

CITY OF MADISON
SPECIFICATION
MARCH 1, 2019

SPECIFICATIONS - BID DOCUMENTS - ADDENDUM 01

01 Addendum

CITY OF MADISON
NAKOOSA TRAIL FLEET/FIRE/RADIO SHOP FACILITY
4151 Nakoosa Trail
Madison, Wisconsin 53714

Volume 1 of 3: Divisions 00 - 01

Volume 2 of 3: Divisions 02 - 14

Volume 3 of 3: Divisions 21 - 30

Volume 4 of 4: Divisions 31 - 45



Contract No. 7528

Munis No. 10305

Prepared by:
1600 Wilson Boulevard, Ste. 360
Arlington, VA 22209
Project No.: 376603

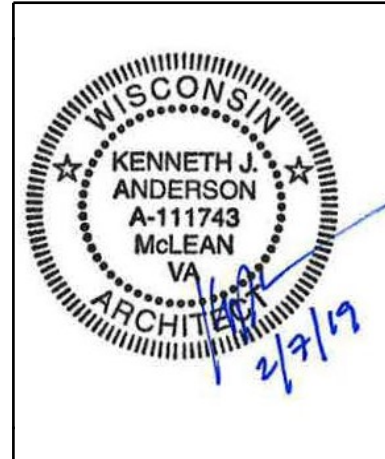
SECTION 00 01 07

SEALS PAGE

DESIGN PROFESSIONALS OF RECORD

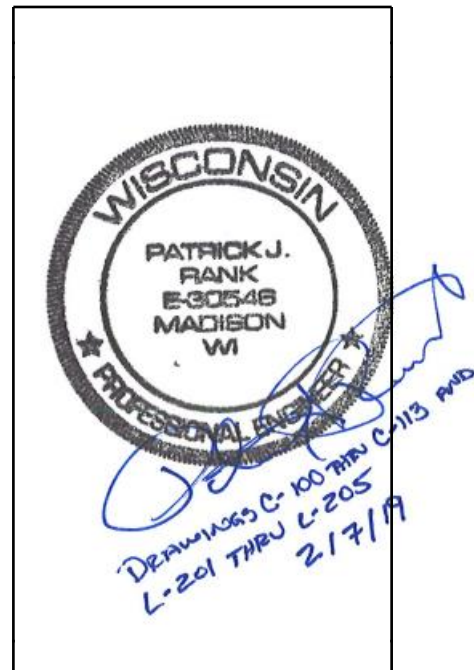
Architect: Stantec Architecture, Inc. [SAI]

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



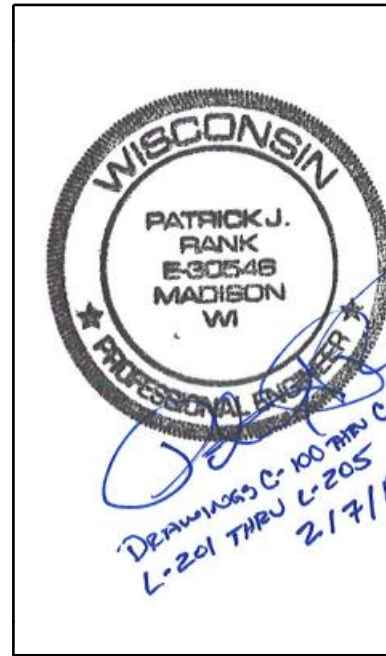
Civil Engineer: Strand Associates [SA]

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



Landscape Architect: Strand Associates [SA]

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



Structural Engineer: Mead & Hunt [M&H]

Responsible for those Sections appended with "[M&H]" on Table of Contents.



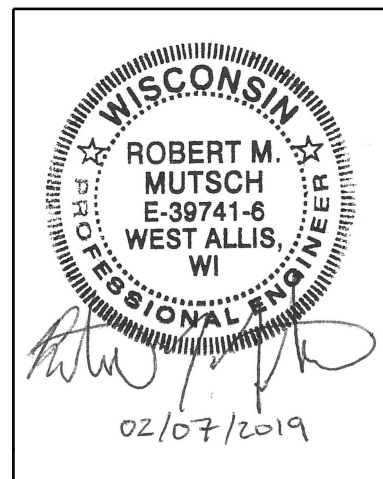
Fire-Protection Engineer: Mead & Hunt [M&H]

Responsible for those Sections appended with "[M&H]" on Table of Contents.



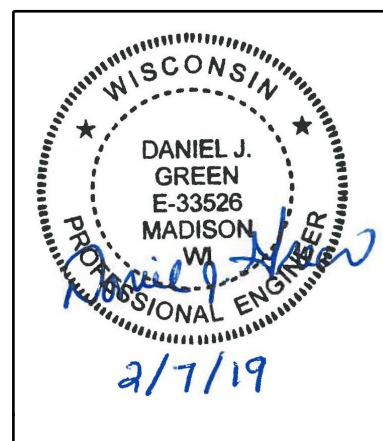
Plumbing Engineer: Mead & Hunt [M&H]

Responsible for those Sections appended with "[M&H]" on Table of Contents.



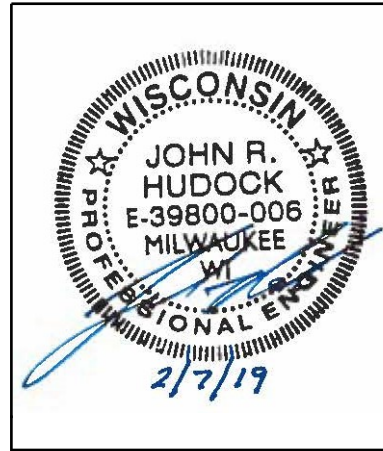
HVAC Engineer: Mead & Hunt [M&H]

Responsible for those Sections appended with "[M&H]" on Table of Contents.



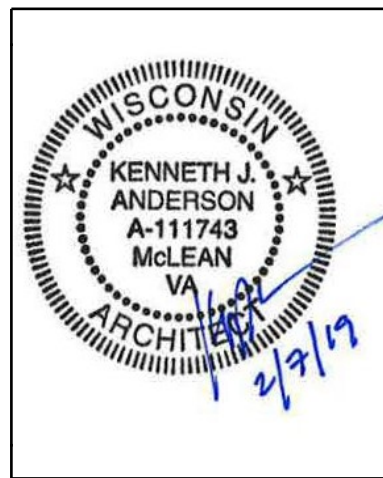
Electrical Engineer: Mead & Hunt [M&H]

Responsible for those Sections appended with "[M&H]" on Table of Contents.



Vehicle Maintenance Equipment Engineer: HDR | MDG [HDR]

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



END OF SECTION 00 01 07

SECTION 00 01 09

PROJECT DIRECTORY

1.1 PROJECT TEAM

A. Owner:

1. City of Madison [COM].
2. Department of Public Works.
3. 210 Martin Luther King Jr. Blvd.
4. Madison, WI 53703.
5. Primary Contact(s):
 - a. Jim Whitney, JWhitney@cityofmadison.com.
6. Phone: 608-266-4563.
7. City Construction Manager:
 - a. Dave Schaller
 - b. Phone: 608-243-5891
 - c. dschaller@cityofmadison.com
8. Website: www.cityofmadison.com .

B. Architect:

1. Stantec Architecture, Inc. [SAI]
2. 1600 Wilson Blvd., Ste. 360.
3. Arlington, VA 22209.
4. Primary Contact(s):
 - a. Maybell Laluna, maybell.laluna@Stantec.com .
 - b. Ken Anderson, AIA, ken.j.anderson@stantec.com
5. Phone: 571-290-7679.
6. Website: www.stantec.com .

C. Civil Engineer:

1. Strand Associates [SA].
2. 910 West Wingra Drive.
3. Madison, WI 53715.
4. Primary Contact(s):
 - a. Pat Rank, patrick.rank@strand.com .
5. Phone: 608-251-4843.
6. Website: www.strand.com .

D. Stormwater Engineer:

1. Strand Associates [SA].
2. 910 West Wingra Drive.
3. Madison, WI 53715.
4. Primary Contact(s):
 - a. John Lindert, Jon.Lindert@strand.com .
5. Phone: 608-251-4843.
6. Website: www.strand.com .
- 7.
- 8.

E. Landscape Architect:

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2. 910 West Wingra Drive.

3. Madison, WI 53715.
 4. Primary Contact(s):
 - a. Rad Hawkos, rad.hawkos@strand.com .
 5. Phone: 608-251-4843.
 6. Website: www.strand.com .
- F. Structural Engineer:
1. Mead & Hunt [M&H].
 2. 2440 Deming Way.
 3. Middleton, WI 53562.
 4. Primary Contact(s):
 - a. David Cockrum, David.Cockrum@meadhunt.com .
 5. Phone: 608-273-6380.
 6. Website: www.meadhunt.com.
- G. Fire-Protection Engineer:
1. Mead & Hunt [M&H].
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 3. Middleton, WI 53562.
 4. Primary Contact(s):
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 5. Phone: 608-443-0569.
 6. Website: www.meadhunt.com.
- H. Plumbing Engineer:
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 2. 2440 Deming Way.
 3. Middleton, WI 53562.
 4. Primary Contact(s):
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 5. Phone: 608-443-0569.
 6. Website: www.meadhunt.com.
- I. HVAC Engineer:
1. Mead & Hunt [M&H].
 2. 2440 Deming Way.
 3. Middleton, WI 53562.
 4. Primary Contact(s):
 - a. Dan Green, Dan.Green@meadhunt.com .
 5. Phone: 608-443-0536.
 6. Website: www.meadhunt.com.
- J. Electrical Engineer:
1. Mead & Hunt [M&H].
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 4. Primary Contact(s):
 - a. Jason McCann, jason.mccann@meadhunt.com .
 5. Phone: 608-273-6380.
 6. Website: www.meadhunt.com.
- K. Communications and Audio/Visual Consultant:
1. Mead & Hunt [M&H].
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 3. Middleton, WI 53562.

