connected air compressors (200 PSI minimum) and bearing appropriate code symbols.

2. Interior Finish: Corrosion-resistant coating.


4. Accessories: Include safety valve, pressure gauge, automatic drain, and pressure regulator.

PART 2 - PRODUCTS

2.01 COMPRESSOR, AIR, RECIPROCATING, 5 HP, VERTICAL RECEIVER

Equipment Identifier: 8020

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.
a. Champion
b. Quincy, IL (866) 276-3440
c. Model No.: VR5-8 with accessories

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

| a. Ingersoll Rand, Davidson, NC (704) 655-4000 |
| b. Quincy Compressor, Bay Minette, AL (251) 937-5900 |

B. General Description: Provide compressor unit consisting of air-cooled motor compressors, air receiver, after cooler, pressure reducing station, spring isolators, and operating controls.

C. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
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<tbody>
<tr>
<td>Length</td>
</tr>
<tr>
<td>a. Equipment</td>
</tr>
</tbody>
</table>

2. Receiver: 80 gallons
3. Rating: 175 PSIG
4. Speed: 710 RPM
5. Displacement: 21.4 CFM
6. Delivery: 17.3 CFM
7. Bore diameters: 4-5/8 and 2-1/2 inches
8. Stroke: 3 inches
9. Number of cylinders: Two
10. Output valve: 1/2 inch NPT(F)
11. Boltdown dimensions: Four on 22.25 inch diameter
12. Weight (approximate): 550 pounds
D. Features/Performance/Construction:

1. Compressor construction:
   a. Construct compressor unit with cast iron housing and head, heat treated forged steel or ductile iron shaft, aluminum alloy connection rods, aluminum pistons with lubricated carbon steel rings, high-strength alloy suction and discharge valves. Statically and dynamically balanced rotating parts.
   b. Mount motor and compressor on one-piece ribbed cast iron or welded steel base with provision for V-belt adjustment.
   c. Provide vibration isolators under the compressor to stabilize unit.

2. Aftercooler:
   a. Each pump shall be fitted with an air cooled aftercooler suitable for operation under 175 PSIG working pressure.
   b. Provide a belt guard style aftercooler mounted on the compressor belt guard.

3. Air receiver:
   a. Compressor shall be mounted on a vertical receiver stamped ASME rated for working pressure of 200 PSI. Flange or screw inlet and outlet connections, welded steel construction.
   b. Fittings to include a pressure relief valve, a pressure gauge, a drain cock, and an automatic no-loss pneumatic tank drain.
   c. Unit shall come equipped with vibration isolation pads.

4. Pressure reducing valve:
   a. Provide pressure reducing stations complete with automatic reducing valve and bypass, and low pressure side relief valve and gauge.
   b. Valve capacity suitable to reduce receiver pressure from 180 PSIG to 50 PSIG. Pressure reducing valve to be adjustable upward from reduced pressure.

5. Pump shall be equipped with a 5 micron intake filter.

6. Unit shall be capable of operating from 32 degrees to 104 degrees Fahrenheit.

7. Particulate filter; Champion No. CFL60CAP

8. Vibration Isolators
9. Annual Maintenance Kit; Champion No. Z11892
10. Automatic, no-loss pneumatic tank drain; Champion No. CC107015

E. Controls:
   1. Pressure switch to cutout at 145 PSIG (adjustable) with minimum differential of 20 PSIG.
   2. Unit shall include a magnetic starter for thermal overload protection.
   3. Pump shall come equipped with a low oil level monitor to shut down the unit when the oil falls below an adequate level and to prevent the unit from restarting while at the low oil level condition.
   4. Unit shall start unloaded each time in order to prolong the life of the pump by utilizing centrifugal unloaders.

F. Accessories:
   1. Vibration Isolation: Champion No. VI
   2. Low oil stop control: Champion No. LOLM

G. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
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<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
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<tr>
<td>Phase</td>
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<td>HP</td>
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<tr>
<td>Amps</td>
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<tr>
<td>b. Connection Type</td>
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</tbody>
</table>

H. Finish: Durable enamel in manufacturer’s standard color

2.02 COMPRESSOR, AIR, RECIPROCATING, DUPLEX 5 HP, HORIZONTAL RECEIVER, SMALL
   Equipment Identifier: 8027

A. Manufacturer’s Reference:
   1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.
2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.

| a. Champion                                      |
| b. Quincy, IL (866) 276-3440                     |
| c. Model No.: HR5D-12 with accessories          |

| a. Ingersoll Rand, Davidson, NC (704) 276-3440   |
| b. Quincy Compressor, Bay Minette, AL (251) 937-5900 |

B. General Description: Provide duplex compressor unit consisting of air-cooled compressors, air receiver, after cooler, pressure reducing station, vibration isolators and operating controls.

C. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
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<tr>
<td>Length</td>
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<tr>
<td>Equipment</td>
</tr>
</tbody>
</table>

2. Weight (approximate): 980 pounds
3. Motors: Unit has two 5 HP motors
4. Receiver: 120 gallons
5. Rating: 175 PSIG
6. Speed: 750 RPM
7. Displacement: 42.8 CFM
8. Delivery: 38.2 CFM
9. Bore diameters: 4-5/8 and 2-1/2 inches
10. Stroke: 3 inches
11. Number of cylinders: Two per pump
12. Discharge connection: 3/4 inch NPT(F)
D. Features/Performance/Construction:

1. Compressor construction:
   a. Unit shall include multi finned, integral cylinders/head, first and second stage balanced pistons, aluminum connecting rods, pressure relief valves, finned tube intercoolers, and balance ductile iron crankshafts.
   b. Mount motor and compressor on one-piece ribbed cast iron or welded steel base with provision for V-belt adjustment.

2. Aftercooler:
   a. Each pump shall be fitted with an air-cooled aftercooler suitable for operation under 175 PSIG working pressure.
   b. Provide a belt guard style aftercooler mounted on the compressor belt guard.

3. Air receiver:
   a. Compressors shall be mounted on a horizontal receiver stamped ASME rated for working pressure of 200 PSI. Flange or screw inlet and outlet connections, welded steel construction.
   b. Fittings to include a safety relief valve, a pressure gauge, a drain cock, and an automatic pneumatic no-loss tank drain.
   c. Unit shall come equipped with vibration isolation pads.

4. Pressure reducing valve:
   a. Provide pressure reducing stations complete with automatic reducing valve and bypass, and low pressure side relief valve and gauge.
   b. Valve capacity suitable to reduce receiver pressure from 180 PSI to 50 PSI. Pressure reducing valve to be adjustable upward from reduced pressure.

5. Unit shall be capable of operating from 32 degrees to 104 degrees Fahrenheit.

E. Controls:

1. Pressure switch to cutout at 145 PSIG (adjustable) with minimum differential of 20 PSIG (adjustable).

2. Unit shall include a magnetic starter for thermal overload protection.
3. Both pumps shall come equipped with a low oil level monitor to shut down the unit when the oil falls below an adequate level and to prevent the unit from restarting while at the low oil level condition.

4. Unit shall start unloaded each time in order to prolong the life of the pump by utilizing positive-acting, governor-type centrifugal unloaders.

5. Provide electrical automatic alternation. In the event one compressor fails, another compressor automatically maintains air pressure.

F. Accessories:

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<tbody>
<tr>
<td>1.</td>
<td>Condensation filter: Champion No. CFO60A</td>
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<tr>
<td>2.</td>
<td>Conversion kit: Champion No. CC1047671 (one per unit)</td>
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</tbody>
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G. Utility Requirements:

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</tr>
</thead>
<tbody>
<tr>
<td>1. Electrical:</td>
<td></td>
</tr>
<tr>
<td>a. Connection Requirements</td>
<td>Unit</td>
</tr>
<tr>
<td>Voltage</td>
<td>230</td>
</tr>
<tr>
<td>Phase</td>
<td>3</td>
</tr>
<tr>
<td>HP</td>
<td>5</td>
</tr>
<tr>
<td>Amps</td>
<td>15.2</td>
</tr>
<tr>
<td>b. Connection Type</td>
<td>Provide disconnect</td>
</tr>
</tbody>
</table>

H. Finish: Durable enamel in manufacturer’s standard color

2.03 COMPRESSOR, AIR, RECIPROCATING, DUPLEX, 30 HP (X2), HORIZONTAL (LARGE) RECEIVER

Equipment Identifier: 8238

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer’s name and model to establish acceptable standard of quality, performance, features, and construction.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Champion</td>
</tr>
<tr>
<td>b.</td>
<td>Quincy, IL 866-276-3440</td>
</tr>
<tr>
<td>c.</td>
<td>Model No.: HDRA30D-25 with accessories</td>
</tr>
</tbody>
</table>
2. Alternate manufacturers: Contingent upon compliance with these specification and documentation requirements set forth in SUBMITALS equipment produced by other manufacturers, including the following, may be considered as an equal.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a. Ingersoll Rand, Davidson, NC 704-655-4000</td>
<td></td>
</tr>
<tr>
<td>b. Quincy Compressors, Quincy IL 251-397-5900</td>
<td></td>
</tr>
</tbody>
</table>

B. General Description: Provide duplex compressor unit consisting of air-cooled motor compressors (30 HP), air receiver, aftercooler, pressure reducing station, vibration isolators and operating controls.

C. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
</tr>
<tr>
<td>Equipment</td>
</tr>
</tbody>
</table>

2. Weight (approximate): 3018 pounds

3. Bore: 6-1/4 and 3-1/4

4. Motors: Two - 30 HP each

5. Receiver: 250 gallons

6. Rating: 175 PSI

7. Speed: 890 RPM

8. Displacement: 252.8 CFM (126.4 per pump)

9. Delivery: 202 CFM (101 per pump)

10. Stroke: 4 inches

11. Number of cylinders: Four

D. Features/Performance/Construction:

1. Compressor construction:

   a. Construct compressor unit with cast iron housing and head, heat treated forged steel or ductile iron shaft, aluminum alloy connection rods, aluminum pistons with lubricated carbon steel
rings, high-strength alloy suction and discharge valves. Statically and dynamically balance rotating parts.

b. Mount motor and compressor on one-piece ribbed cast iron or welded steel base with provision for V-belt adjustment.

2. Aftercooler:
   a. Air compressor with air aftercooler suitable for operation under working pressure.
   b. A belt guard style aftercooler mounted on the compressor belt guard.
   c. Aftercooler capacity to cool discharge air to within 25 degrees F of ambient air temperature with compressors operating at specified capacity.

3. Air receiver:
   a. Horizontal receiver stamped ASME rated for working pressure of 200 PSI. Flange or screw inlet and outlet connections, welded steel construction.
   b. Fittings to include adjustable pressure regulator, safety valve, check valve, isolation valve, pressure gauge, drain cock, and automatic pneumatic no-loss tank drain.

4. Pressure reducing valve:
   a. Provide pressure reducing stations complete with automatic reducing valve and bypass, and low pressure side relief valve and gauge.
   b. Compressor shall be provided with automatic start/stop capacity controls. In addition, provide centrifugal unloading to ensure for an unloaded compressor at start-up.
   c. Pressure reducing valve able to reduce pressure from 180 PSI to 50 PSI. Pressure reducing valve shall be adjustable upward from reduced pressure.
   d. Provide valves with bronze or semi-steel bodies with stainless steel springs, stems, and seats.

5. Low level oil monitor: Unit shall include monitor for each compressor. (Champion Model No. LOLM)

6. Vibration isolators: Unit shall include vibration isolators. (Champion Model No. VI)
E. Controls:

1. Pressure switch to cutout at 160 PSI with maximum differential of 20 PSI.
2. Compressor regulation through a lead-lag switch.
3. Provide electrical automatic alternation. In the event one compressor fails, the other compressor automatically maintains air pressure.
4. Unit shall be equipped with a three phase magnetic starter.
5. Provide pneumatic no loss drain, Champion Model No. ATD-P.

F. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>HP</td>
</tr>
<tr>
<td>Amps</td>
</tr>
<tr>
<td>b. Connection Type</td>
</tr>
</tbody>
</table>

G. Finish: Durable enamel in manufacturer’s standard color

2.04 DRYER, AIR, REFRIGERATED, NON-CYCLING, 25 CFM
Equipment Identifier: 8504

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

| a. Champion |
| b. Princeton, IL (815) 875.3321 |
| c. Model No.: CRN25 with accessories |

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>20-1/2</td>
<td>18</td>
<td>26</td>
</tr>
</tbody>
</table>

2. Capacity: 38 degrees F: 25 SCFM

3. Drain connection: 3/8 inch tube

4. Air connection: 1/2 inch NPT(M)

5. Maximum working pressure: 232 PSIG (Level 1 controller standard)

6. Weight: 147 pounds

C. Features/Performance/Construction:

1. Refrigerated air dryer of self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, moisture removal trap, internal wiring and piping, and full refrigerant charge.

2. Provide air inlet and outlet connections and insulate.

3. Heat exchangers to consist of multiple layers of press formed stainless steel. Unit shall contain a moisture separator located at discharge of heat exchanger. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no load condition.

4. Refrigeration unit of hermetically sealed type to operate continuously to maintain specified 38 degree F dew point. House unit in steel cabinet provided with access door and/or panel for maintenance and inspection.

5. Panel mounted gauges: Provide dryer with air inlet temperature gauge, air outlet pressure gauge, and refrigerant head pressure gauge.

6. High temperature alarm with dry contacts.

7. Dryer maintenance filter kit (Champion No. CRNMK2) with separator element, drain, drain tube, hose fastener, wave spring, head o-rings, lube packet, and service reminder decal.
8. Coalescing maintenance kit (Champion No. CRNMK12) with filter elements, drain rebuild kit, drain tube, hose fastener, head o-rings, lube packet, and service reminder decal.

9. Coalescing oil filter: Provide Grade E cold coalescing oil removal filter. Oil filter shall extract oil and aerosols from supply air stream down to 0.008 ppm. This coalescing oil removal filter shall remove particulates greater than 0.01 microns in size; (Champion Option F).

10. Controls:
   a. I-Controller level 1: Provide controls with on/off switch, dew point temperature indicator, Power-on light, and time drain.

D. Accessories:

| 1. Panel Mounted Gauges: Champion No. Option F |
| 2. High Temperature Alarm: Champion No. Option D |
| 3. Coalescing Oil Filter: Champion No. Option F |
| 4. Dryer Maintenance Filter Kit: Champion No. CRNMK2 |
| 5. Coalescing Maintenance Filter: Champion No. CRNMK12 |
| 6. I-Controller, Level 1 |

E. Utility Requirements:

1. Electrical:
   a. Connection Requirements | Unit
      | Voltage: 208 |
      | Phase: 1   |
      | HP: 1/6    |
      | Amps: 2.2  |
   b. Connection Type          | Provide standard grounded receptacle

F. Finish: Durable enamel in manufacturer’s standard color
2.05 DRYER, AIR, REFRIGERATED, NON-CYCLING, 50 CFM
Equipment Identifier: 8508

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

| a. Champion                        |
| b. Princeton, IL (866) 276-3440    |
| c. Model No.: CRN50 with accessories |

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may* be considered as equal.

| a. Ingersoll Rand, Davidson, NC (704) 655-4000 |
| b. Quincy Compressor, Quincy, IL (251) 937-5900 |

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>a. Equipment</td>
</tr>
</tbody>
</table>

2. Weight: 152 pounds

3. Capacity:
   a. 38 degrees F: 50 CFM
   b. 50 degrees F: 65 CFM

4. Maximum working pressure: 232 PSIG (Level 1 Controller standard)

C. Features/Performance/Construction:

1. Provide refrigerated air dryer of self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, moisture removal trap, internal wiring and piping, and full refrigerant charge.
2. Provide air inlet and outlet connections at same level and factory insulated.

3. Heat exchangers to consist of air-to-air and refrigerant-to-air coils. Provide centrifugal type moisture separator located at discharge of heat exchanger. Provide heat exchangers with automatic control system to bypass refrigeration system on low or no load condition.

4. Refrigeration unit of hermetically sealed type to operate continuously to maintain specified 38 degree Fahrenheit dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.

5. Provide dryer with air inlet temperature gauge, air inlet pressure gauge, ON/OFF switch, high temperature LED, status indicators, refrigerant gauge, and Level 1 controller.

6. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>120</td>
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<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>HP</td>
<td>1/4</td>
</tr>
<tr>
<td>b. Connection Type</td>
<td>Provide standard grounded receptacle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Plumbing:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Compressed Air:</td>
<td></td>
</tr>
<tr>
<td>Connection (inches)</td>
<td>1/2</td>
</tr>
<tr>
<td>Volume (CFM)</td>
<td>50</td>
</tr>
<tr>
<td>Capacity (PSI)</td>
<td>232</td>
</tr>
</tbody>
</table>

E. Finish: Durable enamel in manufacturer’s standard color

2.06 DRYER, AIR, REFRIGERATED, NON-CYCLING, 250 CFM
Equipment Identifier: 8535

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.
COMPRESSED AIR VEHICLE SERVICE

2. Alternate manufacturers: *Contingent upon compliance with these specification* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.

<table>
<thead>
<tr>
<th>a. Ingersoll Rand, Davidson, NC (704) 896-4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Quincy Compressor, Bay Minette, AL (251) 937-5900</td>
</tr>
</tbody>
</table>

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>32</td>
<td>32-1/5</td>
<td>38-1/2</td>
</tr>
</tbody>
</table>

2. Air capacity: 38 degrees F dewpoint: 250 CFM at 100 PSI, 100 degrees F ambient

3. Drain connection: 1/4 inch NPT(F)

4. Air connection: 1-1/2 inch NPT(M)

5. Maximum working pressure: 232 PSIG (Level 2 controller standard)

6. Weight: 476 pounds

C. Features/Performance/Construction:

1. Refrigerated air dryer of self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, moisture removal trap, internal wiring and piping, and full refrigerant charge.

2. Air inlet and outlet connections on the same side.

3. Heat exchangers to consist of multiple layers of press formed stainless steel. Unit shall contain a moisture separator located at discharge of heat exchanger.
4. Refrigeration unit of hermetically sealed type to operate continuously to maintain specified 38 degrees Fahrenheit dew point. House unit in powder coated steel cabinet provided with access door and/or panel for maintenance and inspection.

5. Panel mounted gauges: Provide dryer with air inlet temperature gauge, refrigerant suction pressure gauge, air outlet pressure gauge and refrigerant head pressure gauge, and a timed drain valve. (Champion Option R)

6. High temperature alarm with dry contacts. (Champion Option D)

7. Coalescing oil filter: Provide Grade E cold coalescing oil removal filter. Oil filter shall extract oils and aerosols from supply air stream down to 0.008 PPM. This coalescing oil removal filter shall remove particulates greater than 0.01 microns in size (Champion Option F).

8. Dryer maintenance filter kit (Champion: CRNMK24S) with separator element, drain, drain tube, hose fastener, wave spring, head o-ring, lube packet, and service reminder decal.

9. Coalescing maintenance kit (Champion CRNMK44S) with filter elements, drain rebuild kit, drain tube, hose fastener, head o-rings, lube packet, and service reminder decals.

10. Provide seismic bracing and anchorage to meet any local, state, and national codes and provisions.

D. Controls:

1. I-Controller Level 2: Provide controls with On/Off switch, power on light, and time drain.

E. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>Amps</td>
</tr>
</tbody>
</table>

b. Connection Type | Provide disconnect |

F. Finish: Durable enamel in manufacturer’s standard color
PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Check equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

B. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment as detailed or directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces. Install compressed-air equipment to allow maximum headroom unless specific mounting heights are indicated.

4. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

5. Install equipment to allow right of way for piping installed at required slope.

6. Install the following devices on compressed-air equipment:

   a. Thermometer, Pressure Gauge, and Safety Valve: Install on each compressed-air receiver.

   b. Pressure Regulators: Install downstream from air compressors, dryers, and filter assemblies.
c. Drain Valves: Install on aftercoolers, receivers, and dryers. Discharge condensate over nearest floor drain.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve(s) if required.

D. Connect piping to equipment with moving parts, except safety relief valve connections, with flexible connectors of materials suitable for service.

E. Connect compressed air and fluid tappings with shutoff valve and union or flange at each connection.

F. Install piping from safety relief valves to nearest floor drain.

G. Install electrical devices furnished with equipment but not specified to be factory mounted.

H. Ground equipment according to Division 26.

I. Install control wiring, in conduit, to field-mounted electrical devices. Connect wiring according to Division 26.

3.04 IDENTIFICATION

A. Identify compressed-air equipment system components. Comply with requirements for identification specified in Division 22.

3.05 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative for final acceptance.

3.06 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check for lubricating oil in lubricated-type equipment.
3. Check belt drives for proper tension.
4. Verify that air-compressor inlet filters and piping are clear.
5. Check for equipment vibration-control supports and flexible pipe connectors and verify that equipment is properly attached to substrate.
6. Check safety valves for correct settings. Ensure that settings are higher than air-compressor discharge pressure, but not higher than rating of system components.
7. Drain receiver tank(s).
8. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
9. Test and adjust controls and safeties.

B. Prepare written report documenting testing procedures and results.

3.07 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Startup and testing report shall be submitted to the Architect or designated representative.

1. Replace damaged and malfunctioning controls and equipment.
2. Test and adjust controls and safeties.
3. Testing Certification: Certify that specified tests, inspections, and procedures have been performed and certify report results. Include the following:
   a. Inspections performed.
   b. Procedures used.
   c. Test methods used.
   d. Results of tests.

B. Components shall be considered defective if they do not pass tests and inspections.
C. Prepare test and inspection reports.

3.08 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. 8020 Compressor, air, reciprocating, 5 HP, vertical receiver; 2 hours (minimum)

2. 8027 Compressor, air, reciprocating, duplex 5 HP, horizontal receiver, small; 1 hour (minimum)

3. 8238 Compressor, air, reciprocating, duplex 30 HP (x2), horizontal (large) receiver; 2 hours (minimum)

4. 8504 Dryer, air, refrigerated, non-cycling, 25 CFM; 0.5 hours (minimum)

5. 8508 Dryer, air, refrigerated, non-cycling, 50 CFM; 1 hours (minimum)

6. 8535 Dryer, air, refrigerated, non-cycling, 250 CFM; 1 hours (minimum)

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

C. Provide a Windows compatible movie file format recording on DVD disk of the training session. The DVD training movie can be of a live session or a produced training video.

END OF SECTION 11 11 13
SECTION 11 11 26 - VEHICLE WASH EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
   1. 3836 Washer, drive through, touchless, with reclamation (Ref Part 2.01)

B. Installation:
   1. General Contractor shall provide final connection of equipment to all utilities, including disconnects, floor, piping and conduit structures, with labor services and incidentals necessary for complete and operational equipment installation.
   2. Manufacturer’s Representative shall provide piping, wiring, and switching between equipment and roughed-in utilities and equipment connections. Installer is responsible for all system wiring and plumbing for a complete operation of wash equipment after installation.
   3. General Contractor shall coordinate all washer features which interface with building systems that are required beyond the roughed-in utilities and equipment disconnects between wash equipment components with the manufacturer before construction of building and approval of the manufacturer’s shop drawings.

1.02 QUALITY ASSURANCE

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of 5 years experience supplying specified equipment.

B. Manufacturer’s Representative:
   1. Installation: Provide a qualified manufacturer’s representative at site to supervise work related to equipment installation, check out, and start up.
   2. Training: Provide technical representative to provide training to Owner’s maintenance personnel in operation and maintenance of specified equipment.
   3. Service: Provide a qualified manufacturer’s representative to respond within 24 hours of a malfunction with the equipment during the warranty period.
C. Performance:

1. Manufacturer’s representative of the washer and water reclamation system shall be responsible for the design of a washer and reclaim that

2. The equipment shall satisfactorily wash up to approximately 30 vehicles per hour.

3. The amount of detergent used per vehicle to remove road film shall not exceed 0.4 gallons. The evaluation of the system capability to remove road film shall be determined only after the vehicles have dried after the washing has been completed.

4. The vehicle wash shall be able to remove most visible, heavy dirt accumulation and most of the road film from the owner’s vehicles when they are driven thru the washer at 50 feet per minute. No acids containing fluorides (HF or ABF) shall be allowed. The evaluation of the system capability to remove road film shall be determined only after the vehicles have dried after the washing has been completed.

5. Manufacturer or Supplier shall guarantee the control of any unpleasant odors created by the water reclamation system for the warranty period after final acceptance. Manufacturer or Supplier shall, as necessary, take whatever action is required, without cost to the owner, to correct any odor created by the wash system without the use of chemicals during the warranty period.

1.03 SUBMITTALS

A. Product Data: Submit Product Data in accordance with Division 1 of these specifications.

B. Operations and Maintenance Manual:

1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.

2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.

3. Description of system and components.

4. Schematic diagrams of electrical, plumbing, and compressed air system.

5. Manufacturer’s printed operating instructions.

6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.
C. Shop Drawings: Submit Shop Drawings in accordance with Division 1.

1.04 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance will be based on the technical requirements herein as determined by Owner and Architect.

1.05 WARRANTY

A. Warranty work against defects in materials, functions and workmanship specified herein shall be good for 1 year from substantial completion.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer’s recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.07 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer’s name, address, model number, serial number, and pertinent utility or operating data.
B. Label all piping in vehicle wash and water reclaim systems as to its function and flow directions.

C. All electrical equipment and materials shall be new and shall be listed by Underwriter’s Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer’s plant.

PART 2 - PRODUCTS

2.01 WASHER, TRUCK, DRIVE-THROUGH, TOUCHLESS, WITH RECLAMATION
Equipment Identifier: 3836

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

   a. Interclean Equipment, Inc.
   b. Ypsalanti, MI (734) 961-3300
   c. Model No.: LYUS-RB2-00

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.

   a. Red Arrow Manufacturing, Denver, CO (303) 375-0908x106
   b. Ross and White, Cary, IL (847) 516-3900
   c. Belanger, Inc., Northville, MI (248) 349-7010

B. General Description:

1. Scope of work:
   
   a. To furnish a completely automatic, touchless truck wash and water reclamation system which washes all types of vehicles used by fleet owners for front, roof, rear, both sides and chassis in drive-thru mode.
   
   b. The supplier is to be 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.
2. Wash system performance:
   a. Access to the wash bay through the overhead door entry shall be signaled by a red/green traffic light. When the bus wash system is active, the indicator shall remain red until the wash cycle has completed. Wash authorization shall be by a key pad reader provided by the Wash supplier.
   
b. Operation: The vehicle washer shall be actuated in cycle sequence by vehicles driven in a fixed path between tire guides at a slow speed (50 to 60 feet per minute) through the washing system. All washing operations and related water recycling operations shall by automatically activated by the vehicle (driving through).
   
c. The supplier is responsible to design the equipment to satisfactorily wash at least 30 vehicles per hour. The vehicle wash shall be able to remove most visible, heavy dirt accumulation and most of the road film from the owner's vehicles when they are driven thru the washer at 50 feet per minute. The amount of detergent used per vehicle to remove road film shall not exceed 0.35 gallons for each step. No acids containing fluorides (HF or ABF) shall be allowed. The evaluation of the system capability to remove road film shall be determined only after the vehicles have dried after the washing has been completed.
   
d. The system shall have a built-in feature to operate either with recycled water or with all fresh water as may be desired by the Owner. The arrangement of such option shall be shown on the engineering drawings to be submitted with the bid package. Switching between recycled and fresh water modes shall require no specialty tools and shall be accomplished in a matter of minutes.
   
e. The supplier is solely responsible for the equipment performance. Should the equipment not perform, as per these specification requirements, the supplier shall modify, add and/or alter the equipment supplied at his own expense until the performance is satisfactory. The owner shall approve all such changes. Should the performance criteria not be met after the changes, the supplier shall remove the system at no cost to the owner.
   
f. The vehicle wash system to be capable of washing all vehicles up to 12 feet in height including the following:
   
1) Cars, pick-ups, and vans
2) Single axle or tandem axle dump trucks with or without attached plows and other equipment
3) Utility trucks with or without attached ladders and other equipment

3. Water reclamation performance:

a. The water reclamation system shall be capable of reclaiming water from the vehicle washer and process it by means of settling pits, in-line filters, centrifugal filter system, and bio-remediation system. The system must be able to continuously supply adequate amount of water for high-pressure pump regardless of traffic volume through the washer.

b. Washing trucks with salt: The reclaim system shall be able to be shut off and the truck wash system shall be able to operate with a fresh water supply.

c. Prior to final acceptance of the system by the owner, the supplier shall demonstrate the continuous operating capacity of the reclamation system in relation to the truck wash system by running (on manual override) both the high pressure wash system and the water reclamation system for a period of 60 minutes (without a pause). During the 60 minutes test no manual adjustments or overrides are allowed and no solenoid shall be allowed to fill the reclamation tank with fresh water should the sump pump capacity be not able to keep the recycled water tank full.

d. Regardless of technical specifications, the equipment supplier explicitly assumes the responsibility to design the water reclamation system for the intended purpose and has made themselves familiar with all performance requirements prior to bidding.

e. All equipment located outside the wash bay area including reclamation tank, high pressure pump, sump pump, aeration pump, booster pump, cyclonic separators and all float switches must be mounted on a single modular skid assembly.

f. The equipment module shall be tested for all plumbing connections (pressure tested), all electrical circuitry, pump rotations and for all component functions at the factory prior to shipping.

g. The odors must be kept in total control without the use of any chemicals. The guarantee that the system is built to control odors must remain valid after the final acceptance for the period of three years. Algae build-up in wash water that will results in objectionable odors is not acceptable to the Owner.

h. The above ground tank or tanks must be of self-cleaning type and shall be designed not to accumulate any dirt build-up.
i. Bio-Remediation system shall be included in total system design. The bio-remediation system shall be designed to eliminate and/or reduce the total load of hydrocarbon loading within the recycled water body. The system shall include and consist at least the following components:
   1) Enzyme dispensing system
   2) Accelerator dispensing system
   3) Dissolved oxygen and aeration system

C. Capacities/Dimensions:
   1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>1080</td>
<td>360</td>
<td>192</td>
</tr>
</tbody>
</table>

D. Features/Performance/Construction:
   1. Wash system technical specifications:
      a. Detergent arch components (two step):
         1) System shall have two chemical arches one acid based application system and one alkaline based application system.
         2) Timing of operation and position of the detergent arch shall be determined by manufacturer to provide optimum detergent penetration before high-pressure wash cycle.
         3) Detergent injectors shall be Inject-o-meter, InterClean DM or engineer approved equal with adjustable chemical injection ratio from 1:20 to 1:100. The ratio of detergent delivery (by the injector) has to be readable on the injector calibrated settings. The detergent injector must be of positive displacement type. Four chemical injectors are required for the two soap arches.
         4) The system shall have 3 HP water booster pump to ensure even water pressure under all circumstances.
         5) Detergent Arches shall be made a minimum of 1.00-inch stainless steel pipe compatible with used detergents and equipped with 25 pieces of adjustable swivel nozzle bodies with diaphragm check valve to evenly apply detergent, hot
water solution to front, rear, sides and roof of vehicle proceeding through the arch. The design of the detergent arches shall allow immediate activation of the nozzles upon arch activation by the vehicle.

6) Intensified Rear Detergent Feature: The rear of the vehicle shall be applied detergent via a separate, stainless steel rear wash arch which is activated immediately after the vehicle has passed through the detergent arch. The intensified rear detergent arch shall be controlled and operated via its own vehicle sensing device, solenoid valves, and chemical pumps as required for proper performance.

7) Activation: The detergent arches shall be activated by photo eye assemblies system mounted on the adjustable height steel frame located at the front of the detergent arch. The assemblies shall be able to be activated by all sizes of vehicles.