4. Primary Contact(s):
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5. Phone: 608-273-6380.
6. Website: www.meadhunt.com.
- L. Electronic Safety and Security Consultant:
 1. Mead & Hunt [M&H].
 2. 2440 Deming Way.
 3. Middleton, WI 53562.
 4. Primary Contact(s):
 - a. John Hudock, John.Hudock@meadhunt.com .
 5. Phone: 608-273-6380.
 6. Website: www.meadhunt.com.
- M. Vehicle Maintenance Equipment Consultant:
 1. HDR | MDG [HDR].
 2. 70 Xenia Avenue S, Ste. 600.
 3. Minneapolis, MN 55416.
 4. Primary Contacts:
 - a. Jared Weismantel, Jared.Weismantel@hdrinc.com .
 5. Phone: 626-389-2444.
 6. Website: www.hdrinc.com .
- N. Geotechnical Consultant:
 1. Construction - Geotechnical Consultants, Inc. (CGC) [CGC].
 2. 2921 Perry Street.
 3. Madison, WI 53713.
 4. Primary Contact(s):
 - a. David Staab, dstaab@cgcinc.net.
 5. Phone: 608-288-4100.

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END OF SECTION 00 01 10

SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: All demolition, removal, and salvage work as shown on the drawings or specified herein.

1.2 REFERENCES

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, current edition, including all issued supplemental specifications.
- B. Reference the City of Madison Standard Specifications for Public Works Construction, latest edition. The City of Madison Standard Specifications for Public Works Construction, latest edition, takes precedence over this specification section.

1.3 SUBMITTALS

- A. CONTRACTOR shall submit permits and notices.

1.4 QUALITY ASSURANCE

- A. CONTRACTOR shall perform demolition, removal, and salvage in conformity with applicable federal, state, and local safety practices and code requirements.
- B. CONTRACTOR shall contact all public utilities and shall shut off, cut and cap all utility services in accordance with utility requirements, codes, rules and regulations.
- C. Obtain and pay for all necessary permits, licenses and certificates required.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Compacted fill shall meet the requirements of Section 31 23 00–Excavation, Fill, Backfill, and Grading.
- B. Pipe fittings and materials shall meet the requirements of Section 33 00 00–Buried Piping and Appurtenances.

PART 3 - EXECUTION

3.1 BREAKING DOWN AND REMOVING STRUCTURES

- A. General:
1. All existing structures, with all attached parts and connections, shown on the drawings or specified to be removed or that interfere with the new construction, shall be entirely removed within the limits shown or specified, unless otherwise provided.
 2. When a portion of any existing structure is to be retained, CONTRACTOR shall take care during construction operations so as not to impair the value of the retained portion.
 - a. Complete all operations necessary for the removal of any existing structure which might endanger the new construction prior to the construction of the new work.
 - b. Do not use any equipment or devices which might damage structures, facilities, or property which are to be preserved and retained.
 3. CONTRACTOR shall remove the existing commercial building (Cub Foods) on site that is above ground and all substructure elements below ground including concrete foundations and floor slabs. The Cub Foods building shell above the floor slabs was demolished by the City in 2016. Concrete floor slabs on grade and foundations remain that are to be demolished and removed in this project. All foundation fill areas shall be graded and restored with granular fill compacted with vibratory rollers or plate compactors in uniform, vertical lifts not exceeding 12 inches in loose thickness.

4. All surficial topsoil and pavements shall be stripped to at least 5 feet beyond the proposed construction areas, including areas requiring cuts or fills beyond the proposed building footprint or new pavement limits.
- B. Pavement, Curb, Gutter, Sidewalk, Driveways, Crosswalk, and Similar Structures:
 1. Where portions of the existing structure are to be left in the surface of the finished work, CONTRACTOR shall remove the structure to an existing joint, or saw and chip the structure to a true line.
 2. Sufficient removal shall be made to provide for proper grades and connections in the new work.
- C. Existing Utilities:
 1. Remove entirely all existing utilities that are to be removed, except as hereinafter specified.
 2. Where existing utilities are to be extended or otherwise incorporated into the new work, remove only such part or parts of the existing utility as necessary to provide a proper connection to the new work.
 3. Remove existing utilities designated for salvage in a manner that will preclude damage.
 4. Abandon Existing Utilities:
 - a. A utility may be abandoned instead of being removed if the following conditions apply:
 - 1) If the diameter of the utility is less than 48 inches.
 - 2) If the top thereof does not come within 5 feet of the elevation of the finished grade line.
 - 3) If the utility is in suitable condition.
 - b. Completely fill each end of the utility with concrete for a distance from each end of at least 2 feet plus the height of the opening of the utility.

3.2 ABANDONING STRUCTURES

- A. Tanks, Manholes, Catch Basins, and Inlets:
 1. CONTRACTOR shall thoroughly clean structures to be abandoned.
 2. CONTRACTOR shall plug existing pipe connections with brick or concrete block masonry or with any grade of concrete having a 28-day compressive strength in excess of 2,000 psi.
 3. CONTRACTOR shall remove the walls of the structures to an elevation at least 3 feet below the finished grade line, or to such elevation that may be designated on the drawings or as necessary to clear new construction.
 4. CONTRACTOR shall provide an approximate 9-inch opening in the bottom of the structure to allow for groundwater movement. CONTRACTOR shall backfill the structure with granular material compacted to that of the trench backfill.

3.3 ABANDONING AND REMOVING UTILITIES AND UNDERGROUND PROCESS PIPING

- A. CONTRACTOR shall be responsible for the turning off or unhooking of all utilities and process piping before starting the demolition work. Remove all utility lines, including electrical services and piping that are shown or specified to be removed. Remove utility lines that are to be abandoned as needed to clear new construction.
- B. The ends of utility lines and piping shown or specified to be abandoned that are exposed by excavation shall be plugged with concrete to prevent soil infiltration into the pipes.

3.4 BACKFILL

- A. CONTRACTOR shall fill all abandoned structures and excavations resulting from removal of structures and utilities with compacted granular fill. See Section 31 23 00—Excavation, Fill, Backfill, and Grading for required degree of compaction.
- B. Prior to filling, CONTRACTOR shall break one opening in the floor or wall near the base of each compartment to allow groundwater to freely migrate through the structure.

END OF SECTION 02 41 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Footings.
2. Foundation Walls, Grade beams and Piers
3. Slabs-on-grade.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- B. 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.
- C. Field quality-control reports.
1. See Part 3 paragraph "Field Quality Control" for report requirements.
 2. Submit both in-progress reports showing test results within 48 hours of each test and final reports including results of all tests completed for each sample.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on site 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.

- D. 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.
 - E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
 - F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 706, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 706, 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. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Provide aggregates from a single source.
 - 1. Coarse Aggregate: Coarse Aggregate shall conform to the requirement of ASTM C33, Class 4S or better and shall be graded as follows:

- a. C.A. Mix 200: Use Size No. 357 or a combination of Size No. 3 and Size No. 57 with aggregate Size No. 3 comprising 35 to 65 percent of the total amount of coarse aggregate (2-inch nominal maximum aggregate size).
 - b. C.A. Mix 150: Use Size No. 467 or a combination of Size No.4 and Size No.67 with aggregate Size No.4 comprising 35 to 65 percent of the total amount of coarse aggregate (1-1/2-inch nominal maximum aggregate size).
 - c. C.A. Mix 100: Use Size No. 57 (1-inch nominal maximum aggregate size).
 - d. C.A. Mix 075: Use Size No. 67 (3/4-inch nominal maximum aggregate size).
 - e. C.A. Mix 050: Use Size No. 7 (1/2-inch nominal maximum aggregate size).
2. Application of Coarse Aggregate: Nominal maximum size of coarse aggregate shall not exceed three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.
 3. Fine Aggregate: Fine aggregate shall conform to the requirements of ASTM C33, Paragraph 6, Grading, and shall be free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- 2.4 ADMIXTURES
- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- 2.5 VAPOR BARRIERS
- A. See section 07 26 16.
- 2.6 WET CURE, CURING MATERIALS
- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
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. BASF Construction Chemicals - Building Systems; Confilm.
 - b. ChemMasters; SprayFilm.
 - c. Dayton Superior Corporation; Sure Film (J-74).
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

2.7 POST WET CURE, CURING MATERIALS

- A. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A, 30% Solids by Weight.
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. BASF Construction Chemicals - Building Systems; Kure-N-Seal 30 ES.
 - b. ChemMasters; Spray-Cure & Seal Plus.
 - c. Dayton Superior Corporation; Cure & Seal 1315 EF
 - d. Edoco by Dayton Superior Corporation; Cure & Seal 1315 EF.
 - e. Meadows, W. R., Inc.; CS-309/30.
 - f. Metalcrete Industries; Seal N Kure 30.

2.8 POST WET-CURE, PENETRATING SEALER MATERIALS

- A. Clear, Breathable, High-Performance, Solvent-Borne, Silane Sealer, 100% Silane by Weight
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. BASF Construction Chemicals - Building Systems; Hydrozo 100
 - b. ChemMasters; Aquanil Plus 100
 - c. Dayton Superior Corporation; Weather Worker S-100 (J-29-A)

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) 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 (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.11 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%.

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

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

D. 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.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings, Grade beams: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture.
4. Air content 5 percent, plus or minus 1.5 percent at point of delivery for 2-inch (51-mm) nominal maximum aggregate size.
5. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.
6. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) to 3/4-inch (19-mm) nominal maximum aggregate size.
7. Air Content: 7 percent, plus or minus 1.5 percent at point of delivery for 1/2-inch (13-mm) nominal maximum aggregate size.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3500 psi (27.6 MPa) at 28 days.
2. Maximum Cementitious Materials Content: 500 lb/cu. yd.
3. 1 inch nominal aggregate size
4. Maximum Water-Cementitious Materials Ratio: 0.50.
5. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture.
6. Air Content:

- a. Interior: Do not allow air content of trowel-finished floors to exceed 3 percent.
- b. Exterior: 6 percent, plus or minus 1.5 percent at point of delivery.

C. Concrete Toppings: Normal-weight concrete.

- 1. Minimum Compressive Strength: 3500 psi at 28 days.
- 2. Maximum Cementitious Materials Content: 610 lb/cu. yd.
- 3. 1/2-inch nominal aggregate size
- 4. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture.
- 5. Air Content: Do not allow air content of trowel-finished toppings to exceed 3 percent.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PROVISIONS FOR FINISHES

- A. Floor elevations shown on the floor plans are finished floor elevations, and represent the top elevation of any finishes or flooring systems to be applied over the base slab.
- B. Depress slabs on grade where floor mats, ceramic tile, or other flooring systems or finishes are scheduled, specified or noted, to maintain full required base slab thickness and achieve finish floor elevations shown or noted.
- C. Depress slabs full thickness of special flooring systems where those systems are scheduled.
- D. Slope grades under sloped floors or grade to maintain full specified slab thickness at all times.
- E. Do not apply curing compounds to surfaces to receive subsequent finishes.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 VAPOR BARRIERS

- A. Sheet Vapor Barriers: Place, protect, and repair sheet vapor barrier according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Granular Course: Where indicated, cover vapor barrier with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 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.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete. Place wall, floor, and curb isolation, contraction and construction joints as shown on plans or, where not covered on the plans, as specified herein.
- 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. Locate joints for beams, elevated 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.
 - 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 4. Space vertical joints in walls at 60'-0" maximum spacing. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- C. Contraction Joints in Exposed Foundation Walls: Form by cant strips on both sides of wall, and space at 15' maximum and coincident with masonry control joints where possible
- D. 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. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks and in no case more than 24 hours after concrete placement.
 2. If not shown or noted, provide contraction joints at maximum 15' spacing each way, or less as necessary to maintain approximately square panels, with consideration given to intersecting reentrant corners, in final locations as approved by the Architect.
 3. Contraction joints shall be parallel to or perpendicular to column lines unless shown otherwise. Reinforcing shall run through center of joints unless otherwise indicated.
 4. Tooled joints not allowed.
- E. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- F. Curb Joints: Joints in concrete curbs shall be coincident with same type of joints in floor slab wherever possible.
- G. 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.
- H. Cleaning: Before next section is placed, reinforcing bars shall be cleaned from concrete splashed on from placing previous section. Vertical and horizontal concrete surfaces shall be thoroughly cleaned of all laitance and thoroughly wetted before adjacent concrete is placed.
- 3.6 CONCRETE PLACEMENT
- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Light Reflective Finish: See specification 03 35 53.13.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces 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 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.
- E. 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.
- F. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
1. 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. Levelness does not apply to slabs shown as slope to drain.

3.8 MISCELLANEOUS CONCRETE ITEMS

- 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: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete slabs according to ACI 308.1, by the following methods:
 - 1. Wet Cure: Moisture Curing or Moisture-Retaining-Cover Curing for a period of not less than seven (7) days.
 - a. Moisture Curing: Keep surfaces continuously moist for not less than seven (7) 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 (300-mm) 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 (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven (7) days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 2. Post-Wet Cure, Curing Compound:
 - a. All new exposed interior and exterior flatwork and other new exposed concrete surfaces not scheduled, specified, or noted to receive post-cure penetrating sealers, ceramic tile, or other bonded systems, coatings, or finish materials shall receive a liquid-applied, post-wet cure, curing compound after wet curing seven (7) days as specified, to extend the curing process.
 - b. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions immediately after the seven (7) day wet cure. Recoat areas subjected to heavy

rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 POST-WET CURE, PENETRATING SEALER:

- A. New concrete floors scheduled to be sealed on Room Finish Schedule shall receive a post-wet cure penetrating sealer after full seven (7) day wet cure and an additional 21-day drying/aging period.
- B. Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subject to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat.

3.11 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one-part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact

patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

- B. Inspections:

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

- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

- 1. Testing Frequency: Obtain one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
- 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
- 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
- 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
- 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure three sets of two standard cylinder specimens for each composite sample.
- 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two specimens at 7 days, one set of two specimens at 28 days. In the event of a failed strength test one set of two specimens at 56 days.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
- 7. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- 8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- 9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- 10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as

directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 30 00

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SECTION 03 35 43

POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes polished concrete finishing.

1.3 DEFINITIONS

- A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of exposed color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advanced Floor Products; Retro Plate 99.
 - b. Ardex Americas; PC 50 Lithium Densifier.
 - c. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
 - d. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
 - e. QuestMark; DiamondQuest Densifying Impregnator.
 - f. Vexcon Chemicals, Inc.; Certi-Shine Clear.

PART 3 - EXECUTION

3.1 POLISHING

- A. Polish: Class 3 finish, Gloss shine, 1500 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 45 00

PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Architectural precast concrete cladding units.
 - 2. Architectural precast concrete load-bearing units.
 - 3. Insulated, architectural precast concrete units.

1.3 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.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED 2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
- C. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- D. Shop Drawings:
 - 1. Certificate of Compliance; Stamped and signed by Professional Engineer, List of drawing and revision dates, statement of compliance with Building Code and Contract Documents.
 - 2. Detail fabrication and installation of architectural precast concrete units.
 - 3. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
 - 4. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.

5. Indicate details at building corners.
 6. Indicate separate face and backup mixture locations and thicknesses.
 7. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
 8. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
 9. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
 10. Include plans and elevations showing unit location and sequence of erection for special conditions.
 11. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
 12. Indicate relationship of architectural precast concrete units to adjacent materials.
 13. Indicate locations, dimensions, and details of thin-brick units, including corner units and special shapes, and joint treatment.
 14. Indicate locations, dimensions, and details of stone facings, anchors, and joint widths.
 15. 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.
- E. 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.
- F. Delegated-Design Submittal: For architectural precast concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
1. Installer.
 2. Fabricator.
- B. Welding certificates.
- C. Source quality-control test reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Either of following:
1. A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect 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 : A professional engineer who is licensed and legally qualified to practice in jurisdiction where Project is located. Minimum 10 years experience in providing engineering services of structural and architectural precast concrete. 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. 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."
 - E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
 - F. 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.
 - G. 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.
 - H. 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:
 1. Architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
 2. 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.
- 1.8 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.
- 1.9 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

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1. Spancrete.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer 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 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 as indicated on Structural Drawings. **[as follows:]**

- 1. Upward and downward movement of 3/4 inch.
- 2. Floors: L/300.
- 3. Roofs: L/200.

- 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.

2.3 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.
- B. Form Liners: Use with manufacturer's recommend 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.
 - 1. Provide units of face design and texture indicated on Drawings.

2.4 REINFORCING MATERIALS

- A. LEED 2009 - Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content (by weight) not less than following:
 - 1. Reinforcing Bars: 60 percent.
 - 2. Wire Reinforcement: 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- D. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 deformed bars, assembled with clips.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn galvanized steel wire into flat sheets.
- F. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- G. 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.

2.5 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.

2.6 CONCRETE MATERIALS

- A. LEED2009 - 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. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.
2. Supplementary Cementitious Materials:
 1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
 4. Metakaolin: ASTM C 618, Class N.
3. Blended Hydraulic Cement: ASTM C 595, of following type(s):
 1. Type IS, portland blast-furnace slag cement.
 2. Type IP, portland-pozzolan cement.
 3. Type I (PM), pozzolan-modified portland cement.
 4. Type I (SM), slag-modified portland cement.
- D. 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.
 1. Gradation: Uniformly graded
 2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.
- E. Lightweight Aggregates: Except as modified by PCI MNL 117, ASTM C 330/C 330M, with absorption less than 11 percent.
- F. Coloring Admixture: ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.
- G. 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.
- H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- I. 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.
 8. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
 9. Corrosion Inhibiting Admixture: ASTM C 1582/C 1582M.

2.7 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Stainless steel: Type A316L.
- C. 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.
- D. Carbon-Steel Plate: ASTM A 283/A 283M, Grade C.
- E. Malleable Iron Castings: ASTM A 47/A 47M, Grade 32510 or Grade 35028.
- F. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30.
- G. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
- H. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.
- I. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65.
- J. Deformed-Steel Wire or Bar Anchors: ASTM A 496/A 496M or ASTM A 706/A 706M.
- K. 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.
- L. 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.
- M. Shop-Primed Finish: Prepare surfaces of nongalvanized steel connections and other items, except those surfaces to be embedded in concrete, according to requirements indicated below, and shop-apply the primer according to SSPC-PA 1:
 - 1. Prep and Primer At Dry Locations: SSPC-SP 3, Power Tool Cleaning, either of following primers:
 - 1. Primer, Alkyd, Anti-Corrosive for Metal MPI#79.
 - 2. Primer, Alkyd, Quick Dry, for Metal MPI#76.
 - 2. Prep and Primer At Wet Locations (e.g. Wash Bays): SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning, either of following primers:
 - 1. Primer, zinc rich, epoxy, MPI #20.
 - 2. Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - 3. Primer, zinc rich, inorganic, MPI #19.
 - 4. Epoxy, high build, self-priming, MPI #120.
- N. Welding Electrodes: Comply with AWS standards.