8) The chemical spray components located in the equipment room must be assembled in a modular, wall mounted assembly containing the following components:

a) Solenoid valves (four required)
b) Pressure gauge
c) Pressure regulator
d) In-line screen
e) Isolator ball valves for all components
f) Isolator ball valves to bypass water softener

9) Water softener for detergent arch - if the domestic water exceeds 3 grains of hardness, the equipment supplier shall include water softener as part of the package. Should the water softener not be needed, the supplier shall provide the owner testing results of water hardness being acceptable (3 grains or lower).

a) Water softener shall be dual resin tank design with flow capacity to meet the maximum flow demand from all four chemical pumping systems being on at the same time.
b) Resin tanks shall be equipped with flow meter, timer, and valve to allow for adjustable back wash
and recharge settings relating to total flow and hardness conditions at the site.

c) Brine tank shall be minimum 400 pound capacity with integral float and automatic operation.

10) Water Heater for detergent arch - Chemical arch shall be supplied soft water, heated by a 199,000 BTU gas-fired heater supplied as a part of the equipment package.

b. High pressure spinner:

1) High pressure cleaning shall be achieved using 12 rotating spinners mounted on one common self supporting arch assembly and one additional self mounted spinner on either side to additionally clean the wheels. Five spinners shall be mounted on each side of the arch for complete coverage of all shapes and sizes of vehicles including wheels and insides of the wheel wells.

2) The high-pressure arch shall be made of 2 inch Schedule 40 galvanized pipe. The spinner(s) position in relation to the vehicle shall be adjustable vertically and horizontally.

3) Three bottom spinners on both sides must be protected by 2 inch schedule 40 spinner protection guards. Should the vehicle jump the tire guide, spinners shall be protected (by the guards) by being able to swing aside by the vehicle impact. The supplier shall demonstrate to the owner the function of the spinner guard system.

c. Chassis wash system:

1) Chassis wash system shall have two of the specified or engineer approved spinners located in the center trench for effective under chassis cleaning. The chassis wash system shall consist of two spinners for each chassis module normal spray nozzles - stationary or oscillating - are not acceptable.

2) The chassis wash spinners shall be mounted in the pit trench by a removable (for cleaning purposes) modular skid assembly.

3) The removable chassis wash assembly shall be equipped with a protective plate at the bottom of the assembly to prevent a person accidentally stepping into the chassis wash spinner opening from further falling into the trench.
d. Spinners:

1) All spinners submitted for the approved equal must have been tested and passed a 5,000 hour continuous test run.

2) Each spinner to have four fully adjustable spray nozzles. The nozzles to be of zero degree type and be supported at the end of adjustable position elbows.

3) The rotational speed of the spinner is to be fully individually adjustable between 90 to 300 RPM. The rotational speed adjustment of the spinners to be arranged thru an internal oil pump. No free-floating oil pump gears without center shaft supports are acceptable.

4) The high pressure water seal in the spinner shall be of the mechanical seal type.

5) The zero degree nozzles shall be standard Spraying Systems nozzle and shall be equipped with air jet nozzles. Zero degree water to pass thru the secondary orifice, which is a minimum of 3 inches long and has eight openings for air intake at the joint of the spray nozzle and air jet nozzle. Air jets and nozzles must be made of stainless steel. The spinners not equipped with air jet nozzles are not acceptable.

6) The spinner inlet hookup must be a minimum of 1 inch (stainless steel). Spinners equipped with smaller inlet hook-ups are not acceptable. The spinner shall be protected by spinner guards as specified herein.

7) Spinner assembly shall have no periodic maintenance or lubrication requirements.

e. Spinner adjuster tool:

1) The adjuster tool to set all four spinner elbows in an exact, pre-determined angle (position) shall be supplied with the system.

2) Tool shall allow adjusting the spinner elbow angles in precisely same (angle to be determined) position without removing the spinners from the arch.

f. Intensified rear wash system:

1) The Intensified Rear Wash System shall be activated after the vehicle passes the high pressure spinner arch. The separate rear wash arch shall be made of minimum of 2
inch schedule 40 galvanized piping with an output of a minimum of 240 GPM at 300 PSI.

2) The supplier shall guarantee that the rear of the vehicle passing through the system at the speed of 50 feet per minute shall be cleaned equally effectively as the rest of the vehicle.

3) The rear wash arch shall be activated only for the rear of the vehicle and shall immediately (automatically) shut off after the vehicle has passed.

4) The rear wash shall utilize a co-axial three-way valve with the following features:
   a) The valve shall utilize a control tube that moves linearly along the same axis as the fluid flow.
   b) The valve shall pressure balanced so that operation is unaffected by inlet pressure or pressure fluctuations.
   c) Designed cycle life for the intended application shall be minimum of 500,000 cycles.
   d) Adjustable switching time 150 to 2,000 milliseconds.
   e) The valve shall have wear-compensating seats

5) The rear wash arch shall use either rotating spinners, oscillating zero degree nozzles or other supplier selected method for effective rear wash arrangement. The rear wash arch shall be totally separate and independent from the high-pressure spinner arch. The supplier is solely responsible for the performance warranty regardless of the chosen method.

g. Pumping module:

1) The high-pressure pump is of the centrifugal diffuser type and shall be capable of producing pressures up to 320 PSI. The pump shall deliver a maximum flow of 300 GPM as determined by the nozzle sizes incorporated in zero degree spinners.

2) Casing: The suction casing shall be 3.0 inch, 250 pound ANSI flat faced flanged. It shall be oriented to right angles of the vertical center line when viewed from the drive end. The discharge shall be 2.5 inch 600 pound ANSI raised face flange oriented on the vertical center line. The
suction casing, discharge casing, stage casings, and diffusers shall be made of ductile iron free from blow holes, sand pockets, or other detrimental defects. Flow passages shall be smooth to permit maximum efficiency. Pump shall be equipped with external tie bolts to hold the radially split casing sealed by 'O' rings. The casing shall be capable withstanding the hydrostatic test pressure 150 percent of maximum pumping pressure under which the pump could operate at the designed speed.

3) Impellers: The impellers shall be of the enclosed single suction type, hydraulically balanced to minimize axial thrust loads. Each impeller shall be individually keyed to the shaft. Impeller shall be bronze

4) Stuffing box: Packed type stuffing boxes shall be equipped with a mechanical seal.

5) Shaft sleeves: The shaft sleeve through the stuffing box shall be 11 to 13 percent chrome stainless steel hardened to a minimum of 225 Brinnel and shall be keyed to shaft.

6) Shaft: The shaft shall be standard carbon steel adequately sized for transmitted loads.

7) Bearing: The bearings are designed for an average life of 50,000 hours. The outboard bearing is a deep groove type; the in board bearings are of the radial roller type with grease fittings.

8) Base: A steel base plate shall contain the mounting of the pump and motor, which shall be carefully aligned and bolted in place prior to shipment. Final alignment shall be checked and certified after installation and prior to operation by the user.

9) Coupling: The pumping module shall have a “Jaw” type coupling as manufactured by Lovejoy or equal and shall include a coupling guard.

h. Electric motor:

1) The electric motor shall be of the squirrel cage induction type suitable for across the line starting. Motor shall operate on 460 VAC, 3 phase, 60 cycle and be ODP with a 1.15 service factor.

2) The motor shall be sized so as not to exceed the name plate rated power during operation. The motor should be a minimum of =75 HP.
3) The motor shall be certified by the manufacturer for 25 activations per hour.

i. Final rinse arch:

1) Timing of operation and position of the rinse arch shall be determined by manufacturer to provide optimum rinse penetration after high-pressure wash cycle.

2) Final Rinse Arch shall be made a minimum of 1.00 inch stainless steel pipe and equipped with 25 pieces of dual, adjustable swivel nozzle bodies with diaphragm check valve to evenly apply fresh water rinse to front, rear, sides, and roof of vehicle proceeding through the arch.

3) Activation: The rinse arch shall be activated by a photo eye assembly system or approved equal mounted on an adjustable steel frame located at the front of the final rinse arch.

j. Electric control panel and components:

1) The panel and controls must be built according to these specifications. No substitutions shall be allowed. The control system shall be PLC based with separate HMI.

2) The PLC shall be the process application controller and provide near real time control of the entire wash system. It shall be connected to distributed I/O via an Ethernet network. The operator interface shall be through a separate HMI not integral to the PLC, connected to the PLC via Ethernet.

3) The PLC shall be panel mounted in a 48”x36”x12” electrical enclosure, which also houses the electrical controls for the wash system. The PLC may be mounted in its own enclosure in an office environment. The PLC provides the centralized infrastructure to enable simple and complete integration with other systems.

4) The PLC and HMI programs shall be developed and provided by the bidder. These programs shall include the specified wash components and provide capacity for future expansion. The PLC program shall be provided in RSLogix 5000 v20 and the HMI program shall be provided in RSView ME v6.1

5) PLC and HMI programs shall provide the following:
a) GUI shall be intuitive to use by people without computer experience. Little or no training should be required.

b) At program start up, all devices shall be initialized to a known state.

c) All system settings, such as baud rates, parity, comm. port configurations, etc shall be reconfigurable without necessitating recompiling the application software.

d) All user configurable settings shall be stored in the PLC and/or HMI and saved to their respective SD cards. These include all timing set points, alarm settings, and communication settings.

e) Periodic polling of I/O shall be every 20 ms or less.

f) Alarms should have user configurable delays to prevent nuisance tripping.

g) Latency: scanning interval for all closed loop processes should be executed <20 ms.

h) Provide terminal windows for spying on any devices communicating to PC via Ethernet, RS232, etc. These will be used for troubleshooting communications problems.

i) Failure of any single component shall result in disabling the entire wash. For example, the system will not be allowed to wash vehicles in a crippled state if a chemical pump motor overload trips.

6) The Industrial Control Panel shall be manufactured and evaluated in accordance with the Underwriters Laboratories, Inc. (UL) standard 508A (Industrial Control Panels). In addition, the panel shall be evaluated for high-capacity short circuit withstand and shall bear the appropriate UL marks including the short circuit withstand value mark as part of the official UL label.

7) The industrial Control Panel shall be designed for operation on a 460 Volt, 3 phase, 60 Hertz system, with a short circuit capacity of 65,000 amperes RMS Symmetrical available at the incoming line terminals of the control panel.

8) The Industrial Control Panel shall be designed to meet the requirements of the National Electric Code (NEC) Articles
430 and 670, also the National Fire Protections Association (NFPA) Standard 79 (Industrial Machinery).

9) E-Stop related operator controls, all push buttons, selector switches, pilot devices, system control and access functions must be by Touch Screen Operator Interface Terminal.

10) Electric Panels that are not UL approved are not acceptable.

11) The activation switches shall be designed to be activated by all fleet vehicles used by the owner. Each activator shall be pre-mounted and wired to a water tight junction box equipped with built-in drainage holes.

k. Tire guides:

1) Fabricated from 4 inch diameter hot dipped galvanized steel pipe headings supported at 5 feet intervals provide guide runs on both sides of the vehicle. The tire guide shall be for the full length of the wash system.

2) The system has angled entry at the entrance. Ends of rails are capped and all headings are smoothly finished to prevent tire damage. Brackets supporting pipe shall be made of minimum of 3/8 inch steel plate that are welded to concrete imbedded cleats or anchor bolted to the concrete.

l. Skid plates:

1) Provide flat, polished, 1/4 inch thick grade 304 stainless steel skid plates mounted flush to slab. Fasteners shall be flush with the skid plates.

2) Plates shall be nominally 3 feet, 0 inches wide tapering with tire guide angle to 2 feet, 0 inches wide at entrance to straight section of tire guides.

m. Illumination:

1) Illuminated signage directs the driver into the wash bay after a wash system is authorized. Entry signage shall be mounted outside at the entry side of the wash bay and shall be designed for outdoor use. Two lights shall be provided: Red “Wait” and green “Go.”

2) Provide 32 Illuminated LED lighting shall be spaced evenly from entrance to exit on both driver and passenger sides (16 lights each side). Lights shall blink in runway fashion...
to pace driver. LED lights shall be rated for use in a wet environment.

2. Water reclamation and treatment system specifications:

a. Sump pump:

1) Shall be self priming type for transferring water from sump pit to the above ground recycled water tank through the filtration system. Minimum capacity shall be 300 GPM of cleaned water.

2) The capacity of sump pump shall allow for the pressure losses from two cyclone separators used in series and GPM after the pressure losses shall be greater than or equal to the high pressure wash water usage.

3) The sump pump shall be designed to handle solids that will be found in the reclaimed wash water.

b. Cyclone separators:

1) Two (minimum) cyclone separator systems are to be used in series with at least one of them being in-line. The cleaned water from the first cyclone shall pass through the second cyclone separator to ensure maximum solid removal performance.

2) Cyclone centrifugal separators shall provide second and third stage filtration.

c. Cyclone solid removal:

1) Down flows (purge water from cyclone separators containing solids) from cyclones separators shall be pumped back to the exit end of the trench pit with a solid handling pump. The solid removal pumping shall be activated when cyclone separators need to be purged. Solid removal from cyclone separators by gravity alone shall not be acceptable.

d. Aeration system:

1) Aeration system shall provide air into the trench pit to prevent algae and odor build-up. Aerated water shall be evenly distributed throughout the bay trench even when the wash system is not operational. The system shall be designed to have no odors from algae. No odor masking deodorants or other chemical use to kill odors shall be allowed.
e. Stainless steel pump intake filter:

1) Stainless Steel Intake Filter Screen shall provide first stage filtration for sump pump intake. The pump intake filter shall be sized 0.015 inches or smaller.

2) The intake filter shall be made of stainless steel and shall have slotted orifices; wire mesh filters are not acceptable. Intake filter shall prevent any dirt from clogging the recycled water spray nozzles under all circumstances.

3) Intake filter screen shall be equipped with high-pressure air back wash system that is automatically activated by the reduced flow into the pump intake to remove potential contaminants from the filter surface.

f. Reclamation tank:

1) Reclamation water storage tank shall be made of linear low-density polyethylene with a minimum holding capacity to allow recycling a minimum of 300 GPM continuous operational flow. Size to be determined by wash system manufacturer to ensure adequate storage and supply.

2) The tank shall have conical bottom with minimum of 35 degree slope equipped with a 6 inch bottom manhole, float switch connections and other required fittings. The tank to be equipped with the steel support structure with 1/2 inch thick polyethylene continuous support for the cone part of the tank.

g. Fresh water tank:

1) Provide a 925 gallon tank to supply fresh water to the pump module.

2) Fresh water supply system shall include all valves and components to switch from using reclaim water to fresh water as the Owner desires.

h. Enzyme-Catalyzed Water Treatment System:

1) A biological water treatment system shall be included in total system design. This water treatment system, the Enzyme-Catalyzed Water Treatment System, shall be designed to eliminate and/or reduce the total petroleum hydrocarbon loading within the recycled water body. When used in conjunction with the specified recycling equipment, the systems shall remove both organic contaminants and inorganic particulate from the reclaimed water stream.
2) The Enzyme-Catalyzed Water Treatment System shall be equipped with an automatic product injection system for delivery of specialized biological products and enhancements. These biological products shall be specifically suited for wash water treatment applications, including degradation of petroleum hydrocarbon components commonly found in vehicle wash systems. This system shall treat the reclaim wash water generated during the vehicle wash process. The bulk of the treatment process shall take place in the wash water pit, where continuous biological treatment of organic wastes in the vehicle wash water shall occur.

3) The Enzyme-Catalyzed Treatment System shall deliver a constant supply of biological products, bio-enhancements, and oxygen to support degradation of organic constituents. The biological products and enhancements shall be injected directly into the circulation/aeration discharge pipeline of the recycling system, where they shall then subsequently be discharged into the wash water pit. Oxygen shall be provided by the aeration pumping and mixing system.

4) The automatic product injection system shall consist of low-flow injector pumps that inject biological products on a continuous basis. The injector pumps shall be:

a) Operating temp: 35 to 110 degrees F

b) Product flow rate: 0.5 to 1.5 liters per day, adjustable

c) Product delivery: Up to 10 feet of 3/8-inch diameter polyethylene tubing

d) Two 3/8-inch NPT polyethylene check valves

e) Two 3/8-inch compression fittings
E. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
<th>Wash</th>
<th>Water Softener</th>
<th>Water Heater</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
<td>Voltage</td>
<td>460</td>
<td>120</td>
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<tr>
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<td>Phase</td>
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<tr>
<td></td>
<td>Amps</td>
<td>215</td>
<td>20</td>
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</tbody>
</table>

|  | Air Comp. | Traffic Signal |
|---|---|---|---|---|---|---|
| Voltage | 120 | 120 | --- |
| Phase | 1 | 1 | --- |
| Amps | 20 | 20 | --- |

b. Connection Type: Provide disconnect

2. Plumbing:

| a. Domestic Water: | Connection (inches) | 2 |
|---|---|
| Capacity (PSI) | 30 to 80 |

b. Natural Gas:

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c. Compressed Air:

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<tbody>
<tr>
<td>Volume (CFM)</td>
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<tr>
<td>Capacity (PSI)</td>
<td>90</td>
</tr>
</tbody>
</table>

3. Mechanical:

| a. Venting: | Connection (inches) | 8 |
|---|---|

F. Finish: All fabricated sections of the washer frame and miscellaneous structures shall be hot dip galvanized after fabrication per ASTM A123 or A385. Metallic surfaces not suitable for galvanizing shall be coated with 95 percent zinc primer and covered with industrial grade enamel. All erection bolts shall be plated Grade 5.
PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

C. Report in writing to the Architect, any damaged, missing or incomplete scheduled equipment, and improper rough-in work or utility stub-outs.

3.02 INSTALLATION

A. Manufacturer’s representative shall be responsible for complete operational equipment installation.

B. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

C. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

D. Manufacturer shall provide an initial fill of all soap and solution tanks with the recommended brand of chemicals. A list of all recommended chemicals shall be provided to the owner.

3.03 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specification in the presence of the Architect or designated representative using acceptance procedures provided by
the manufacturer. Testing report shall be submitted to the Architect or designated representative.

B. Each washer shall be performance tested by consecutively washing, without human assistance and without Manufacturer’s representative personnel involvement, up to about 5 vehicles of owners choosing within 15 minutes.

C. Prior to final acceptance of the Vehicle Wash Equipment by the Owner, the Manufacturer’s Representative shall demonstrate the continuous operating capacity of the Reclamation System in relation to the Wash Equipment. During the 60-minute test, no manual adjustments or overrides are allowed and no solenoid shall be allowed to fill the reclamation tank with fresh water should the sump pump capacity be not able to keep the recycled water tank full.

D. Equipment shall not damage vehicles, including mirrors, windshield wipers and windows, or equipment itself.

E. Malfunctions during testing shall be corrected within 5 days and re-tested. Malfunctions during second testing shall be corrected within 5 days and re-tested.

F. Inadequate Performance: If equipment fails third test, Owner may elect to have all specified Vehicle Wash Equipment and any associated water reclamation system removed from site at no cost or obligation to Owner.

G. The vehicle air dryer must be able to dry off a line of consecutive vehicles going through the wash with no more than 6 feet separating each vehicle. If the wash system is unable to perform the above requirements, it is not acceptable.

H. All damage to the machine that is incurred as a result of the test shall be the responsibility of the manufacturer/supplier.

I. Vehicle was equipment shall not damage vehicles, including mirrors, windshield wipers or windows, or the equipment itself.

J. Inadequate performance: If equipment fails the third test, Owner may elect to have all specified vehicle wash equipment and any associated water reclaim system removed from site at no cost or obligation to the Owner.

3.04 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).
3.05 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in *operation and maintenance* of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. 3836 Washer, drive through, touchless, with reclamation; 8 hours (minimum)

B. Obtain, from technical representative, a list of Owner’s personnel trained in equipment operations and maintenance.

END OF SECTION 11 11 26
SECTION 11 11 29 - VEHICLE SHOP EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:

1. 2496 Reel, electric, quad receptacle (Ref Part 2.01)
2. 2610 Drill press, variable speed, 20 inch (Ref Part 2.02)
3. 2837 Vise, 6-1/2 inch (Ref Part 2.03)
4. 3718 Washer, high pressure, hot water, NG, 4 GPM (Ref Part 2.04)
5. 5442 Lift, parts, straddle (Ref Part 2.05)

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, wiring, and switching between equipment and utilities.

1.02 QUALITY ASSURANCE

A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years’ experience supplying specified equipment.

B. Manufacturer’s Representative:

1. Installation: Provide a qualified manufacturer’s representative at site to supervise work related to equipment installation, check out, and start up.

2. Training: Provide technical representative to provide training to Owner’s maintenance personnel in operation and maintenance of specified equipment.

1.03 SUBMITTALS

A. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

2. Restrict submitted material to pertinent data. For instance, do not include manufacturer’s complete catalog when pertinent information is contained on a single page.
B. Operations and Maintenance Manual:

1. Submit Operations and Maintenance Manuals in accordance with Division 1 - General Requirements of these specifications.

2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.

3. Description of system and components.

4. Schematic diagrams of electrical, plumbing, and compressed air system.

5. Manufacturer’s printed operating instructions.

6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information shall indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings:

1. Submit Shop Drawings in accordance with Division 1 - General Requirements of these specifications.

2. Submit site specific installation drawings and procedures.

1.04 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.05 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.
E. All parts shall be readily available locally in the United States.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.07 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer’s name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter’s Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer’s plant.

PART 2 - PRODUCTS

2.01 REEL, ELECTRIC, QUAD RECEPTACLE

Equipment Identifier: 2496

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified by manufacturer’s name and model to establish acceptable standards of quality, performance, features and construction.

   a. Cox Reels
   b. Tempe, AZ (800) 269-7335
   c. Model No.: PC13-5012-B

2. Alternate manufacturers: Contingent upon compliance with these specification and documentation requirements set forth in SUBMITALS equipment produced by other manufacturers may be considered as equal.

   a. Appleton, Rosemont, IL (800) 621-1506
B. Capacities/Dimensions:

1. Overall reel dimensions, nominal:

<p>| Dimensions (inches) |</p>
<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>8-1/2</td>
<td>13-1/2</td>
</tr>
</tbody>
</table>

2. Reel diameter: 11.25 inches

3. Weight: 40 pounds

C. Features/Construction:

1. Reel:
   a. Construction: Frames, discs, and drum shall be fabricated of heavy gauge steel.
   b. Cable guide arm: Reel cable guide arm shall be adjustable. At the cable opening of the guide arm, the cable shall run over acetyl resin (POM).
   c. Ball stop: Adjustment of cable extension length shall be permitted by ball stop.
   d. Rewind mechanism: Reel spring shall be enclosed and fastened to reel drum with a reinforcing clip, and rewind speed damper.
   e. Bearings and ratchet latch: Reel shall have a ring block assembly and extra-large ratchet latch with audible cable position lock.

2. Cable shall be type 16/3 SJOOW-A and 50 feet in length.

3. Plate shall be constructed of 1/4 inch steel.

D. Utility Requirements:

1. Electrical:

   a. Connection Requirements | Unit
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>115</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>Amps</td>
<td>20</td>
</tr>
</tbody>
</table>

   b. Connection Type | Provide standard grounded receptacle
E. Finish: Durable enamel in manufacturer’s standard color

2.02 DRILL PRESS, VARIABLE SPEED, 20 INCH
Equipment Identifier: 2610

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.

| a. Clausing Industrial |
| b. Kalamazoo, MI (800) 323-0972 |
| c. Model No.: 2277 with accessories |

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, *may be considered as equal.*

| a. WMH Tool/Wilton, La Vergne, TN (615) 793-8900 |
| b. Dake Machine, Grand Haven, MI (800) 937-3253 |

B. Capacities/Dimensions:

1. Overall dimensions, nominal:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
</tr>
<tr>
<td>a. Equipment</td>
</tr>
</tbody>
</table>

2. Working dimensions:

a. Chuck to table: 33-1/8 inches

b. Chuck to base: 43-3/8 inches

3. Table working surface:

a. Width: 22 inches

b. Depth: 19-1/2 inches

c. Tilt range: 90 degrees to left and right
4. Base working surface:
   a. Width: 15-1/2 inches
   b. Depth: 13 inches

5. Motor: 1.5 HP

6. Speed: 150 to 2,000 RPM (Variable speed)

7. Capacities:
   a. Spindle: 3MT, 1.74 inches
   b. Spindle travel: 6-1/2 inches
   c. Drill to center of circle: 20 inch diameter
   d. Hand feed: 1.25 inch diameter
   e. Column: Ground steel, 4 inches diameter and 1/2 inch wall thickness

C. Features/Performance/Construction:

1. Speed control shall permit positive speed changing while machine is running and hold speed setting constant under all load conditions.

2. Belt drive shall remain aligned and automatically maintain full power transmission to spindle at all times.

3. Work table shall have slots, side ledges, and machined front apron with mounting holes shall be provided for clamping of work with mounting holes.

4. Tilt table shall have scale to provide accurate readings to 90 degrees right and left with index pin at level and 45 degrees left and right positions.

5. Table lock shall have expanding bushing to provide rigid positioning of tables at any angle.

6. Hand gear crank shall be provided for table adjustment.

7. Safety features shall include self-ejecting chuck key and completely enclosed drive belt and pulleys.

8. Motor shall be totally enclosed fan-cooled (TEFC).


10. Provide Arbor adapter (Clausing No. 1898)
D. Controls:

1. Push-button switch shall include shrouded START button and protruding STOP button. Switches and other electrical controls shall meet applicable National Electrical Code requirements.

2. Depth control shall be self-locking adjustable feed depth stop.

3. Function controls shall provide manual speed selection and feed via knobbed spoked wheels.

E. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>HP</td>
</tr>
<tr>
<td>Amps</td>
</tr>
<tr>
<td>b. Connection Type</td>
</tr>
</tbody>
</table>

2.03 VISE, 6-1/2 INCH
Equipment Identifier: 2837

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

   a. Wilton Tools
   b. La Vergne, TN (615) 793-8900
   c. Model No.: Tradesman 63201-1765

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Ridgid Tool Co., Elyria, OH (800) 474-3443
   b. Milwaukee Tool and Equipment Co., Brookfield, WI (414) 645-0200
B. Capacities/Dimensions:

1. Overall dimensions, nominal:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>20</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

2. Jaw width: 6-1/2 inches
3. Jaw opening: 6-1/2 inches
4. Throat depth: 4 inches
5. Weight: 71 pounds
6. Pipe capacity: 1/4 to 3-1/2 inches

C. Features/Performance/Construction:

1. Slide bar shall be machined steel and be oil port operable in machined channel.
2. Base shall swivel 360 degrees and have locking device.
3. Construction shall be 60,000 PSI tensile ductile iron and have spindle and nuts fully enclosed.
4. Jaws shall have replaceable facings.

2.04 WASHER, HIGH PRESSURE, HOT WATER, NG, 4 GPM
Equipment Identifier: 3718

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimum acceptable standards of quality, features, performance, and construction.

| a. Hotsy Corporation  
| b. Camas, WA (360) 834-0983  
| c. Model No.: 945N with accessories |

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>47-1/2</td>
<td>21</td>
<td>51</td>
</tr>
</tbody>
</table>

2. Net weight: 545 pounds

3. Operating pressure: 2,000 PSI

4. Maximum discharge capacity: 4 GPM

C. Features/Performance/Construction:

1. Burner: NG fired, 365,000 BTU/hr minimum capacity, AGA-listed gas controls, ring type with aspirating spuds, natural draft.

2. All open flames and fire rings shall be mounted at minimum of 18 inches above the finished floor.

3. Heating coil: Vertically-fired; 7/8 inch OD, hydrostatic-pressure tested; 17,500 PSI burst-rated.

4. Water pump: Triplex water pump with positive displacement, ceramic plungers, brass manifold, and oil bath crankcase.

5. Fabrication: Welded angle iron frame shall have heavy gauge tank and cabinet.

6. Piping: Supplier shall provide 1/2 inch OD piping ASTM-A-312 Schedule 80 stainless steel piping. Provide ANSI/ASME B 31.3 stainless steel fittings. Provide piping from high-pressure wash unit to each trigger gun wand for a complete and operable system.

7. Manufacturer shall supply all necessary soap system equipment including piping, fittings, distribution hose, and connections for a complete and operable soap distribution system.

8. Shall have a time delay shut down.

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Landa, Inc., Camas, WA</td>
<td>(360) 833-9100</td>
</tr>
<tr>
<td>b. Alkota Cleaning Systems, Inc., Alcester, SD</td>
<td>(800) 255-6823</td>
</tr>
</tbody>
</table>
D. Controls: Adjustable temperature controller, safety pressure relief valve, pressure switch, ON/OFF electric motor switch with overload protection, unloader, water heater switch, detergent valve and automatic, non-contaminating float valve.

E. Accessories:

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scabbard</td>
<td>Hotsy No. 87088810</td>
</tr>
<tr>
<td>2</td>
<td>Trigger gun</td>
<td>Hotsy No. 87512140</td>
</tr>
<tr>
<td>3</td>
<td>50 foot hose</td>
<td>Hotsy No. 87391210</td>
</tr>
<tr>
<td>4</td>
<td>36 inch wand</td>
<td>Hotsy No. 87253890</td>
</tr>
<tr>
<td>5</td>
<td>Nozzle (154, 4,000 PSI hardened steel)</td>
<td>Hotsy No. 87087020</td>
</tr>
<tr>
<td>6</td>
<td>Quick coupler</td>
<td>Hotsy No. 87071020</td>
</tr>
<tr>
<td>7</td>
<td>360 rapid reel pivot reel</td>
<td>Hotsy No. 87504860</td>
</tr>
<tr>
<td>8</td>
<td>Remote starter</td>
<td>Hotsy No. 89169890</td>
</tr>
<tr>
<td>9</td>
<td>Remote starter, additional</td>
<td>Hotsy No. 89030140</td>
</tr>
<tr>
<td>10</td>
<td>Soap solenoid and switch</td>
<td>Hotsy No. 89169880</td>
</tr>
<tr>
<td>11</td>
<td>Additional nozzles (four pack, 0, 15, 25, 45 degrees, color coded, QC nozzles)</td>
<td>Hotsy No. 87087120</td>
</tr>
<tr>
<td>12</td>
<td>Draft diverter</td>
<td>Hotsy No. 87177280</td>
</tr>
<tr>
<td>13</td>
<td>Breakthrough detergent, 55 gallons</td>
<td>Hotsy No. 89053900</td>
</tr>
<tr>
<td>14</td>
<td>Powershine plus detergent, 55 gallons</td>
<td>Hotsy No. 89051800</td>
</tr>
</tbody>
</table>
F. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>HP</td>
</tr>
<tr>
<td>Amps</td>
</tr>
<tr>
<td>b. Connection Type</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Plumbing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Domestic Water:</td>
</tr>
<tr>
<td>Connection (I.D. inches)</td>
</tr>
<tr>
<td>Flow Rate (GPM)</td>
</tr>
<tr>
<td>Capacity (PSI)</td>
</tr>
<tr>
<td>b. Natural Gas:</td>
</tr>
<tr>
<td>Connection (inches)</td>
</tr>
<tr>
<td>Capacity (BTU/Hr)</td>
</tr>
<tr>
<td>Gas Pressure (W.C.I)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Mechanical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Venting:</td>
</tr>
<tr>
<td>Connection (inches)</td>
</tr>
<tr>
<td>Volume (CFM)</td>
</tr>
</tbody>
</table>

G. Finish: Powder coating in manufacturer’s standard color

2.05 LIFT, PARTS, STRADDLE
Equipment identifier: 5442

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.
2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

<table>
<thead>
<tr>
<th>Alternate Manufacturer</th>
<th>Contact Information</th>
<th>Model No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Pflow Industries, Inc.</td>
<td>Milwaukee, WI (414) 552-9000</td>
<td>Series M VRC</td>
</tr>
<tr>
<td>a. Colorado Custom Elevator and Lift, Inc.</td>
<td>Grand Junction, CO (970) 245-4472</td>
<td></td>
</tr>
<tr>
<td>b. Essex-Rise Corporation, West Callwell, NJ (973) 575-7483</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Capacity/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>96</td>
<td>84</td>
<td>280</td>
</tr>
</tbody>
</table>

2. Vertical travel: 14 feet

3. Lift platform: The vertical reciprocating lift platform, also known as usable carriage, shall have steel deck plate and 48 inches high welded handrails and kick plates on non-operating ends and safety chains with snap hooks on operating ends.