2.8 BEARING PADS

- A. Provide one of the following bearing pads for architectural precast concrete units:
 - 1. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.9 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:
 1. 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.
 2. Edges: Square.
 3. Thickness: As indicated on Drawings.
- B. Wythe Connectors: Units manufactured to connect wythes of precast concrete panels.
1. Epoxy-coated carbon-fiber grid.
 1. Structural Action: Composite.
 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Chomarat North America; C-Grid.

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.
- 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.
 - 1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form 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:
 - 1. 10 feet or under, plus or minus 1/8 inch.
 - 2. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch.
 - 3. 20 to 40 feet, plus or minus 1/4 inch.
 - 4. 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:
 - 1. 10 feet or under, plus or minus 1/4 inch.
 - 2. 10 to 20 feet, plus 1/4 inch, minus 3/8 inch.
 - 3. 20 to 40 feet, plus or minus 3/8 inch.
 - 4. 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.
10. Dimensions of Haunches: Plus or minus 1/4 inch.
11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch.
12. Difference in Relative Position of Adjacent Haunch Bearing Surfaces from Specified Relative Position: Plus or minus 1/4 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.
17. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 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.
11. Reglets for Glazing Gaskets: 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. Faces exposed to view 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 sample panels.
 2. Match approved mockups.
 3. As-Cast Surface Finish: Provide surfaces to match approved sample for acceptable surface, air voids, sand streaks, and honeycomb.
 4. Textured-Surface Finish: Impart by form liners or inserts.
 5. Exposed-Aggregate Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
 6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
 7. 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 attack.
 8. Sand Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curling.

- B. Finish exposed top and back surfaces of architectural precast concrete units with smooth, steel-trowel finish.
- C. Finish unexposed surfaces of architectural precast concrete units as follows:
 - 1. As cast finish.

2.18 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, ASTM C 1610/C 1610M, ASTM C 1611/C 1611M, ASTM C 1621/C 1621M, and ASTM C 1712.
- B. Strength of precast concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.
- C. 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:
 - 1. Project identification name and number.
 - 2. Date when tests were performed.
 - 3. Name of precast concrete fabricator.
 - 4. Name of concrete testing agency.
 - 5. 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.
- D. 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.
- E. 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

3.1 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.

3.2 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:
 - 1. Galvanized Metal: Apply a minimum 4.0 mil thick coat of galvanized repair paint to surfaces according to ASTM A 780/A 780M.
 - 2. Painted Metal: Reprime damaged painted surfaces using same primer applied in shop.
 - 4. Visually inspect welds and remove, reweld, 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:
 - 1. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 2. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 3. Twist-off Tension Control Bolt: ASTM F3125/F 3125M, Grade 1852.
 - 4. 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.

3.3 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:
 - 1. Exposed Individual Panel: Plus or minus 1/4 inch.
 - 2. Non-Exposed Individual Panel: Plus or minus 1/2 inch.
 - 3. Exposed Panel Relative to Adjacent Panel: 1/4 inch.
 - 4. Non-Exposed Panel Relative to Adjacent Panel: 1/2 inch.
 - 4. Support Elevation from Nominal Support Elevation: As follows:
 - 1. Maximum Low: 1/2 inch.
 - 2. Maximum High: 1/4 inch.
 - 5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet: 1 inch.
 - 6. Plumb in Any 10 Feet of Element Height: 1/4 inch.
 - 7. Maximum Jog in Alignment of Matching Edges: 1/4 inch.
 - 8. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch.
 - 9. Maximum Joint Taper: 3/8 inch.
 - 10. Joint Taper in 10 Feet: 1/4 inch.
 - 11. Maximum Jog in Alignment of Matching Faces: 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.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
 - 1. Special inspections are indicated on Structural Drawings.
 - 2. Special inspections include the following:
 - 1. Erection of loadbearing precast concrete members.
 - 2. _.
 - 3. Owner's testing agency will report test results promptly and in writing to Contractor and Architect.
- B. Testing Agency: Owner will 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. Insert other special tests and inspections at underscore below or delete paragraph if not used.
 - 3. Owner's testing agency will 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.

3.5 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.

3.6 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 04 20 00
UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Standard Specifications, Proposal Documents, Special Provisions, Supplemental Specifications, Bid Item Manual and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Concrete masonry units.
2. Brick
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Embedded Flashing.
7. Miscellaneous masonry accessories.

- B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
2. Division 05 Section "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural-steel frame.
3. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).

- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

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

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

1.5 SUBMITTALS

- A. Shop Drawings: For the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 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, movement joints, headers, bonding, and other special conditions.

- B. Integral Water Repellent: Provide units made with integral water repellent for exterior exposed units and where indicated.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

- C. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3750 psi (19.3 MPa).
2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.2 BRICK

- A. Clay Brick: Match existing size, texture and color.

2.3 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

- B. Hydrated Lime: ASTM C 207, Type S.

- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

- D. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4-inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

- E. Aggregate for Grout: ASTM C 404.

F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.

G. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
5. Wire Size for Veneer Ties: 0.187-inch (4.76-mm) diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.6 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 unless otherwise indicated.
3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

C. Control Joint Anchor

1. Restrains lateral movement across control joints while allowing masonry shrinkage.
 - a. Available products
 - 1) Hohmann & Barnard; Slip-Set Stabilizer
 - 2) Hohmann & Barnard; Corrugated, Veed, control joint anchor
 - 3) Wire-bond; Control Joint Anchor
 - 4) Heckmann Building Products; #351 Corrugated Control Joint Anchor

2.7 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Division 07 Section "Sheet Metal Flashing and Trim."

B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."

2.8 MISCELLANEOUS MASONRY ACCESSORIES

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

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use Type S.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type S.
 - 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength of 2500 psi (17.5 MPa).
 - 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. 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.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/194 sq. cm (30 g/30 sq. in.) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).

4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

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

3.5 MORTAR BEDDING AND JOINTING

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

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuous horizontal wire in the facing wythe.

D. Provide continuity at wall intersections by using prefabricated T-shaped units.

E. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

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

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

C. If not shown on plans, provide at maximum 25 feet joint-to-joint and at maximum 12 joint-to-corner in locations to coincide with changes in wall height or thickness, construction joints in foundation, chases or recesses, columns, sides of wall opening, return angles or reentrant corners, as approved by Architect/Engineer.

3.9 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

1. Provide (2) #5 in continuous bond beams immediately above the lintel and below the sill. Extend reinforcing a minimum of 2'-0" beyond jambs of openings.

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

3.10 FLASHING

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

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.12 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 an inconspicuous location approved by the Contracting Officer. Clean part of the area for comparison purposes. Obtain Contracting Officer's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.13 MASONRY WASTE DISPOSAL

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

END OF SECTION 04 20 00

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SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Structural steel.
2. Grout.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 SUBMITTALS

- A. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Prepare erection drawings
 - a. Follow AISC Code of Standard Practice

- B. Mill test reports for structural steel, including chemical and physical properties.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications:

1. A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
2. Certified welders required perform all welding.

- B. Installer Qualifications:

1. Certified welders required perform all welding.

- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303-05. Code of Standard Practice for Steel Buildings and Bridges
2. AISC 360-05. Specification for Structural Steel Buildings
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.6 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. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.7 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.

B. Coordinate steel detailing with mechanical equipment.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.

C. Plate and Bar:

1. Unless noted otherwise; ASTM A 36/A 36M.
2. Selected plates on moment connections; ASTM A529 Gr 50.

D. Cold-Formed Hollow Structural Sections: ASTM A 1085, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

F. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

G. Steel Forgings: ASTM A 668/A 668M.

H. Welding Electrodes: Comply with AWS requirements.

2.2 Crane Runway Beams shall be straightened and fabricated to CMAA requirements and tolerances.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. Steel Bolts and Nuts: Heavy hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with heavy hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Anchor Rods: ASTM F 1554, Grade 55.
 - 1. Configuration: Straight, headed or tacked nut.
 - 2. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 5. Finish: Plain.
- E. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 3. Finish: Plain.
- F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.
- G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces according to SSPC-SP 6, "Commercial Blast Cleaning."

- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- H. Stainless steel shall be passivated after fabrication to restore non-corrosive properties to prevent corrosion or staining at welded joints.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.6/D1.6M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

- A. Primer: Comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."
- B. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
- C. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- E. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 FIELD-APPLIED PAINT FINISH

- A. Field paint all exposed steel in accordance with the architectural finish schedule and "Interior Painting" in Division 9 of the specifications.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: For all exterior steel apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
1. Complete all fabrication and cleaning before galvanizing.
 2. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 3. Galvanize lintels and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

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

3.6 REPAIRS AND PROTECTION

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

END OF SECTION 05 12 00

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SECTION 05 21 00

STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. K-series steel joists.
2. Joist accessories.

1.3 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 non-uniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. 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.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
1. Use ASD; data are given at service-load level.
 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists Vertical deflection:
 - 1) 1/360 of the span for joists supporting gypsum ceiling.
 - 2) 1/240 of the span for all others.