4. Effective carriage length: 84 inches

5. Effective carriage width: 72 inches

6. Load height: 84 inches

7. Capacity: The vertical reciprocating lift shall be rated at a live load capacity of 3,000 pounds

8. Operating levels: Two

9. Operating configuration: “Z” pattern and “C” pattern, front load, rear unload, right side mechanical

10. Speed: The vertical reciprocating lift shall have a lifting speed of 25 to 30 feet per minute when loaded to capacity.
C. Features/Performance/Construction:

1. Support columns: The vertical reciprocating lift shall have a minimum of two, 6-inch wide, roll formed support columns.

2. Deflection under load: When loaded to rated capacity, no portion of the vertical reciprocating lift shall exhibit permanent deformations.

3. Lifting means:
   a. Raising and lowering of the carriage shall be provided by dual two-inch ram direct acting hydraulic cylinders. Sheaves, wire ropes, or chains are not to be incorporated in the lifting means.
   b. An adjustable mechanical stop and pressure switch act to limit the upward travel of the lift platform to a height flush and level with the upper floor. The pressure switch shall be designed and set to allow full buildup of hydraulic pressure to secure the lift platform in place and prevent bounce during loading or unloading.

4. Safety enclosure:
   a. Provide safety enclosure on all non-operating sides of VRC extending continuously from lowest service level to minimum 8 feet high above top service level, and fabricated using 18 gage flattened expanded metal panels which reject a ball [1/2 inch] [2 inches] in diameter, set in steel angle framing with minimum 1-1/2 inch legs. Finish to match carriage panels.

5. Floor level gates: Gates are required on all operating sides of the vertical reciprocating lift at each level of operation.
   a. The gates shall be vertical acting type.
   b. Each gate must be equipped with an electro-mechanical interlock to prevent opening of the gate unless the carriage is present, and to prevent operation of the vertical reciprocating lift unless all gates are closed.

6. Signs: "NO RIDER" signs shall be provided. Lettering shall be a minimum of 2 inches high for visibility.

D. Controls:

1. Each operating floor level shall be equipped with a momentary contact push button control station with call, send, and mushroom style e-stop operators for manual control of lift operation.

2. An internally pre-wired main control panel shall be provided with step-down transformer and field wiring terminal block.
3. The motor/pump unit shall be pre-wired to the main control panel.

4. Power source: A disconnect shall be installed within 10 feet of the location designated for installation of the vertical reciprocating lift.

E. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>HP</td>
</tr>
<tr>
<td>Amps</td>
</tr>
<tr>
<td>b. Connection Type</td>
</tr>
</tbody>
</table>

1. All motors shall be designed for continuous duty at ambient temperatures from 32 degrees to 102 degrees F.

F. Finish: Paint with standard Pflow Blue industrial enamel. Prior to painting, all dirt, mill scale, oil, and grease shall be removed from carbon steel surfaces by a combination of brushing, wiping, and use of solvents. Clean surfaces to SSPC-SPC.

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather.

C. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.
2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.04 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.05 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner’s maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. 3718 Washer, high pressure, hot water, NG, 4 GPM; 2 hours (minimum)

2. 5442 Lift, parts, straddle; 2 hour (minimum)

B. Obtain, from technical representative, a list of Owner’s personnel trained in equipment operations and maintenance.

END OF SECTION 11 11 29
PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section. This section covers existing Adams County-supplied equipment that shall be relocated and installed by the Contractor as specified herein.

1.01 WORK INCLUDED

A. Existing equipment items as listed in the Equipment Schedule Table on Equipment Drawings with an equipment identification number (ID) having 5 digits and noted under “Furnish/Install” column in this table as being “Owner Furnished and Contractor Installed” (OF/CI) shall be relocated and installed by the contractor.

B. Disconnection, cleaning, removal, transport, and re-installation of existing equipment located at other facilities with labor, services, and incidentals necessary for complete and operational equipment re-installation.

1.02 QUALITY ASSURANCE AND CONDITION DOCUMENTATION

A. Existing Equipment shall be tested and certified as operational and safe by the Adams County prior to removal by the contractor or his agents.

B. Adams County’s staff to note all existing defects, and damage to existing equipment to be relocated and provide this document to the Contractor. Defects shall include, but not be limited to, noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

C. Contractor to ensure that only qualified, licensed and certified equipment installers are involved in the relocation process. Contractor is responsible for equipment during removal, relocation, installation, testing, and until building is occupied by Adams County.

D. Contractor to coordinate directly with the Owner on relocation timeframe and schedule. Relocation will not be scheduled before new facility is considered substantially complete, with exception of equipment specified herein in order to maintain the Adams County’s current operation.

1.03 SUBMITTALS

A. Contractor shall submit a schedule for equipment relocation no less than two months before any relocation is required. Adams County must approve relocation and installation schedule.

B. Drawings for existing equipment shall be required where re-installation is provided by the original equipment manufacturer.
1.04 IMPACT ON ORIGINAL WARRANTY

A. The Contractor is responsible for all aspects of relocation including coordination with Original Equipment Manufacturer on the impact of existing equipment still under original warranty.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. A relocation and transport plan listing each item in Part 2.0 requiring reinstallation by the contractor must be submitted to the Adams County’s Representative. Plan shall be developed by the Contractor and must convey a complete understanding of required utility disconnection and reconnections and responsibility; crating, transportation, and tie-down methods; and temporary storage methods if required.

B. Contractor is responsible for constructing or providing any necessary or special crates or packing materials to ensure that equipment is protected during transport or shipment and storage in humid and/or dusty conditions.

C. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

D. Contractor is responsible for providing any required specialized personnel or equipment manufacturer/supplier representatives required for re-installation of existing equipment.

PART 2 - PRODUCTS

2.01 RELOCATION, TRANSPORTATION, AND RE-INSTALLATION

A. Each of the Existing Equipment items listed below has been designated as an Owner Furnished/Contractor Installed item. This indicates that the item may require special utility connections, special transportation, or special expertise to successfully re-install the existing equipment.

1. 1755 Table, work, cutting
2. 21501 Oil filter crusher
3. 35551 Washer, parts
4. 37161 Pressure washer, hot water
5. 56401 Lift, parallelogram, 50,000 pound
6. 57101 Lift, 10,000 pound
7. 57102 Lift, 10,000 pound

B. The Relocation Plan shall be developed by the Contractor and must convey an understanding of utility disconnection and reconnection methods and
responsibility, transportation and tie down method, and temporary storage methods if any.

C. Contractor is solely responsible for the security, safety and operation of all Existing Equipment during relocation.

D. Existing Equipment Schedule: Reference Equipment Layout Drawings for final installation instruction and other directives delineated on the drawing.

2.02 EXISTING EQUIPMENT SCHEDULE

A. Reference Equipment Layout Drawings for final installation instruction and other directives delineated on the drawing.

B. Relocation shall be completed following an approved schedule submitted by Contractor no less than two months before said relocation. No relocation shall be started before the project is substantially complete and Adams County’s move-in is imminent, unless approved by Adams County or Adams County’s Representative.

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with existing equipment to be installed.

B. Inspect existing equipment transported from other sites for damage from shipping and exposure to weather. Compare delivered equipment with document prepared by the Owner noting any pre-existing defects. Contractor and Adams County’s Representative to resolve any differences to this list prior to re-installation and again upon completion of re-installation for each item.

3.02 INSTALLATION

A. Perform work under direct supervision of Construction Superintendent with authority to coordinate re-installation of existing equipment with Architect, and Owner’s Representative.

B. Install equipment in accordance with manufacturer's instructions where available:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment as required by existing equipment or as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
C. Upon completion of work, finish surfaces shall be free of any new (not previously noted) tool marks, scratches, blemishes, and stains.

3.03 TESTING

A. After final connections are made and prior to authorizing payment, re-installed existing equipment shall be tested to ensure re-installation has resulted in a complete and operable equipment item. This test should take place in the presence of the Adams County’s Representative, the Architect or designated representative. Where available, the test should be conducted using acceptance procedures provided by the manufacturer.

3.04 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or Adams County’s Representative for acceptance observation.

END OF SECTION 11 11 40
SECTION 11 24 19 - VACUUM EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:
   1. 3464 Reel, vehicle exhaust, spring operated, individual fan, with six inch hose (diesel, CNG) (Ref Part 2.01)
   2. 3470 Rail system, vehicle exhaust, four six inch hose (unleaded) (Ref Part 2.02)
   3. 3471 Rail system, vehicle exhaust, six inch hose (unleaded) (Ref Part 2.03)
   4. 3610 Vacuum, canister, stainless steel (Ref Part 2.04)

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, ductwork, wiring, and switching between equipment and utilities.

1.02 QUALITY ASSURANCE

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

B. Manufacturer's Representative:
   1. Installation: Provide a qualified manufacturer's representative at site to perform work related to equipment installation, check out and start up.
   2. Training: Provide technical representative to train Owner's maintenance personnel in operation and maintenance of specified equipment.

1.03 SUBMITTALS

A. Product Data: Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

B. Operations and Maintenance Manual:
   1. Submit Operations and Maintenance Manuals in accordance with Division 1- General Requirements of these specifications.
2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.

3. Description of system and components.

4. Schematic diagrams of electrical, plumbing, and compressed air system.

5. Manufacturer’s printed operating instructions.

6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information shall indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings: Submit Shop Drawings in accordance with Division 1 - General Requirements of these specifications.

1.04 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.

A. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.05 WARRANTY

A. Warrant work specified herein for one year from acceptance by Owner against defects in materials, function and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts must be readily available locally in the United States.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and in humid, dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title of this specification.
C. Provide equipment with materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.07 LABELING

A. Manufacturer will securely attach in a prominent location on each major item of equipment a noncorrosive nameplate showing manufacturer’s name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter’s Laboratories, Inc. (U.L.) in categories for which standards have been set by that agency and labeled as such in the manufacturer’s plant.

PART 2 - PRODUCTS

2.01 REEL, VEHICLE EXHAUST, SPRING OPERATED, INDIVIDUAL FAN, WITH SIX INCH HOSE (DIESEL, CNG)

Equipment Identifier: 3464

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimum acceptable standards of quality, features, performance, and construction.

   a. Nederman, Inc.
   b. Westland, MI (313) 724-3344
   c. Model No.: 865, No. 20804865 with accessories

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in Section 01300 SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Plymovent, Cranbury, NJ (609) 395-3500
   b. Monoxivent, Rock Island, IL (309) 794-1000

B. Capacities/Dimensions:

1. Overall reel dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>46</td>
<td>31</td>
<td>33</td>
</tr>
</tbody>
</table>
2. Exhaust hose:
   a. Diameter: 6 inches
   b. Length: 33 feet
3. Exit duct: 12 inches
4. Exhaust fan:
   a. Air volume: 675 CFM
5. Drum storage capacity hose length: 29 feet, 6 inches

C. Features/Performance/Construction:

1. Exhaust hose drum:
   a. The exhaust hose drum, Nederman Model No. 20804865 shall consist of an aluzinc-lined metal cylinder bolted to two metal ends. Inside the drum there is a flexible 6-1/4 inch pipe which links the hose and the swivel.
   b. The stand shall consist of two aluzinc-lined supports and two aluzinc-plated steel tubes.
   c. The hose guide shall guide the hose on the first evolution of the drum.
   d. The connecting tube of aluminum, flexible, 6-1/4 inch diameter, 12 inch length, shall be used in a straight position when bends are needed in the duct system.

2. Exhaust fan:
   a. Each exhaust hose reel shall have an individual exhaust fan which shall be mounted to the ceiling or wall. The exhaust fan shall be Nederman series N27, No. 14510229
   b. Exhaust fan shall be centrifugal type fan constructed of powder coated steel.
   c. The exhaust fan shall be mounted to ductwork utilizing a fan mounting bracket, Nederman Model No. 14510126

3. Exhaust hose
   1) The hose, Nederman series NFC 4.2, No. 86900693, shall be constructed of high temperature fabric with an external steel helix. The steel helix shall have a plastic coating to prevent it from scratching vehicles.
2) The exhaust hose shall be resistant to temperatures of up to 800 degrees F continuously.

4. Hose stop Nederman Model No 20344476 shall be adjustable so that the hose will hang at any required height.

D. Controls:

1. Exhaust fan shall be wall mount fan starter with on/off switch. Nederman Model No 86900422.
   a. Telescopic lifting pole, Nederman Model No. 20374287 (one each per nozzle).

E. Accessories:

   a. 869006SP NFC 4.2 hose. Six inch by ten feet.
   b. 20948810 Quick Couplings set (two sets required per reel). 20 foot extension arm: Nederman 10507735
   c. 10374374 Duct kit for extension arm.

F. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
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<tr>
<td>Phase</td>
</tr>
<tr>
<td>HP</td>
</tr>
<tr>
<td>b. Connection Type</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Mechanical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Venting:</td>
</tr>
<tr>
<td>Connection (inches)</td>
</tr>
<tr>
<td>Volume (CFM)</td>
</tr>
</tbody>
</table>
2.02 RAIL SYSTEM, VEHICLE EXHAUST, FOUR INCH HOSE (unleaded)
Equipment Identifier: 3470

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimum acceptable standards of quality, features, performance, and construction.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>a.</td>
<td>Nederman, Inc.</td>
</tr>
<tr>
<td>b.</td>
<td>Thomasville, NC (800) 533-5286</td>
</tr>
<tr>
<td>c.</td>
<td>Model No.: 20916820 with accessories</td>
</tr>
</tbody>
</table>

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in Section 01300 SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Plymovent, Cranbury, NJ (609) 395-3500</td>
</tr>
<tr>
<td>b.</td>
<td>Monoxivent, Rock Island, IL (309) 794-1000</td>
</tr>
</tbody>
</table>

B. Capacities/Dimensions:

1. Rail length: 89 feet 6 inches
2. Exit duct: 6 inches
3. Exhaust hose:
   a. Dimensions
      1) Diameter: 4 inches
      2) Length: 24 feet
   b. Quantity per rail: Three
4. Exhaust fan:
   a. Air volume: 1,325 CFM AT 7.5 inches static pressure (measured in inches of water), size for quantity of exhaust hoses per rail.
5. Weights:
   a. Rail: 9 pounds/foot
   b. Hose and trolley: 68 pounds
c. Exhaust fan: 70.6 pounds

C. Features/Performance/Construction:

1. Suction rail:
   a. Suction rail shall be a polished aluminum extrusion that is formed in a configuration such that the extrusion serves not only as a suction duct, but also as the guide rail that the extraction trolley travels in.
   b. Each open end of the suction rail shall be covered with an end cap that can also be used as a round duct outlet of 6 inch diameter exhaust duct.
   c. A pair of EPDM rubber seals shall be installed at the bottom of the extrusion opening.
   d. Rubber seals shall remain tight during fan operation for an airtight seal, but open evenly around the trolley during trolley travel.
   e. The suction rail shall be supplied with internal rubber bumpers installed at both ends that serve as secondary stops to the trolley.
   f. The suction rail shall have suspension attachments that are specifically designed for fastening to the configuration of the suction rail. Spacing not to exceed 16 feet center-to-center.
   g. Each trolley shall travel the entire length of the suction rail.

2. Extraction trolley assembly:
   a. The extraction trolley assembly (Nederman No. 20915520) shall serve as the component in the rail system that travels in the suction rail, carries and supports the hose assembly and balancer.
      1) Each trolley shall have eight wheels that support the weight of the hose and nozzle.
      2) Each extraction trolley body shall be made of light weight composite with a low friction surface on each side to enable the trolley to travel smooth through the rubber seal.

3. Balancer:
   a. The adjustable tension balancer shall retract and lift the hose and nozzle.
      1) The balancer shall have a spring characteristic that ensures that the cord is wound onto the drum at a safe and constant speed.
2) The balancer shall have a latch that will lock the balancer when the hose is pulled down. The latch shall release when the hose is pulled a second time allowing the balancer to retract the cord and lift the hose and nozzle.

4. Exhaust fan:
   a. The rail shall have an individual exhaust fan which shall be mounted. The exhaust fan shall be Nederman series N29, No. 14510229.
   b. Exhaust fan shall be centrifugal type fan constructed of powder coated steel.
   c. The exhaust fan shall be mounted on the wall with included fan mounting bracket.