2.2 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.
1. Joist Type: K-series steel joists and KCS-type K-series steel joists, as indicated.
- 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. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- D. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- E. Camber joists according to SJI's "Specifications."
- F. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.3 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. Camber long-span steel joists according to SJI's "Specifications."
- C. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 JOIST GIRDERS

- A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.
- B. Camber joist girders according to SJI's "Specifications."
- C. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.5 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.6 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Provide horizontal bridging at locations where mechanical equipment or ductwork must pass between joists.
- C. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.7 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. 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 (0.025 mm) thick.
1. Comply with Division 9.

2.8 FIELD-APPLIED PAINT FINISH

- A. Field paint all exposed steel in accordance with the architectural finish schedule and "Interior Painting" in Division 9 of the specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

- C. Field weld joists to supporting steel bearing plates and framework as indicated. 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. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: 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.
- 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.

3.4 PROTECTION

- A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 - 1. Clean and prepare surfaces by power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- B. 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Roof deck.
- 2. Composite Deck.

1.3 SUBMITTALS

- A. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction. Include product data for each type of deck

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
 - 1. Galvanized: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
 - 2. Deck Profile: As indicated.
 - 3. Profile Depth: As indicated.
 - 4. Design Uncoated-Steel Thickness: As indicated.

5. Span Condition: Triple span or more.
6. Side Laps: Overlapped.

2.2 COMPOSITE DECK

A. Composite 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. Galvanized: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Triple span or more.

2.3 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 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.
- I. Sump Plate/Pan: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
- J. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- K. Repair Paint: Match primer paint system specified in Division 9 painting section, of same color as primer.

2.4 FIELD-APPLIED PAINT FINISH

A. Field paint all exposed steel in accordance with the architectural finish schedule and "Interior Painting" in Division 9 of the specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Locate mechanical fasteners as indicated and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members with fastener type and spacing as indicated but exceeding the lesser of the following:
1. Fasten edge and interior webs of deck units with a minimum of two fasteners per unit at each support.
 2. Space fasteners at 12 inches apart in the field of the roof and 6 inches apart in roof corners and perimeters, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.
 3. As indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of the following:
1. As indicated.
 2. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) 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 (38 mm), with end joints as follows:
1. End Joints: Lapped 2 inches (51 mm) minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and fasten flanges to top of deck. Space fasteners not more than 12 inches (305 mm) apart with at least one fastener at each corner.
1. Install reinforcing channels or zees in ribs to span between supports and 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. Fasten to substrate to provide a complete deck installation.
 - 1. Fasten cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members with fastener type and spacing as indicated but exceeding the lesser of the following:
 - 1. Fasten edge and interior webs of deck units with a minimum of two fasteners per unit at each support.
 - 2. Space fasteners at 12 inches apart in the field of the floor and 6 inches apart in floor corners and perimeters.
 - 3. As indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated.
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) 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 (38 mm), with end joints as follows:
 - 1. End Joints: Lapped.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

3.5 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. Fastener type, size, spacing, and layout shall be inspected while exposed for easy access and repair.
- C. Testing agency will report inspection results promptly and in writing to Contractor and COR.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color and paint type as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- C. 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

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SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing metal stud wall framing (Administration area).
2. Exterior metal stud wall framing for support of wall openings.
3. Interior non-load bearing metal stud wall framing for partition walls taller than 15' or where structural metal stud wall framing is indicated.
4. Bridging, bracing and attachments to structure, including provisions for deflections of adjacent construction.
5. Ceiling framing for gypsum board ceilings, where scheduled.

B. Related sections:

1. See Section 092216 – 'Non-Structural Metal Framing' for interior non-load-bearing steel stud partition walls not otherwise indicated to be constructed with structural metal framing systems.
2. See Section 133419 – 'Metal Building Systems' for structural cold-formed components of pre-engineered metal building systems.

1.2 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel (CFS) Framing, General: Design and provide in accordance with 2012 International Building Code (IBC) with State of Wyoming Natrona County Amendments, and AISI's "Standard for Cold-Formed Steel Framing - General Provisions".

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design for all Code required loads and load cases including Dead, Live, Wind, and Earthquake, for project design criteria indicated on the structural drawings and herein.
3. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
4. Design for support of openings and components that cover openings, including but not limited to: doors, windows, other glazing systems, and louvers. Reinforce opening framing, jambs, heads and sills, to resist tributary loads from components that cover openings, and to provide for attachment of doors, windows, louvers and other construction.
5. Provide framing with no punched opening at doors and openings.
6. Design attachments between system components.
7. Design attachments to structure.
8. Design wall bridging, bracing and attachments to structure.
9. Include elements indicated on drawings as load-bearing or 'structural' metal studs or framing or "Cold Formed Steel" or "CFS".
10. Design CFS ceiling joists for gypsum board ceilings.

1.3 DEFINITIONS

A. CFS: Cold Formed Steel

1.4 COORDINATION

- A. Coordinate and provide additional framing, blocking and backing to provide support for items attached to CFS system.

1.5 SUBMITTALS

- A. Shop Drawings. Include materials, sizes, dimensions, details, connections necessary to indicate and properly construct CFS system and interface with main structure and related components. Prepared under the supervision of CFS PE and signed and sealed by CFS PE.
- B. Structural Design Calculations. Performed, signed and sealed by the CFS PE.
- C. Product Data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Clark Steel Framing.
 - 2. Dale/Incor.
 - 3. Dietrich Metal Framing; a Worthington Industries Company.

2.2 MATERIALS

- 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.

2.3 WALL AND CEILING FRAMING

- A. Steel Studs and Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Flange width: Not less than 1-5/8 inch.
 - 2. Base metal thickness: As required by design, but not less than 0.033 inch.
 - 3. Base metal thickness, for stud backing at veneer, masonry veneer, and elements at risk for weather exposure: As required by design, but not less than 0.043 inch.
 - 4. Base metal thickness, for studs having components and backing for support of equipment, appurtenances, and architectural features: As required by design, but not less than 0.043 inch and not less than required for connections and load path.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges.
- C. Screws: Self drilling, self tapping sheet metal screws; ASTM C 1513.
- D. Connections, General: Connection products shall be capable of providing load resistance required with appropriate performance qualification for use and project conditions, demonstrable by Code Evaluation Report or equivalent documentation. Connections shall be appropriate and qualified for use in Project Seismic Design Category indicated on drawings.

- E. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dietrich Metal Framing; a Worthington Industries Company.
 - b. SCAFCO Corporation
 - c. The Steel Network, Inc.
- F. Single Deflection Track: 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 and lateral loads and transfer them to the primary structure.
- G. Double Deflection Tracks: Double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure.
 2. Inner Track: Of web depth indicated.
- H. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.4 FABRICATION

- A. Fabricate cold-formed metal 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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Use slip provisions at adjacent construction to accommodate the anticipated range of differential movement under design loads and conditions. Provide custom sizes and components as necessary.
- D. Install anchors in accordance with Section 055000 Metal Fabrications.
- E. Coordinate the installation of related components of adjacent construction.

3.2 PROTECTION AND REPAIR

- A. Protect CFS elements from damage, including notching, bending, clipping, boring, punching, and unacceptable deformation of cross section.

- B. Repair damaged framing components and connections by a method approved in writing by the PE. Procedures, drawings and details provided for repair shall be stamped and signed by the PE and submitted to the Owner for approval prior to commencing repairs.

END OF SECTION 05 40 00

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for overhead doors.
 - 2. Steel framing and supports for overhead grilles.
 - 3. Steel framing and supports for countertops.
 - 4. Steel framing and supports for mechanical and electrical equipment.
 - 5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 6. Steel bollards permanently set with anchored base plates.
 - 7. Steel bollards permanently set in concrete footings.
 - 8. Steel pipe guards.
- 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.
- C. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 05 12 00 "Structural Steel Framing."
 - 3. Section 12 93 00 "Site Furnishings" for bicycle racks.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Paint products.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

1.5 QUALITY ASSURANCE

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

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.

2.2 METALS

- A. LEED2009 - Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- E. 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.
- F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- G. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- H. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- I. 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, commercial steel, Type B, with G90 coating; nominal thickness.
- J. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- K. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- L. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- M. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- N. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 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.
- 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 1.
- 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.
 - 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. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 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.
 - 2. Inorganic Zinc-Rich Primer: Inorganic based, anti-corrosive primer complying the MPI#19.
 - 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.

2.5 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.

2.6 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. Anti-corrosive primer.
 - 2. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.

2.7 STEEL SUPPORT FRAMING FOR OVERHEAD GRILLES

- 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. Anti-corrosive primer.
 - 2. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.

2.8 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.

2.9 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.

2.10 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. Exception: Primer not required where framing is completely concealed in interior wall or ceiling construction.

2.11 STEEL BOLLARDS PERMANENTLY SET WITH ANCHORED BASE PLATES

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- thick steel plate.
- B. Fabricate bollards with 3/4-inch- thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
 - 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
- C. Shop Finish:
 - 1. Anti-corrosive primer at interior.

2.12 STEEL BOLLARDS, PERMANENTLY SET IN CONCRETE FOOTINGS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Shop Finish:
 - 1. Anti-corrosive primer at interior.
 - 2. Galvanized at exterior.

2.13 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. Galvanized and primed with shop primer for galvanized steel.

2.14 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.