5. Exhaust hose:
   a. The hose Nederman series NFC4.2 No. 86900684 shall be constructed of silver fabric with an abrasion protector over the external galvanized steel helix to prevent damage to vehicles.
   b. The exhaust hose shall be resistant to temperatures of up to 800 degrees F continuously.

6. Duct connection: the duct connection shall be at the end of the rail to the fan.

D. Accessories:

1. Exhaust extraction nozzle with clamp:
   a. A 6 inch EPDM exhaust extraction nozzle with clamp. Nozzle shall accept an up to 5 inch exhaust port, Nederman No. 20804761.
   b. Nozzles shall be capable of withstanding temperatures up to 800 degrees F.
   c. A fully adjustable locking clamp shall be used to secure the nozzle to the vehicle exhaust pipe(s).
   d. A steel mesh inlet guard shall be use to prevent passage of debris to hose.
   e. Provide one each per hose
2. Wye assembly:
   a. A 4 inch diameter inlet/outlet wye assembly that shall split the hose connection for double exhaust pipes, Nederman No. 20815061.
   b. Wye assembly shall be capable of withstanding temperatures of up to 500 degrees F.

E. Controls:
   1. Electrical control box shall have start/stop switch with fan contactor and 24V transformer to start/stop fan, Nederman No. 89115570.
   2. Provide two wall mounted remote switches per rail. Reference Equipment Drawings for locations.

F. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements Fan</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>HP</td>
</tr>
<tr>
<td>Amps</td>
</tr>
<tr>
<td>b. Connection Type</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Mechanical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Venting:</td>
</tr>
<tr>
<td>Connection (inches)</td>
</tr>
<tr>
<td>Volume (CFM)</td>
</tr>
<tr>
<td>Stack Type</td>
</tr>
</tbody>
</table>

2.03 RAIL SYSTEM, VEHICLE EXHAUST, SIX INCH HOSE (UNLEADED)
Equipment Identifier: 3471

A. Manufacturer’s Reference:

1. Prime manufacturer: -Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimum acceptable standards of quality, features, performance, and construction.
2. Alternate manufacturers: -Contingent upon compliance with these specifications and documentation requirements set forth in Section 01300 SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

| a. Plymovent, Cranbury, NJ (609) 395-3500 |
| b. Monoxivent, Rock Island, IL (309) 794-1000 |

B. Capacities/Dimensions:

1. Rail length: 16 feet 10 inches
2. Exit duct: 6 inches
3. Exhaust hose:
   a. Dimensions
      1) Diameter: 6 inches
      2) Length: 24 feet
   b. Quantity per rail: One
4. Exhaust fan:
   a. Air volume: 800 CFM AT 7.5 inches static pressure (measured in inches of water), size for quantity of exhaust hoses per rail.
5. Weights:
   a. Rail: 9 pounds/foot
   b. Hose and trolley: 68 pounds
   c. Exhaust fan: 70.6 pounds

C. Features/Performance/Construction:

1. Suction rail:
   a. Suction rail shall be a polished aluminum extrusion that is formed in a configuration such that the extrusion serves not only as a
suction duct, but also as the guide rail that the extraction trolley travels in.

b. Each open end of the suction rail shall be covered with an end cap that can also be used as a round duct outlet of 6 inch diameter exhaust duct.

c. A pair of EPDM rubber seals shall be installed at the bottom of the extrusion opening.

d. Rubber seals shall remain tight during fan operation for an airtight seal, but open evenly around the trolley during trolley travel.

e. The suction rail shall be supplied with internal rubber bumpers installed at both ends that serve as secondary stops to the trolley.

f. The suction rail shall have suspension attachments that are specifically designed for fastening to the configuration of the suction rail. Spacing not to exceed 16 feet center-to-center.

g. Each trolley shall travel the entire length of the suction rail.

2. Extraction trolley assembly:

a. The extraction trolley assembly (Nederman No. 20374380) shall serve as the component in the rail system that travels in the suction rail, carries and supports the hose assembly and balancer.

   1) Each trolley shall have eight wheels that support the weight of the hose and nozzle.

   2) Each extraction trolley body shall be made of light weight composite with a low friction surface on each side to enable the trolley to travel smooth through the rubber seal.

3. Balancer:

a. The adjustable tension balancer shall retract and lift the hose and nozzle.

   1) The balancer shall have a spring characteristic that ensures that the cord is wound onto the drum at a safe and constant speed.

   2) The balancer shall have a latch that will lock the balancer when the hose is pulled down. -The latch shall release when the hose is pulled a second time allowing the balancer to retract the cord and lift the hose and nozzle.
4. Exhaust fan:
   a. The rail shall have an individual exhaust fan which shall be mounted on the wall or column or suspended. The exhaust fan shall be Nederman series N29, No. 14510229.
   b. Exhaust fan shall be centrifugal type fan constructed of powder coated steel.
   c. The exhaust fan shall be mounted on the wall or column with included fan mounting bracket.

5. Exhaust hose:
   a. The hose Nederman series NFC4.2 No. 86900692 shall be constructed of silver fabric with an abrasion protector over the external galvanized steel helix to prevent damage to vehicles.
   b. The exhaust hose shall be resistant to temperatures of up to 800 degrees F continuously.

6. Duct connection: the duct connection shall be at the end of the rail to the fan.

D. Accessories:
1. Exhaust extraction nozzle with clamp:
   a. A 6 inch EPDM exhaust extraction nozzle with clamp. Nozzle shall accept an up to 5 inch exhaust port, Nederman No. 20804761.
   b. Nozzles shall be capable of withstanding temperatures up to 800 degrees F.
   c. A fully adjustable locking clamp shall be used to secure the nozzle to the vehicle exhaust pipe(s).
   d. A steel mesh inlet guard shall be used to prevent passage of debris to hose.
   e. Provide one each per hose

2. Wye assembly:
   a. A 4 inch diameter inlet/outlet wye assembly that shall split the hose connection for double exhaust pipes, Nederman No. 20815061.
   b. Wye assembly shall be capable of withstanding temperatures of up to 500 degrees F.
E. Controls:
1. Electrical control box shall have start/stop switch with fan contactor and 24V transformer to start/stop fan, Nederman No. 89115570.
2. Provide two wall or column mounted remote switches per rail. Reference Equipment Drawings for locations.

F. Utility Requirements:

1. Electrical:
   a. Connection Requirements
      | Fan |
      | --- |
      | Voltage | 460 |
      | Phase   | 3   |
      | HP      | 3   |
      | Amps    | 4.6 |
   b. Connection Type
      Provide disconnect

2. Mechanical:
   a. Venting:
      |                 |
      | Connection (inches) | 6   |
      | Volume (CFM)        | 1400|
      | Stack Type          | No loss stack |

2.04 VACUUM, CANISTER, STAINLESS STEEL
   Equipment Identifier: 3610

A. Manufacturer’s Reference:
1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish acceptable standards of quality, performance, features, and construction.
   a. J.E. Adams Industries
   b. Cedar Rapids, IA (319) 363-0237
   c. Model No.: 9235-3 with accessories

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.
VACUUM EQUIPMENT

B. General Description:

1. Operation: Dry type vacuum system shall be complete with stationary, self-contained central vacuum unit, necessary piping and fittings, hoses, and tools for vacuuming interiors of buses and vehicles.

2. Major components:
   a. Vacuum producer (exhauster) (one each)
   b. Separator (one each)

3. Piping and fittings: Provide necessary piping, fittings, and hose inlets for each workstation.

4. Workstation: Provide a complete set of necessary hose, hangers, and cleaning tools as specified herein for each unit.

C. Capacities/Dimensions:

1. Overall dimensions, vacuum unit (nominal):

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>20-1/8</td>
<td>26</td>
<td>52</td>
</tr>
</tbody>
</table>

2. Motor performance: 210 CFM

3. Dirt capacity: 2.0 cubic feet

4. Hose and fittings:
   a. Hose diameter: 2 inch hose shall be provided for optimum working suction at workstations.
   b. Fittings and seals: Fittings and seals shall be properly sized for the pipe diameters and to provide a leak-free installation.

5. Weight, nominal: 127 pounds

6. Number of workstations: One at each unit
D. Features/Construction:

1. System configuration: Vacuum producer (exhauster) and separator shall be a freestanding integral unit mounted to a wall/structural column, or on a concrete base.

2. Vacuum housing shall be constructed of 18 gauge stainless steel.

3. Vacuum producer motor: Three, two-stage, single speed bypass motors (1.6 HP each)

4. Vacuum shall incorporate a timer device.

5. Workstations: Each workstation shall be complete and operable with the following components
   a. Hose: 25 feet long, 2 inch diameter, static proof, heavy duty PVC with male and female couplings.
   b. Cleaning tool: Auto type cleaning tool, 4-1/2 inch, one per station.
   c. Hose rack: 18 gauge stainless steel.

E. Controls:

1. System START/STOP electrical JE Adams No. 9225PBK controls shall be pre-wired in a NEMA 4 type enclosure mounted on the unit adjacent to the hose inlet.

2. Solid state timer shall be set to 13 minutes. To be mounted on unit adjacent to controls.

3. All electrical components shall meet applicable National Electrical Code requirements for an intense wet environment.

4. Motor push button START/STOP controls and indicator light shall be mounted on unit.

F. Accessories:

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Dirt bin: J.E. Adams No. 8080 (one each)</td>
</tr>
<tr>
<td>2.</td>
<td>Wall mounting bracket. J.E. Adams No. 9300-3 (two each)</td>
</tr>
</tbody>
</table>
G. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>HP</td>
</tr>
<tr>
<td>Amps</td>
</tr>
<tr>
<td>b. Connection Type</td>
</tr>
</tbody>
</table>

H. Finish: Stainless steel

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather.

C. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings and manufacturer’s instructions:

1. Positioning: -Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

2. Fitting: -Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: - Attach equipment securely to floor, as directed by Architect or designated representative, to prevent damage resulting from inadequate fastening. - Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.
C. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 CLEANING

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.

D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.04 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

3.05 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner’s maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. 3464 Reel, vehicle exhaust, spring operated, individual fan, with six inch hose (diesel, CNG); 2 hours (minimum)

2. 3470 Rail system, vehicle exhaust, four/six inch hose (unleaded); 4 hours (minimum)

3. 3470 Rail system, vehicle exhaust, six inch hose (unleaded); 4 hours (minimum)

4. 3610 Vacuum, canister, stainless steel; 1 hours (minimum)

B. Obtain, from technical representative, a list of Owner’s personnel trained in equipment operations and maintenance.

END OF SECTION 11 24 19
SECTION 11 31 00 - KITCHENETTE APPLIANCES

PART 1 - GENERAL

1.01 SUMMARY
   A. Section Includes:
      2. Refrigeration appliances.

1.02 ALLOWANCES
   A. Furnish residential appliances as part of residential appliance allowance.
   B. Furnish clothes washer/dryer combination, as part of residential appliance allowance.

1.03 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include installation details, material descriptions, dimensions of individual
         components, and finishes for each appliance.
      2. Include rated capacities, operating characteristics, electrical characteristics, and
         furnished accessories.
   B. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS
   A. Product Certificates: For each type of appliance.
   B. Field quality-control reports.
   C. Sample Warranties: For manufacturers' special warranties.

1.05 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For each residential appliance to include in
      operation and maintenance manuals.
1.06 WARRANTY

A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

B. Microwave Oven: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the magnetron tube.
   1. Warranty Period: Two years from date of Substantial Completion.

C. Refrigerator/Freezer, Sealed System: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
   1. Warranty Period for Sealed Refrigeration System: Two years from date of Substantial Completion.
   2. Warranty Period for Other Components: Two years from date of Substantial Completion.

D. Icemaker, Sealed System: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
   1. Warranty Period for Sealed Refrigeration System: Two years from date of Substantial Completion.
   2. Warranty Period for Other Components: Two years from date of Substantial Completion.

E. Dishwasher: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
   1. Warranty Period for Deterioration of Tub and Metal Door Liner: Five years from date of Substantial Completion.
   2. Warranty Period for Other Components: Two years from date of Substantial Completion.

F. Clothes Washer: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
   1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in ICC A117.1.
2.02 MICROWAVE OVENS

A. Microwave Oven (MICRO):

1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Appliance Schedule or comparable product acceptable to Architect.
3. Type: Conventional.
4. Dimensions:
   c. Height: 10-1/2 inches.
5. Capacity: 2.0 cu. ft..
6. Oven Door: Door with observation window and pushbutton latch release.
8. Electric Power Supply: As indicated on Drawings.
9. Controls: Digital panel controls and timer display.
10. Other Features: Turntable and interior light.

2.03 REFRIGERATOR/FREEZERS

A. Refrigerator/Freezer (REF): Two-door refrigerator/freezer with freezer on bottom and complying with AHAM HRF-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Appliance Schedule or comparable product acceptable to Architect.
2. Type: Freestanding.
3. Dimensions:
   a. Width: 36 inches.
   b. Depth: 30-3/4 inches.
   c. Height: 70 inches.
4. Storage Capacity:
   a. Refrigeration Compartment Volume: 15.4 cu. ft..
   b. Freezer Volume: 6.7 cu. ft..
   c. Shelf Area: Three adjustable glass shelves, One slide under glass shelf.
5. General Features:
   a. Door Configuration: Two-door with freezer on bottom.
b. Separate temperature controls for each compartment.

6. Freezer Features: Two freezer compartment(s) configured as pull-out drawer(s).
   a. Interior light in freezer compartment.
   b. Automatic icemaker and storage bin.


2.04 COFFEE MAKER

A. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Appliance Schedule or comparable product acceptable to Architect.

1. Type: Freestanding.
2. Dimensions:
   a. Width: 16.5 inches.
   b. Depth: 17.7 inches.
   c. Height: 17 inches.

3. Capacity: 3.9 gal./hr.
4. Electrical Power Supply: 120V.
5. Other Features: plumbing; 20-90 psi.

2.05 ICEMAKERS

A. Icemaker (ICE):

1. Manufacturers: Subject to compliance with requirements, provide product as indicated on Appliance Schedule or comparable product acceptable to Architect.
2. Type: Undercounter.
3. Dimensions:
   c. Height: 31-1/2 inches.

4. Ice Capacity:
   a. Production: 92 lbs. per day.
   b. Storage: 22 lbs..

5. Features:
   a. Automatic shutoff.

2.06 DISHWASHERS

A. Dishwasher (DW): Complying with AHAM DW-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Appliance Schedule or comparable product acceptable to Architect.
2. Type: Built-in undercounter.
3. Dimensions:
   b. Depth: 22-9/16 inches.
   c. Height: 32-5/16 inches.
4. Capacity:
5. Sound Level: Maximum 45 dB.
6. Tub and Door Liner: Stainless steel with sealed detergent and automatic rinsing-aid dispensers.
8. Controls: Touch-pad controls with six wash cycles and hot-air and heat-off drying cycle options.
9. LEED2009 - ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
10. Appliance Color/Finish: Stainless steel.

2.07 CLOTHES WASHERS AND DRYERS

A. Clothes Washer (CW): Complying with AHAM HLW-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Appliance Schedule or comparable product acceptable to Architect.
2. Type: Freestanding, front-loading unit.
3. Dimensions:
   a. Width: 27 inches.
   b. Depth: 30-1/4 inches.
   c. Height: 39 inches.
   a. Capacity: 4.5 cu. ft.
5. Controls: Touch-pad or Rotary-dial controls for water-fill levels, wash/rinse water temperatures, and variable-speed and fabric selectors.
a. Wash Cycles: 10 wash cycles, including regular, delicate, and permanent press.
c. Speed Combinations: Three.

6. Electrical Power: 120V, 10 A.
7. Motor: Manufacturer's standard with built-in overload protector.
8. Features:
   a. Unbalanced-load compensator.
   b. Spin-cycle safety switch.
   c. End-of-cycle signal.
   d. Extra-rinse option.
   e. Electronic temperature control.
   f. Water levels automatically set.
   g. Pedestal: Manufacturer's standard height laundry pedestal with storage drawer, matching appliance finish.

9. LEED2009 - ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
10. Appliance Finish: Enamel.

B. Clothes Dryer (CD): Complying with AHAM HLD-1.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Appliance Schedule or comparable product acceptable to Architect.
   2. Type: Freestanding, frontloading, electric unit.
   3. Dimensions:
      a. Width: 27 inches.
      b. Depth: 30 inches.
      c. Height: 38-11/16 inches.
      a. Capacity: 7.4 cu. ft.
   5. Controls: Touch-pad or Rotary-dial controls for drying cycle, temperatures, Insert function, and fabric selectors.
   6. Electric-Dryer Power: 120V, 30 A.
   7. Features:
      a. Removable lint filter.
      b. Electronic temperature and moisture-level-sensor controls.
      c. End-of-cycle signal.
      d. Pedestal: Manufacturer's standard height laundry pedestal with storage drawer, matching appliance finish.

2.08 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.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Examine walls, ceilings, and roofs for suitable conditions where the following will be installed:
   1. Microwave ovens with vented exhaust fans.

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.

3.02 INSTALLATION

A. Install appliances according to manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
D. Range Anti-Tip Device: Install at each range according to manufacturer’s written instructions.

3.03 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers’ written recommendations. Certify compliance with each manufacturer’s appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

3.05 APPLIANCE SCHEDULE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>APPLIANCE TYPE</th>
<th>UNIT PER LOCATION</th>
<th>BASIS OF DESIGN</th>
<th>NOTES</th>
</tr>
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<tr>
<td>FLEET MAINTENANCE</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BREAKROOM</td>
<td>REFRIGERATOR/FREEZER</td>
<td>2</td>
<td>S/ST /FRENCH DOOR BOTTOM FREEZER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MICROWAVE</td>
<td>2</td>
<td>S/ST /MICROWAVE SINGLE</td>
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<tr>
<td></td>
<td>DISHWASHER</td>
<td>1</td>
<td>FISHER &amp; PAYKEL DISHWASHER SERIES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COFFEE MAKER</td>
<td>1</td>
<td>BUNN MODEL CTWP7-5&quot;</td>
<td>CONTRACTOR FURNISHED, CONTRACTOR INSTALLED</td>
</tr>
<tr>
<td>WELLNESS ROOM</td>
<td>UNDER COUNTER REFRIGERATION</td>
<td>1</td>
<td>S/ST /ADIRONDACK 13B</td>
<td>PROVIDE WITH PROFESSIONAL DOOR HANDLE</td>
</tr>
</tbody>
</table>

PUBLIC WORKS |                |                   |                 |                              |
| BREAKROOM    | REFRIGERATOR/FREEZER | 2                | S/ST /FRENCH DOOR BOTTOM FREEZER |                     |
|              | MICROWAVE      | 3                | S/ST /MICROWAVE SINGLE |                     |
|              | DISHWASHER     | 1                | FISHER & PAYKEL DISHWASHER SERIES |                     |
|              | COFFEE MAKER   | 1                | BUNN MODEL CTWP7-5" | CONTRACTOR FURNISHED, CONTRACTOR INSTALLED |
| WELLNESS ROOM | UNDER COUNTER REFRIGERATION | 1 | S/ST /ADIRONDACK 13B | PROVIDE WITH PROFESSIONAL DOOR HANDLE |
| KITCHENETTE  | DISHWASHER     | 1                | FISHER & PAYKEL DISHWASHER SERIES |                     |
|              | COFFEE MAKER   | 1                | BUNN MODEL CTWP7-5" | CONTRACTOR FURNISHED, CONTRACTOR INSTALLED |
| LAUNDRY      | CLOTHES WASHER  | 1                | LG WM3300CW |                     |
|              | CLOTHES DRYER   | 1                | LG DLG3500W |                     |

END OF SECTION 11 31 00
SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.
2. Manually operated roller shades with double rollers.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples: For each exposed product and for each color and texture specified, 10 inches long.

D. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 3 inches square. Mark inside face of material if applicable.

F. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by either of the following:

1. Manufacturer and witnessed by a qualified testing agency.
2. A qualified testing agency.

1.04 CLOSEOUT SUBMITTALS
A. Maintenance Data: For roller shades to include in maintenance manuals.

1.05 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. Roller Shades: Full-size units equal to 10 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than four units.

1.06 QUALITY ASSURANCE
A. Installer Qualifications: Fabricator of products.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.08 FIELD CONDITIONS
A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Source Limitations: Obtain roller shades from single source from single manufacturer.
2.02 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade Systems, Inc.; or comparable product by one of the following:

1. Draper Inc.
3. Lutron Electronics Co., Inc.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Nickel-plated metal or Stainless steel.
   a. Loop Length: Full length of roller shade.
   b. Limit Stops: Provide upper and lower ball stops.
   c. Chain-Retainer Type: Clip, jamb mount.

   a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: In location recommended by fabricator. Indicate location for each shade on submittal for Architect's review.
2. Direction of Shadeband Roll: Regular, from back of roller.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Shadebands:

1. Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
3. Material: 

1) Source: Mermet E Screen Shade Fabric.
2) Type: PVC-coated fiberglass.
3) Thickness: 0.020 inches.
4) Weight: 13.3 oz./sq. yd..
5) Roll Width: 60 inches.
6) Openness Factor: 1 percent.
7) Color: Pearl/ Pearl (007007).

4. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.

2. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.03 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade Systems, Inc or comparable product by one of the following:
   1. Draper Inc.
   3. Lutron Electronics Co., Inc.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
   2. Inside Roller:
      a. Drive-End Location: In location recommended by fabricator. Indicate location for each shade on submittal for Architect's review.
      b. Direction of Shadeband Roll: Reverse, from front of roller.
3. Outside Roller:
   a. Drive-End Location: In location recommended by fabricator. Indicate location for each shade on submittal for Architect's review.
   b. Direction of Shadeband Roll: Reverse, from front of roller.


C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Shadebands:
   1. Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   3. Inside (Roomside) Material: 
         1) Source: Mermet E Screen Shade Fabric.
         2) Type: PVC-coated fiberglass.
         3) Thickness: 0.020 inches.
         4) Weight: 13.3 oz./sq. yd..
         5) Roll Width: 60 inches.
         6) Openness Factor: 1 percent.
         7) Color: Pearl/Pearl (007007).
   4. Outside (Windowside) Material: 
         1) Source: Mermet Avila Twilight Chalk (000016).
         2) Type: Acrylic-coated fiberglass, Polyester-cotton blend, or Polyester with foamed-acrylic backing.
         3) Thickness: 0.017 inches.
         4) Weight: 12.86 oz./sq. yd..
         5) Roll Width: 60 inches.
         6) Color: Chalk (000016).

5. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: As selected by Architect from manufacturer's full range.

E. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.
2. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.04 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
   1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
   2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.03 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.04 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12 24 13
PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Identifier:

1. 5705 Lift, surface, motorcycle, 1200 pound (Ref Part 2.01)
2. 5715 Lift, surface mounted, twin-post, 16,000 pound (Ref Part 2.02)
3. 5740 Lift, alignment, auto/light truck, 10,000 pound (Ref Part 2.03)
4. 5842 Lift, column, mobile (set of four), battery powered, wireless, 72,500 pound (Ref Part 2.04)
5. 5861 Lift, column, mobile (set of six), battery powered, wireless, 112,000 pound (Ref Part 2.05)

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, wiring, and switching between equipment and utilities.

1.02 QUALITY ASSURANCE

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

B. Quality standards shall meet or exceed ISO-9001 and be certified by the Automotive Lift Institute (ALI).

C. Manufacturer’s Representative:

1. Installation: Provide a qualified manufacturer’s representative at site to supervise work related to equipment installation, check out, and start up.

2. Training: Provide technical representative to provide training to Owner’s maintenance personnel in operation and maintenance of specified equipment.

3. Quality standards shall meet or exceed ISO-9001.
1.03 SUBMITTALS

A. Product Data: Submit Product Data in accordance with Division 1 of these specifications.

B. Operations and Maintenance Manual:
   1. Submit Operations and Maintenance Manuals in accordance with Division 1 - General Requirements of these specifications.
   2. Provide complete parts, operating, and maintenance manual covering equipment at time of installation.
   3. Description of system and components.
   4. Schematic diagrams of electrical, plumbing, and compressed air system.
   5. Manufacturer’s printed operating instructions.
   6. Printed listing of periodic preventive maintenance items and recommended frequency to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

C. Shop Drawings:
   1. Submit Shop Drawings in accordance with Division 1 - General Requirements.
   2. Submit site specific installation drawings and procedures.

1.04 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, by model number, including drawing changes and construction, shall be at the expense of the Contractor.

C. Substitution Approval: Prior to delivery or installation, submittals for each equipment item by Equipment Identifier shall be provided in accordance with Division 1 - General Requirements. Acceptance shall be based on the technical requirements herein as determined by Owner and Architect.

1.05 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, functions, and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.
C. Defects shall include, but not be limited to noisy, rough or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish. Defects shall not include damage due to neglect, misuse, or situations resulting from non-performance of a manufacturer’s recommended preventive maintenance schedule.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid and/or dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Equipment Identifier of this specification.

1.07 LABELING

A. Manufacturer shall securely attach in a prominent location, on each major item of equipment, a non-corrosive nameplate showing manufacturer’s name, address, model number, serial number, and pertinent utility or operating data.

B. Manufacturer shall securely attach the ALI label of the Automotive Lift Institute.

C. All electrical equipment and materials shall be new and shall be listed by Underwriter’s Laboratories, Inc. (UL) in categories for which standards have been set by that agency and labeled as such in the manufacturer’s plant.

PART 2 - PRODUCTS

2.01 LIFT, SURFACE, MOTORCYCLE, 1200 POUND
   Equipment Identifier: 5705
   [To Be Developed]

2.02 LIFT, SURFACE MOUNTED, TWIN-POST, 16,000 POUND
   Equipment Identifier: 5715

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.
a. Rotary Lift  
b. Madison, IN (812) 273-1622  
c. Model No.: SPO16

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers *may be considered as equal.*

| a. Mohawk, Amsterdam, NY (518) 842-1431  
| b. Challenger Lifts, Louisville, KY (502) 625-0700 |

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>155</td>
<td>18-1/2</td>
<td>198</td>
</tr>
</tbody>
</table>

2. Capacity: 16,000 pounds

3. Adjustable height: 15 feet, adjustable to 16 feet, 6 inches

4. Lift rise: 88-2/32 inches (from floor to top of fully extended adapter)

5. Distance between columns: 126-15/32 inches

6. Drive-through clearance: 111-11/32 inches

7. Floor to overhead switch bar: 15 feet, 10-13/16 inches, 5 inches to 15 feet, 11 inches

8. Arm reach:
   a. Front: 34-11/16 inches minimum, 64 inches maximum
   b. Rear: 34-11/16 inches minimum, 64 inches maximum

9. Minimum adapter height: 5-31/32 inches (floor to top of adapter)

10. Minimum low step height: 10-31/32 inches

11. Minimum high step height: 15-31/32 inches
12. Lifting speed: 81 seconds

C. Features/Performance/Construction:

1. Columns shall be manufactured of one-piece formed steel. Carriage bearing surfaces shall be placed to the back of the column.

2. Each column assembly shall incorporate an external locking latch mechanism which automatically engages at 4-1/4 inch increments after the first 18-1/2 inches of travel, continuing through full rise. Dual locking latch system release shall be constant pressure air operated switch. Locking latches shall be spring actuated and shall automatically reset when the latch handle is released. There shall be no less than 13 locking positions per column assembly.

3. Each hydraulic cylinder shall be designed with a restrictor orifice to regulate the lowering speed so that it shall not exceed 20 feet per minute at rated capacity. Cylinder shall be installed so that all lifting force is applied directly to column base and is not attached to the carriage. Cylinder replacement shall be achieved without disassembly of columns, column extensions, or overhead assembly.

4. Arm/adapter assembly shall consist of four telescoping swing arm assemblies. Each arm assembly shall have an adapter base which is laterally adjustable and shall be equipped with a screw type adjustable height vehicle contact adapter, 4 inch and 8 inch adapter extensions shall be provided for additional adapter height. The vehicle contact adapter shall be capable of accommodating optional adapters for special lifting applications. Each arm assembly shall be equipped with an arm restraint feature, capable of withstanding 150 pounds of horizontal force, which shall engage when the carriage has been raised 1 inch and shall automatically release when the carriage is fully lowered.

5. Floor-mounted, three-position wheel spotting dishes shall be provided.

6. Power unit shall be self-contained. Fluid system shall have a 13 quart capacity. Standard power unit shall be suitable for indoor or outdoor use.

7. Lift shall be equipped with a mechanical equalization system consisting of adjustable cables and sheaves with self lubricating bearings.

8. Lift shall be equipped with an overhead limit switch composed of a padded overhead trip bar which actuates a limit switch wired to interrupt the power to the power unit in the event that a vehicle contacts the trip bar.

9. Lift shall be anchored to foundation. Foundation requirements and mounting methods shall be verified with manufacturer’s shop drawings.

D. Controls: Single point manual controls push button “UP” and lowering lever for descent mounted on lift column.
E. Accessories:

| 1.  | Air/electric box: Rotary No. FA5911BK (one each) |

F. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
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</thead>
<tbody>
<tr>
<td>a. Connection Requirements</td>
</tr>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Phase</td>
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<tr>
<td>HP</td>
</tr>
<tr>
<td>b. Connection Type</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Plumbing:</th>
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</thead>
<tbody>
<tr>
<td>a. Compressed Air:</td>
</tr>
<tr>
<td>Connection (inches)</td>
</tr>
<tr>
<td>Volume (CFM)</td>
</tr>
<tr>
<td>Capacity (PSI)</td>
</tr>
</tbody>
</table>

G. Finish: Durable enamel in manufacturer’s standard color

2.03 LIFT, ALIGNMENT, AUTO/LIGHT TRUCK, 10,000 POUND
Equipment Identifier: 5740

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

| a. Hunter Engineering Company |
| b. Idaho Falls, ID |
| c. Model No.: RX10KLIS |

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.
a. Steril-Koni, Stevensville, MD (800-336-6637)
b. Rotary, Madison, IN (800-640-5438)

B. Capacities/Dimensions:

1. Overall dimensions:

<table>
<thead>
<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>254-1/4</td>
<td>88-1/2</td>
<td>8-3/4</td>
</tr>
</tbody>
</table>

2. Reach:

a. Minimum: 61-1/2 inches
b. Maximum: 93-1/4 inches

3. Adapter height (floor level to top of adapter):

a. With 4 inch insert: 6-1/4 inches
b. With 8 inch insert: 9-3/4 inches

4. Guide piston diameter: 8-1/2 inches, two each

5. Drive-through clearance: 83-3/4 inches

6. Lifting capacity: 10,000 pounds

7. Time of full rise (single phase): 45 seconds

8. Lift rise: 80-3/4 inches (from floor to top of high step adapters)

C. Features/Performance/Construction:

1. Each jack shall have removable plunger guide with two replaceable bearing liners that shall be designed to snap into position at the top and bottom of the guide.

2. Each plunger shall be manufactured of steel pipe and accurately turned and polished over its entire surface. Each plunger shall have a protective coating to resist rusting or discoloration.

3. Plungers shall be attached to equalizer to prevent rotation.

4. Plungers shall be removable for inspection and/or replacement.
5. Each hydraulic cylinder shall be designed with a restructor orifice to regulate the lowering speed so as not to exceed 20 feet per minute at rated capacity.

6. Each jack shall have two wiper assemblies to prevent the entry of dirt into the bearing area.

7. Arm/adapter assemblies shall consist of four telescoping swing arm assemblies.

8. Each arm assembly shall have an adapter base that is laterally adjustable and equipped with a 360 degrees rotating, three-vehicle contact adapter which shall be capable of accommodating optional adapters for special lifting applications. Operational adapters shall fit over the standard adapter and be held in place with a non-removable detent pin.

9. Floor-mounted, three-position wheel spotting dish shall be provided.

10. Power unit shall be self-contained. Fluid system shall have 18 quart capacity. Standard power unit shall be suitable for indoor or outdoor use.

11. Lift shall be equipped with a positive mechanical equalization system that consists of a rigid channel frame bolted to the plungers.