2.15 STEEL AND IRON FINISHES

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

2.16 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
 - F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
- 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS
- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
 - B. Framing for Overhead Doors: Anchor supports securely to, and rigidly brace from, building structure.
 - C. Framing for Overhead Grilles: Anchor supports securely to, and rigidly brace from, building structure.
- 3.3 INSTALLING METAL BOLLARDS PERMANENTLY SET USING ANCHORED BASE PLATES
- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
 - B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
- 3.4 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. See Structural Drawings
 - B. Fill bollards solidly with concrete, mounding top surface to shed water.
- 3.5 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.
- 3.6 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. 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Preassembled steel stairs with concrete-filled treads.
 - 2. Railings attached to metal stairs.
 - 3. Handrails attached to walls adjacent to metal stairs.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
 - 2. Section 05 52 13 "Pipe and Tube Railings" for pipe and tube railings.

1.3 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal pan stairs and the following:
 - 1. Nonslip aggregates and nonslip-aggregate finishes.
 - 2. Paint products.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Alfab, Inc.
 - 2. American Stair, Inc.
 - 3. Lapeyre Stair Inc.
 - 4. Pacific Stair Corporation.
 - 5. Worthington Metal Fabricators.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 45 16 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: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.

2.3 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. LEED2009 - Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

2.4 ABRASIVE NOSINGS

- A. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

2.5 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 stairs indicated to be galvanized.

2.6 MISCELLANEOUS MATERIALS

- A. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

- D. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.
- E. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.7 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.

2.8 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 channels.
 - a. Provide closures for exposed ends of channel stringers.
 - 2. Construct platforms of steel 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 stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
 - 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
 - 1. Steel Sheet:
 - a. Uncoated cold-rolled steel sheet.
 - 2. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by concrete fill. Do not weld risers to stringers.
 - 3. Shape metal pans to include nosing integral with riser.
 - 4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
 - a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

2.9 STAIR RAILINGS

1. Fabricate newels of square steel tubing and provide newel caps of pressed steel, as shown.
 2. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
 3. Connect posts to stair framing by direct welding unless otherwise indicated.
- 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.
- C. Close exposed ends of railing members with prefabricated end fittings.
- D. 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.
- E. Connect posts to stair framing by direct welding unless otherwise indicated.
- F. 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 galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.

2.10 FINISHES

- A. Shop Finish:
1. Galvanized and primed with shop primer for galvanized steel.
- B. Finish metal stairs after assembly.
- C. 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.
 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- D. 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.
- E. 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.
- F. 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

3.1 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.
- G. Place and finish concrete fill for treads and platforms to comply with Section 03 30 00 "Cast-in-Place Concrete."

3.2 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.

3.3 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.
- B. 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 51 13

SECTION 05 52 13

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel pipe and tube railings hot-dip galvanized and shop primed; with welded connections unless otherwise indicated.
- B. Related Requirements:
 - 1. Section 05 51 13 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Grout, anchoring cement, and paint products.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Pipe and Tube Railings:

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

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 45 16 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. 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.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.4 STEEL AND IRON

- A. LEED2009 - Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed).
- C. 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.
 1. Provide galvanized finish for exterior installations and where indicated.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.5 FASTENERS

- A. General: Provide the following:
 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors 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 zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. 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 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.
- L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 1. Hot-dip galvanize steel railings, including hardware, after fabrication.
 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "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

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 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.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 PROTECTION

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

END OF SECTION 05 52 13

SECTION 05 58 26

METAL COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Stainless-steel countertops.
 - 2. Stainless-steel shelves.

1.3 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

1.5 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.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M, Typ 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.
 - 2. Joint Sealant: Latex.
 - 3. Color: Clear.
 - 4. LEED2009 - Sealant shall have a VOC content of 250 g/L or less.

5. LEED2009 - Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 STAINLESS-STEEL COUNTERTOPS

- A. Countertops: Fabricate from 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.
 1. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.
 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.
 5. Form the backsplash coved to and integral with top surface, with a 1/2-inch- thick top edge and 1/2-inch return flange.
 6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.

2.3 STAINLESS-STEEL SHELVES

- A. Wall-Mounted Shelves: Fabricate from stainless-steel sheet, not less than 0.047 inch 0.079 inch nominal thickness. Weld shop-made joints. Fold down the front edge a minimum of 3/4 inch; fold up the back edge a minimum of 3 inches. Provide integral stiffening brackets, formed by folding up ends a minimum of 3/4 inch and by welding to upturned back edge.

2.4 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

3.1 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.

3.2 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. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
- D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.
- F. Wall-Mounted Shelves: Fasten to masonry, partition framing, blocking, or reinforcements in partitions. Fasten each shelf through upturned back edge at not less than 24 inches o.c.

3.3 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 00

DECORATIVE METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.3 COORDINATION

- A. Coordinate installation of anchorages for decorative 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 such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product, including finishing materials.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. 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, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
- D. Patterns, Models, or Plaster Castings: Made from proposed patterns for each design of custom casting required.
- E. Samples for Verification: For each type of exposed finish.
 - 1. Sections of linear shapes.
 - 2. Full-size Samples of castings and forgings.
 - a. For custom castings, submit finished Samples showing ability to reproduce detail, cast-metal color, and quality of finish. Samples may be of similar previous work.
 - 3. Samples of welded and brazed joints showing quality of workmanship and color matching of materials.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- C. Welding certificates.

1.7 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, as well as sufficient production capacity to produce required units.
- B. Installer Qualifications: Fabricator of products.

- C. Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings, of type indicated, to aluminum extrusions and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- D. Anodic Finisher Qualifications: A firm experienced in successfully applying anodic finishes of type indicated and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- E. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- F. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups for the following types of decorative metal:
 - a. As indicated on drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 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.
- B. Deliver and store cast-metal products in wooden crates surrounded by enough packing material to ensure that products are not cracked or otherwise damaged.

1.9 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.

1.10 WARRANTY

- A. Submit manufacturer's limited warranty against defects in materials and workmanship
- B. Panel: 20 years from the date of Substantial Completion
- C. Factory-Applied Coatings: 10 years from the date of Substantial Completion

PART 2 - PRODUCTS

2.1 DECORATIVE METAL FABRICATORS

- A. Fabricators: Subject to compliance with requirements, provide decorative metal work by the following:
 - 1. Parasoleil, 6510 W. 91st Avenue, Suite 100, Westminster, CO 80031; www.parasoleil.com

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Use materials with smooth, flat surfaces unless otherwise indicated. Use materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.3 ALUMINUM

- A. Plate and Sheet: AA500, H32 temper, aluminum with recycled content of 60%.
- B. Finish: Factory-Applied Powder Coated:
 - 1. Performance: AAMA 2604
 - 2. Color: As indicated in drawings.

2.4 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Aluminum Items: Type 304 stainless-steel fasteners.
 - 2. Fasteners shall be immune to hydrogen-assisted stress-corrosion cracking
 - 3. Head and Shank: Non-magnetic, 300 series stainless steel

4. Drill Point: Carbon steel
 5. Uncoated-Steel Items: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed, Type 304 stainless-steel fasteners where exposed.
 6. Galvanized-Steel Items: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 7. Dissimilar Metals: Type 304 stainless-steel fasteners.
 8. Color: Color of exposed-to-view fasteners in surfaces with factory-applied finishes shall be compatible with panel finish.
 9. Size and Spacing: As shown on Drawings.
 10. Washers: Provide bonded neoprene washers where necessary to prevent water intrusion.
- B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.
- C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work unless otherwise indicated.
1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
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. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

- A. Clips: Provide clips or attachment devices where it is not practical to attach panels directly to substrate. Design clips to minimize visibility.
- B. Galvanic Barriers: Types recommended by manufacturer for conditions of use.
- C. Shims: Non-staining type suitable for condition of use.
- D. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

2.6 FABRICATION, GENERAL

- A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- D. 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.
- E. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- F. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- G. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Cut, reinforce, drill, and tap as needed to receive finish hardware, screws, and similar items unless otherwise indicated.
- H. Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.
 1. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 Welds: no evidence of a welded joint Type 2 Welds: completely sanded joint, some undercutting and pinholes okay Type 3 Welds: partially dressed weld with spatter removed Type 4 Welds: good quality, uniform undressed weld with minimal splatter.
- I. Provide castings that are sound and free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.

2.7 DECORATIVE MECHANICAL GRILLES

- A. Basis of Design Product: Subject to compliance with Parasoleil, 6510 W. 91st Avenue, Suite 100, Westminster, CO 80031; www.parasoleil.com
- B. Fabricate decorative grilles from perforated aluminum sheet or plate of thickness, size, and pattern indicated in this specification section. Form perforations by punching, cutting, or drilling to produce openings of sizes and shapes indicated. Roll, press, and grind perforated metal to flatten and to remove burrs and deformations.
 - 1. Drawings indicate perforated metal patterns required and are based on products of one manufacturer. Perforated metal patterns produced by other manufacturers may be considered, provided deviations are minor and do not change design concept as judged solely by Architect.
- C. Fabricate grille frames from extruded profiles and to sizes and shapes indicated. Miter frame members at corners and connect with concealed splice plates welded to back of frames.
 - 1. Drawings indicate frame profiles required and are based on products of one manufacturer. Similar frame profiles produced by other manufacturers may be considered, provided deviations are minor and do not change design concept as judged solely by Architect.
- D. Drill and countersink frames for mounting screws at 4 inches from corners and at 16 inches or less o.c. Provide units with oval-head self-tapping machine screws.

2.8 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.9 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.
- B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.
- C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work.
- D. Factory-Painted Surfaces: Do not cut, grill, or weld unless required by approved shop drawings.
- E. 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.
- F. Install concealed gaskets, joint fillers, insulation, and flashings as work progresses.
- G. 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.
 - 1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.

- H. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections in "Fabrication, General" Article. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- I. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLING DECORATIVE MECHANICAL GRILLES

- A. Mount decorative grilles at heights and in positions indicated, adjusting ductwork to be centered on grilles if any.
 - 1. Secure to framing and blocking with specified fasteners.
 - 2. On marble, brick, and other solid surfaces, secure with wood screws in plastic plugs.

3.4 CLEANING AND PROTECTION

- A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.
- B. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
- C. 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.
- D. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 13.16 "Exterior Painting" and Section 09 91 13.13 "Interior Painting."
- E. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.
- F. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.
- G. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 70 00

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber for the following:
 - a. Other framing - Utility work.
2. Rooftop equipment bases and support curbs - Architectural work.
3. Rooftop equipment bases and support curbs - Utility work.
4. Wood blocking - Architectural work.
5. Wood blocking - Utility work.
6. Wood cants - Architectural work.
7. Wood nailers - Architectural work.
8. Wood furring - Architectural work.
9. Wood grounds - Utility work.
10. Wood sleepers - Architectural work.
11. Wood sleepers - Utility work.
12. Wood sills and floor plates - Utility work.
13. Wood bracing, stripping, and similar concealed members - Utility work.
14. Equipment backing panels, interior exposure - Architectural work.
15. Equipment backing panels, interior exposure - Utility work.
16. Fasteners.
17. Metal framing anchors.
18. Separator sheeting.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for sheathing, subflooring, and underlayment.

1.2 ACTION SUBMITTALS

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

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

B. LEED2009 - Sustainable Design Submittals:

1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
4. Product Data: For installation adhesives, indicating VOC content.

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. 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. Maximum Moisture Content of Lumber:
 - 1. 19 percent.

2.2 WOOD-PRESERVATIVE-TREATED (WPT) MATERIALS

- A. Preservative Treatment by Pressure Process:
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Lumber: Kiln-dry after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

2.3 FIRE-RETARDANT-TREATED (FRT) MATERIALS

- A. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
 - 1. For exposed lumber or plywood indicated to receive a stained or natural finish, mark end or back of each piece.
- B. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- C. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood bracing, stripping, and similar concealed members - Utility work.
 - 2. Equipment backing panels, interior exposure - Architectural work.
 - 3. Equipment backing panels, interior exposure - Utility work.

2.4 MISCELLANEOUS LUMBER

- A. Blocking - Architectural work:
 - 1. Dimension Lumber:
 - a. Species: Any of following:
 - 1) WCLIB; Hem-fir, Spruce-pine-fir (south), or other western wood.
 - b. Provide wood-preservative-treated (WPT) lumber where indicated.
 - 2. Plywood: Limit use only for attaching other construction such as fixtures, accessories, casework, and other materials.
 - a. DOC PS 1, Exposure 1, Grade C-D Plugged or better.
 - b. Nominal Thickness:
 - 1) Not less than 1/2-inch unless indicated otherwise.
 - 2) As indicated on Drawings.
 - 3) Not less than 3/4-inch where used to support railings, handrails, grab bars, seating, and similar conditions.
- B. Blocking - Utility work:
 - 1. Dimension Lumber:

- a. Grade: Stud, No. 3, Standard, or better.
 - b. Species: Any of following:
 - 1) NLGA; Hem-fir (north), Spruce-pine-fir, or other northern species.
 - 2) SPIB; Mixed southern pine or southern pine.
 - 3) WWPA; Hem-fir, Spruce-pine-fir (south), or other western wood.
 - c. Provide wood-preservative-treated (WPT) lumber where indicated.
 - d. Provide fire-retardant-treated (FRT) lumber where indicated.
2. Plywood: Limit use only for attaching other construction such as fixtures, accessories, casework, and other materials.
- a. DOC PS 1, Exposure 1, Grade C-D Plugged or better.
 - b. Nominal Thickness:
 - 1) Not less than 1/2-inch unless indicated otherwise.
 - 2) As indicated on Drawings.
 - 3) Not less than 3/4-inch where used to support railings, handrails, grab bars, seating, and similar conditions.
 - c. Provide fire-retardant-treated (FRT) plywood where indicated.
- C. Nailers - Architectural work:
1. General: Where used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
 2. Dimension Lumber:
 - a. Grade: No. 2, Construction, or better.
 - b. Species: Any of following:
 - 1) NeLMA; Spruce-pine-fir (south), or other eastern softwood.
 - 2) NLGA; Hem-fir (north), Spruce-pine-fir, or other northern species.
 - 3) SPIB; Mixed southern pine or southern pine.
 - 4) WCLIB; Hem-fir, Spruce-pine-fir (south), or other western wood.
 - 5) WWPA; Hem-fir, Spruce-pine-fir (south), or other western wood.
 3. Board Lumber:
 - a. Species: Any of following:
 - 1) NeLMA; Spruce-pine-fir (south), Spruce-pine-fir, or other eastern softwoods.
 - 2) SPIB; Mixed southern pine or southern pine.
 - 3) WCLIB; Hem-fir, Hem-fir (north), Spruce-pine-fir (south), Spruce-pine-fir, or other western woods.
 - 4) WWPA; Hem-fir, Hem-fir (north), Spruce-pine-fir (south), Spruce-pine-fir, or other western woods.
 4. Provide wood-preservative-treated (WPT) lumber where indicated.
- D. Rooftop equipment bases and support curbs - Architectural work:
1. Dimension Lumber:
 - a. Species: Any of following:
 - 1) NeLMA; Spruce-pine-fir (south), or other eastern softwood.
 - 2) SPIB; Mixed southern pine or southern pine.
 - 3) WCLIB; Hem-fir, Spruce-pine-fir (south), or other western wood.
 - 4) WWPA; Hem-fir, Spruce-pine-fir (south), or other western wood.
 - b. Provide wood-preservative-treated (WPT) lumber where indicated.
 2. Equipment Base Top Panels: Plywood, DOC PS 1, Exterior Exposure, Grade C-C Plugged or better.
 - a. Nominal Thickness: Not less than following unless indicated otherwise on Drawings:
 - 1) 1/2-inch where minor span of support framing is 32 inches or less.
 - 2) 3/4-inch where minor span of support framing exceeds 32 inches.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels, Interior Exposure - Architectural Work:
 - 1. Plywood, DOC PS 1, Exposure 1, Grade A-C.
 - a. Nominal Thickness: Not less than 3/4-inch unless indicated otherwise on Drawings.
 - b. Provide fire-retardant-treated (FRT) plywood where indicated.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. 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:
 - a. Carpentry exposed to weather.
 - b. Carpentry in areas of high relative humidity.
 - c. Interior carpentry pressure-preservative treated (WPT).
 - d. Carpentry fire-resistive-treated (FRT).
 - 2. Provide only Type 304 stainless steel fasteners for the following work:
 - a. Exterior carpentry pressure-preservative treated (WPT).
 - b. Carpentry is in contact with ground.
- B. Wood Screws: ASME B18.6.1.
- C. Lag Bolts: ASME B18.2.1.
- D. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Rough Carpentry to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. LEED2009 - Adhesives shall have a VOC content of 70 g/L or less.
- B. Separator Sheeting: Flexible flashing composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch .
 - 1. Do not use butyl rubber sheeting over substrates containing asphaltic compounds.

PART 3 - EXECUTION

3.1 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. Comply with AWWPA M4 for applying field treatment to cut surfaces of wood preservative-treated (WPT) lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- F. Where wood-preservative-treated (WPT) lumber is installed on metal substrates, install continuous flexible flashing separator between wood and metal substrate.

- G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.
- H. 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.
- I. 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.
- J. Bolt and Nut Fastening: Where indicated, bolt and nut fasten carpentry work. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.2 ROOFTOP EQUIPMENT BASES AND SUPPORT CURBS INSTALLATION

- A. Anchor bases and curbs securely in place so they are capable of resisting indicated loads.
- B. Install equipment support bases so that top surfaces are level with each other and extend not less than 8 inches above finished surface of roofing.
- C. Install equipment support curbs so top surface is level and extends not less than 8 inches above finished surface of roofing.

3.3 WOOD BLOCKING INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading.

3.4 WOOD NAILERS INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading.

3.5 WOOD FURRING INSTALLATION

- A. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring at 24 inches o.c.
- B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.
 - 1. Provide metal clips for fastening gypsum board at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

3.6 PLYWOOD BACKING PANEL INSTALLATION

- A. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- B. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- C. Fasten panels to studs to support applied loading.
 - 1. Screw to metal stud wall framing not less than 12 inches o.c. vertically at each stud.

3.7 PROTECTION

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

END OF SECTION 06 10 53

SECTION 06 16 00

SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing of following type(s).
 - a. Plywood.
 - b. Paper-surfaced gypsum.
 - c. Cellulose fiber-reinforced gypsum.
2. Parapet sheathing of following type(s).
 - a. Plywood.
 - b. Glass-mat gypsum.
3. Composite nail base insulated roof sheathing of following types(s).
 - a. Oriented-strand-board-surfaced, polyisocyanurate-foam.
 - b. Vented, oriented-strand-board-surfaced, polyisocyanurate-foam.
4. Underlayment of following type(s).
5. Wood-preservative treatment (WRT).
6. Fasteners.
7. Sheathing joint and penetration treatment for the following.
 - a. Paper-surfaced gypsum sheathing.
 - b. Glass-mat gypsum sheathing.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for plywood backing panels.
3. Section 07 25 00 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.2 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.

B. LEED 2009 - Sustainable Design Submittals:

1. Chain-of-Custody Qualification Data: For manufacturer and vendor.
2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
4. Product Data: For installation adhesives, indicating VOC content.
5. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

1.3 QUALITY ASSURANCE

- A. LEED 2009 - Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. LEED 2009 - Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Use treatment that does not promote corrosion of metal fasteners.
- C. Application: Treat plywood indicated on Drawings, and the following:
1. Roof sheathing within 48 inches of party walls.
 2. Wall sheathing within 48 inches of party walls.