12. Lift shall be provided with a containment system made of thick, chemically compatible, low-density polymer composite and sized to house lift frame assembly. Containment lid shall be covered with a non-skid-coated lid with watertight seal between lid and lift frame. Containment lid shall be capable of supporting a wheel loading of one quarter of the design capacity without permanent deformation. Watertight entry boot shall be provided for a PVC hose chase.

13. Lift frame assembly shall be capable of being removed and relocated.

14. Lift assembly shall contain a locking latch mechanism that automatically engages at 4-inch increments after the first 15-1/2 inches of travel, continuing through full rise. Locking latch system shall have a single point switch air actuated release, located near the power unit controls, which shall automatically reset when the latch switch is released. There shall be no less than 15 locking positions per lift assembly.

15. Lift shall include a liquid detection system which shall provide an alert on an LCD screen located at the power unit. Alert will reset automatically when liquid is removed from the containment.

16. Power unit shall be wall mounted (with soft touch type controls).

17. Concrete floor is to be finished to grade angle, not to the top of the lift.

D. Controls: “Dead-man” type push button “UP” and lowering lever for descent
E. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
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</thead>
<tbody>
<tr>
<td>a. Connection Requirements Unit</td>
</tr>
<tr>
<td>Voltage 230</td>
</tr>
<tr>
<td>Phase 1</td>
</tr>
<tr>
<td>Amps 26</td>
</tr>
<tr>
<td>b. Connection Type Provide disconnect</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Plumbing:</th>
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<tbody>
<tr>
<td>a. Compressed Air:</td>
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<tr>
<td>Connection (inches) 1/4</td>
</tr>
<tr>
<td>Capacity (PSI) 125-150</td>
</tr>
</tbody>
</table>

2.04 LIFT, COLUMN, MOBILE (SET OF FOUR), BATTERY POWERED, WIRELESS, 72,500 POUND
Equipment Identifier: 5842

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

   a. Rotary Lift
   b. Madison, IN (812) 273-1622
   c. Model No.: MCHF 419

2. Alternate manufacturers: *Contingent upon compliance with these specifications* and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Steril Koni, Stevensville, MD (410) 643-9001
   b. Gray Manufacturing, St. Joseph, MO (816) 233-6121

B. Capacities/Dimensions:

1. Overall dimensions:
Dimensions (inches)

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
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<tbody>
<tr>
<td>a. Equipment</td>
<td>45 1/2</td>
<td>48 9/16</td>
<td>102</td>
</tr>
</tbody>
</table>

2. Extended height: 143-1/2 inches
3. Fork length: 14 inches minimum
4. Minimum lifting height: 73 inches
5. Lifting/Lowering speed: 94 seconds, both ascent and descent mode
6. Weight nominal: 1,350 pounds per column
7. Lift capacities: 18,500 pounds per lift column. 74,000 pounds total.

C. Features/Performance/Construction:

1. Complete assembly shall consist of interchangeable hydraulic lift units, each equipped with an electrically driven power unit. Screw type column lifts are not acceptable.

2. The lift system shall be designed as to be able to handle four columns minimum in a lifting system (74,000 pounds) with the possibility of operating one column or all columns together.

3. Frame shall be made from one metal plate and be rigid and stiff double U-bent and shall contain no welds to provide maximum stiffness and rigidity.

4. Column base construction shall be of a rectangular design with mitered rear corners to provide maximum stability and permit a narrow turning radius.

5. Column shall be structurally designed as to have motor and hydraulic pump assembly positioned in the center of the column to promote greater stability while moving the column. Lift systems with motors mounted on the top of the column shall not be acceptable due to their inherent top-heaviness and possibility of tipping while moving.

6. Each column shall be equipped with an automatic locking system at any position that is automatically engaged during the ascent or descent cycle. A mechanical safety lock shall automatically engage when the lift is not operating.

7. Hydraulic drive shall permit lifting without any pulsation or jerks, lifting shall be smooth.

8. Hydraulic lifting cylinder shall be of a piston type to prevent leakage in case of piston damage.
9. Hydraulic fluid shall be contained in a galvanized hydraulic tubing. Use of hydraulic hoses shall not be permitted.

10. The lifting arms shall be adjustable by hand to accommodate wheel sizes from R10 to R22.5 inclusive without the use of additional small wheel reducers or adapters.

11. A minimum dimension of 10 inches shall be required between the mast of the lifting unit and the vehicle to provide working clearance between the body of the vehicle and the masts.

12. The lifting columns shall have a retraction wheel design that is integrated into the base frame to improve stability of columns. Wheels shall retract into the underside of column when vehicle load is vertically applied to columns. As a result there shall be no load whatsoever to the concrete by the wheels of the columns when the columns are in raised position. Maximum floor pressure of the columns shall not be greater than 900 PSI.

D. Controls:

1. The control system shall have been tested and approved by a Nationally Recognized Testing Laboratory as established by OSHA to UL 508 and shall be capable of operating indoors and outdoors.

2. All motive controls shall be of the “dead-man” type requiring the operator to maintain constant pressure on the controls during operation.

3. Control panel on each column shall be NEMA 4 rated and accommodate the following functions mounted on the panel:
   a. Raise and lower lifts
   b. Emergency stop
   c. Individual/pair/multiple column selection

4. The control system shall have a device to provide for automatic leveling and synchronization to ensure that the lift system raises and lowers at the same rate and that the columns differ in height by no more than one inch during synchronized operation. If the columns become uneven by a greater amount, the lift shall stop and allow only the lowering function.

5. Interconnecting cables shall be of a heavy-duty type minimum thickness 3/4 inches with special construction to permit operator to run over cable when positioning vehicles.
E. Accessories:

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<tr>
<td>1</td>
<td>CV-17 cycle vise</td>
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F. Utility Requirements:

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<th></th>
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<tbody>
<tr>
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<td></td>
<td>Voltage</td>
</tr>
<tr>
<td></td>
<td>Phase</td>
</tr>
<tr>
<td></td>
<td>Amps</td>
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</tbody>
</table>

2.05 LIFT, COLUMN, MOBILE (SET OF SIX), BATTERY POWERED, WIRELESS, 112,000 POUND
Equipment Identifier: 5861

A. Manufacturer’s Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer’s name and model to establish minimal acceptable standards of quality, features, performance, and construction.

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<table>
<thead>
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<tbody>
<tr>
<td>a</td>
<td>Rotary</td>
</tr>
<tr>
<td>b</td>
<td>Madison, IN (812) 273-1622</td>
</tr>
<tr>
<td>c</td>
<td>Model No.: MCH Flex 619</td>
</tr>
</tbody>
</table>

2. Alternate manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>a</td>
<td>Stertil Koni, Stevensville, MD (410) 643-9001</td>
</tr>
</tbody>
</table>
B. Capacities/Dimensions:

1. Overall dimensions:

<table>
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<tr>
<th>Dimensions (inches)</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Equipment</td>
<td>45-1/2</td>
<td>48-9/16</td>
<td>102</td>
</tr>
</tbody>
</table>

2. Full raised height: 144-3/8 inches

3. Fork length: 14 inches minimum to accommodate rim sizes 9 inches to 24-1/2 inches maximum.

4. Minimum lifting height: 70 inches

5. Weight nominal: 1,400 pounds (each)

6. Lifting/lowering speed:
   a. Lifting: 78 seconds to full rise position
   b. Lowering: 54 seconds to fully lowered position

7. Lift capacities:
   a. Column capacity: 18,800 pounds per lift column, minimum
   b. Total: 112,800 pounds

8. Battery charge cycle (new battery): 20 cycles per charge at rated load of the lift.

C. Features/Performance/Construction:

1. Column assemblies:
   a. Columns shall be constructed of formed channel fabrication from a single steel plate and shall not require welded seams to form the column structure.
   b. Columns shall be further reinforced externally along their back face with structural steel angle for additional rigidity and extended service life. Rigid column design shall be protected from corrosion via sand blasted enamel painting of metal surfaces.
   c. Each column shall be fabricated to a set of legs that will sit directly on the floor and provide a stable platform when lifting a load. When unloaded the mobile columns ride on a set of wheels to allow the units to be moved. When a vehicle is lifted, the wheels shall automatically retract and the lift shall sit down flat on its steel
base and no lifted weight shall remain on the casters. Legs have an extended fork configuration that allows for extensions to be added at any time. Such extensions will permit the addition of longer forks to lift dual wheel assemblies or optional assemblies for lifting vehicles further away from the column assembly.

d. Each of the lifting units shall contain a mechanical locking latch mechanism completely separate from the drive of lifting system. This lock shall be gravity actuated with a spring loaded assist to ensure engagement at any position. Spacing between locking positions shall be a maximum of 3 inches in accordance with ALCTV.

e. The column structures shall be moveable on three wheels consisting of two fixed heavy duty steel wheels and a dual rubber steering wheel mounted at the rear of the column. Columns shall come equipped with a hoisting hook for lifting by overhead crane and a fork lift pocket lifting points on each column for ease of relocation by standard fork lift.

2. Carriage assemblies:

a. Each column assembly shall include a carriage assembly which consists of 4 Ultra High Molecular Weight (UHMW) roller bearings. These bearings shall be oil impregnated and shall not require any greasing or maintenance of any kind.

b. Each carriage assembly shall include a full enclosure for the lifting cylinder chrome rod. No part of the chrome lifting cylinder shall be exposed to impact at any time during the lifting stroke.

c. Forks shall provide a minimum of 12 inches of sufficient safety clearance between column and body of vehicle. Forks shall also be available in an extended configuration capable of supporting inboard tires on dual-wheeled axles.

d. Carriage assemblies shall come equipped with adjustable lifting forks to allow for adjustment of lifting forks for small tire applications to standard large tire applications without need for adapter sleeves. Forks shall include handles to facilitate the lateral adjustment of forks for narrower and wider tires. Adjustment shall be accomplished by release of a spring loaded lock on the top of the fork. When adjustment of the forks is complete, locks shall automatically re-engage to secure forks from further movement.

3. Hydraulic system:

a. Each lifting unit shall be equipped with an electric hydraulic power unit, consisting of a DC motor, gear pump, reservoir, check valve, pressure relief valve, and two control valves. Entire power unit totally enclosed to protect from dirt and water.
b. The direct drive lifting cylinder shall be installed in such a manner as to push the carriage up, using no chains or cables. The extension of the cylinder shall occur inside of the carriage as to keep the plunger of the cylinder protected from dirt, sand, or any possible mechanical damage.

c. Hydraulic check valve shall hold load at any position of the cylinder. Redundant mechanical safety lock shall be continuously engaged except while lift is being lowered.

d. Solid zinc plated steel pipes are used to circulate all hydraulic fluids in the system.

e. Pressure relief valve shall prevent overloading of the lifting unit.

f. Unit shall be equipped with two control valves that shall be used to maintain synchronous operation when a lifting system of more than one column is being commanded to raise or lower.

g. Hydraulic system is self-lubricating and shall require little to no maintenance.

h. A velocity fuse shall be installed directly to the end of the cylinder in order to keep hydraulic fluids from discharging if there is a fast leak somewhere after the cylinder, which could cause the load to unintentionally be lowered.

4. Control system:

a. All mobile columns shall have identical control panels and shall be designed to be interchangeable without regard to master/slave relationships.

b. All mobile control panels are waterproof NEMA Type 4.

c. All control circuits and motor power supply circuits shall be 24 volts.

d. Circuit boards are upgradeable. Upgrades in software or control programming shall be available by swapping a memory stick only and board replacement or reprogramming by the user shall not be necessary.

e. All mobile columns shall have a manual lowering override due to loss of power to the unit.

f. Indication lights on each control panel shall show mobile column configurations for an individual mobile column, paired mobile columns, grouped mobile columns, or all mobile columns.

g. “UP” and “Down” buttons shall have momentary function “Dead Man” type switches while depressed and operate from only one control panel at a time.
h. “Select” button shall permit operation of an individual mobile column, paired mobile columns, grouped mobile columns, or all mobile columns.

i. “Emergency Stop Button” on each panel will shut down all connected mobile columns.

j. All control panels have automatic synchronization through the full stroke of the hydraulic cylinder with a maximum tolerance of 1 inch.

k. Control system will actively control hydraulic correction to maintain level synchronization, unless a column deviates more than 3.5 inches from any other column, at which point all motion halts and an error alert is generated.

l. Error codes and other diagnostic information is automatically provided when a fault is detected via alpha-numeric display, audible alarm and visual indicator.

m. Lift shall have programmable height limit settings with no external limit switches.

n. Lift shall come equipped with a lower to lock function.

o. Lift shall come equipped with a slow lowering function.

p. Each column shall have its own 110 volt waterproof marine, 20 amps, two-bank battery smart-charger. The battery charger shall have two independent 12 VDC output leads and incorporate automatic 3-stage charging to minimize charge time and maximize battery life. Total recovery time for a completely discharged system is less than 12 hours. All battery chargers in a system can be connected together into a single 110 VAC receptacle.

q. The lift control interfaces shall include visual representations showing the relationships between the lift columns and a vehicle, such as lift column icons positioned around a vehicle icon.

r. Lift shall come equipped with a three color battery charge indicator. The charger shall also indicate the status of the battery.

s. Primary communication: Communication shall be wireless between columns.

t. Lift shall be equipped with a light to show when the lift has been lowered on its locks. Light shall be bright enough to be seen from 50 feet.
Communication cables shall connect from one column to the next in any order in a single loop forming a horse shoe pattern allowing ingress and egress into the mobile columns without driving over cables. Connecting cables are 50 feet.

5. Steering:
   a. The steering assembly shall consist of a fully automatic, spring-loaded steering handle. The steering handle shall lock the movement of the rear wheel when it is in the vertical position.
   b. The steering assembly shall allow the lift to be moved around the shop floor without the need to pump up a hydraulic jack or pallet jack mechanism.
   c. The rear wheel shall be spring loaded as to retract when weight is applied to the column. All other wheels will automatically retract when the lift is loaded with the weight of a vehicle. All wheels shall be equipped with sealed ball bearings.

6. LED service lamp kit:
   a. Shall consist of two LED lamps per column.
   b. Shall operate on the column’s 24 VDC power source.

7. Motor: 3 kw, 24 volt minimum

8. Hydraulic tank capacity: 10-1/2 quarts mobile columns will require 11-1/2 quarts of fluid to fill tank, hoses, and cylinders (bio-fuel compatible.)

D. Utility Requirements:

<table>
<thead>
<tr>
<th>1. Electrical:</th>
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<tbody>
<tr>
<td>a. Connection Requirements</td>
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<tr>
<td>Voltage</td>
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<tr>
<td>Phase</td>
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<tr>
<td>Amps</td>
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</table>

b. Connection Type Provide standard grounded receptacle

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.
B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all equipment items and specified accessories.

C. Report in writing to the Architect, any damaged, missing or incomplete scheduled equipment and improper rough-in or utility stub-outs.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman of Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect or designated representative.

B. Install equipment in accordance with plans, shop drawings, and manufacturer’s instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level (or slight slope as required by instructions), plumb, and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment as directed by Architect or designated representative. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect or designated representative using acceptance procedures provided by the manufacturer. Testing report shall be submitted to the Architect or designated representative.

B. Each lift shall be tested with the vehicle types operated by the Owner.

3.04 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing and installation debris from job site.
D. Notify Architect or designated representative when installation and cleanup is 100% complete and ready for final observation (punchlist).

3.05 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner’s maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. 5705 Lift, surface, motorcycle, 1200 pound; 1 hour (minimum)
2. 5715 Lift, surface mounted, twin-post, 16,000 pound; 2 hours (minimum)
3. 5740 Lift, alignment, auto/light truck, 10,000 pound; 8 hours (minimum)
4. 5842 Lift, column, mobile (set of four), battery powered, wireless; 1 hour (minimum)
5. 5861 Lift, column, mobile (set of six), battery powered, wireless, 112,000 pound; 4 hours (minimum)

B. Demonstrate each lift operation utilizing each of the vehicle types operated by Owner.

C. Obtain, from technical representative, a list of Owner’s personnel trained in equipment operations and maintenance.

END OF SECTION 11 45 00