2.3 WALL SHEATHING

- A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exterior sheathing.
1. Span Rating: Not less than 16/0.
 2. Nominal Thickness: Not less than 1/2 inch .
- B. Paper-Surfaced Gypsum Sheathing: ASTM C 1396/C 1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. Continental Building Products, LLC.
 - c. Georgia-Pacific Building Products.
 - d. National Gypsum Company.
 - e. Temple-Inland Building Products by Georgia-Pacific.
 2. Type and Thickness: Type X, 5/8 inch thick.
- C. Foil-Faced, Polyisocyanurate-Foam Sheathing: ASTM C 1289, Type I or Type II, Class 2, rigid, cellular, polyisocyanurate thermal insulation. Foam-plastic core and facings shall have a flame-spread index of 25 or less when tested individually.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Chemical Company (The).
 - b. Hunter Panels.
 2. Thickness: 5/8 inch .

2.4 PARAPET SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exterior sheathing.
- B. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
 - 1. Type and Thickness: Type X, 5/8 inch thick.

2.5 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

- A. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: ASTM C 1289, Type V with DOC PS 2, Exposure 1 oriented strand board 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:
 - a. Atlas Roofing Corporation.
 - b. Cornell Corporation.
 - c. Dow Chemical Company (The).
 - d. Rmax, Inc.
 - 2. Oriented-Strand-Board Nominal Thickness: 5/8 inch .

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Roof, Parapet, and Wall Sheathing Fasteners:
 - a. Provide one of following at contractor's discretion, unless indicated otherwise:
 - 1) Fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- D. 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 954:
 - a. 33 mil (20 gage structural).

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. LEED 2009 - Adhesive shall have a VOC content as follows:
 - a. For Subfloor Adhesive: 50 g/L or less.
 - b. For Multipurpose Construction Adhesive 70 g/L or less.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.

3. 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. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. Fastening Methods: Fasten panels as indicated below:
 1. Combination Subfloor-Underlayment:
 - a. Screw to cold-formed metal framing.
 2. Subflooring:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch apart at edges and ends.
 3. Roof Sheathing:

END OF SECTION 06 16 00

SECTION 06 41 16

PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. 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.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
 - 2. Section 06 41 17 "Plastic-Laminate-Clad Countertops."

1.3 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.)

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 - 5. 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 and other items installed in architectural plastic-laminate cabinets.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
2. Wood-grain plastic laminates, 12 by 24 inches, for each type, pattern and surface finish, with one sample applied to core material and specified edge material applied to one edge.
3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
4. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator and installer.

1.6 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications:

1. Fabrication shop and installer that employs skilled workers who custom fabricate and install products similar to those required for this Project and whose products have a record of successful in-service performance. Fabrication shop and installer need not be the same unless indicated otherwise below.
2. LEED2009 - Installer is fabricator of products or if not must be FSC certified for chain of custody.

1.7 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.

1.8 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 between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where 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.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 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.

- B. LEED2009 - Regional Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. LEED2009 - Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Grade: 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. Horizontal Surfaces: Grade HGL.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade VGS.
 - 4. Edges: Grade VGS.
 - 5. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
- 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 tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish or PVC T-mold 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.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers receiving locking hardware unless located directly under tops.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. 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.
- J. 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 Finish Legend.

2.3 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: 5 to 10 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. LEED2009 - Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.
 - b. LEED2009 - Composite Wood Products: Products shall be made without urea formaldehyde.
 - 3. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
 - 4. Particleboard: ANSI A208.1, Grade M-2.
 - 5. Softwood Plywood: DOC PS 1.

2.4 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, minimum 100 degrees of opening, self-closing.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 and BHMA A156.9, B04102; with shelf brackets, B04112.
- F. Shelf Rests: BHMA A156.9, B04013; metal.
- G. Drawer Slides: BHMA A156.9.
 - 1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 2. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 - 3. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
 - 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. Satin Stainless Steel: BHMA 630.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 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. LEED2009 - 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.
 - d. Postformed Cabinet Construction: Do not use PVA or resorcinol.
 - 2. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- E. FABRICATION 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.
- F. 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

3.1 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.

3.2 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.

3.3 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 41 17

PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes plastic-laminate countertops.

1.3 REFERENCES

- A. Acronyms:
 - 1. AWS - Architectural Woodwork Standards and its joint adoptees and publishers including:
 - a. AWI - Architectural Woodwork Institute.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 4. Product Data: For shop applied adhesives, indicating that product contains no urea formaldehyde.
 - 5. Product Data: For installation adhesives, indicating VOC content.
 - 6. Product Data: For installation adhesives, indicating that product contains no urea formaldehyde.
 - 7. 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 locations and sizes of cutouts and holes for plumbing fixtures faucets soap dispensers electrical switches and outlets and other items installed in plastic-laminate countertops.
- D. Samples for Verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator and installer.

1.6 QUALITY ASSURANCE

- A. Fabricator and Installer Qualifications:
 - 1. Fabrication shop and installer that employs skilled workers who custom fabricate and install products similar to those required for this Project and whose products have a record of successful in-service performance. Fabrication shop and installer need not be the same unless indicated otherwise below.
 - 2. LEED2009 - Installer is fabricator of products or if not must be FSC certified for chain of custody.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where countertops 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.
- C. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, 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.
- B. LEED2009 - Regional Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. LEED2009 - Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.

2.2 PLASTIC-LAMINATE COUNTERTOPS

- A. Grade: Custom.
- B. High-Pressure Decorative Laminate:
 - 1. NEMA LD 3, Grade as follows:
 - a. Grade HGS (0.048 inch or 1.2 mm thick) for flat surface countertops where "Heavy Duty" indicated.
 - b. Grade HGL (0.039 inch or 1.0 mm thick) for flat surface countertops unless indicated otherwise.
 - c. Grade HGP (0.039 inch or 1.0 mm thick) for countertops indicated with coved counter/backsplash transitions or curved edges.
- C. 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 manufacturer's designations as indicated on Drawing's Finish Legend.
 - 2. Grain Direction: Parallel to cabinet fronts.
- D. Edge Treatment: As indicated on Drawings.
- E. Core Material, Counters with Dry Exposures:
 - 1. Particleboard.
 - 2. Medium-density fiberboard.
- F. Core Material, Counters with Wet Exposures (e.g. at sinks):
 - 1. Particleboard made with exterior glue.
 - 2. Medium-density fiberboard made with exterior glue.
- G. Core Thickness: Either 3/4 inch or 1-1/8 inch at Contractor's discretion.

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to bottom surface of core. 1-1/8 inch cores need not be built up unless indicated otherwise on Drawings.
 - H. Backer Sheet: Provide the following on underside of countertop substrate:
 1. Paper backing.
- 2.3 WOOD MATERIALS
- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
 1. Wood Moisture Content: 5 to 10 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. LEED2009 - Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.
 - b. LEED2009 - Composite Wood Products: Products shall be made without urea formaldehyde.
 3. Medium-Density Fiberboard: ANSI A208.2, Grade 130; and made with exterior glue where indicated.
 4. Particleboard: ANSI A208.1, Grade M-2; and made with exterior glue where indicated.
- 2.4 ACCESSORIES
- A. Grommets for Cable Passage through Countertops: 2-inch OD, , molded-plastic grommets and matching plastic caps with slot for wire passage. Color as selected by Architect from manufacturer's full range.
 - B. Paper Slots: 17 inches long by 1-3/4 inches wide by 1 inch deep; , molded-plastic, paper-slot liner with 1/4-inch lip. Color as selected by Architect from manufacturer's full range.
- 2.5 MISCELLANEOUS MATERIALS
- A. Shop Applied Adhesives:
 1. LEED2009 - Do not use adhesives that contain urea formaldehyde.
 2. Adhesive for Bonding Plastic Laminate:
 - a. For the following uses:
 - 1) General Use: Unpigmented contact cement, contact cement, PVA, or resorcinol.
 - 2) General Use Postforming: Unpigmented contact cement or contact cement.
 - 3) Through-Color Laminates: Unpigmented contact cement or PVA.
 - 4) Applications Requiring Water and Chemical Resistance and Resistance to Temperature Fluctuations: Resorcinol.
 - b. Postformed Cabinet Construction: Do not use PVA or resorcinol.
 3. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
 - B. Installation Adhesives:
 1. LEED2009 - Adhesives shall have a VOC content of 70 g/L or less.
 2. LEED2009 - Do not use adhesives that contain urea formaldehyde.
- 2.6 FABRICATION
- A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
 1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
 - B. Complete fabrication, including assembly, 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 appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and 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.
 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Install countertops 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.
- E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Secure backsplashes and sidesplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

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

END OF SECTION 12 36 23.13

SECTION 06 61 16.13 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.
 - 3. Solid surface material end splashes.
- B. Related Requirements:
 - 1. Section 22 40 00 "Plumbing Fixtures" for sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- C. 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.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.
 - 2. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material 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.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Avonite Surfaces.
 - b. E. I. du Pont de Nemours and Company.
 - c. Formica Corporation.
 - d. LG Chemical, Ltd.
 - e. Meganite Inc.
 - f. Samsung Chemical USA, Inc.
 - g. Swan Corporation (The).
 - h. Transolid Div of Trumbull Industries.
 - i. Wilsonart International Holdings, Inc.
 - 2. Type: Provide Standard type unless Special Purpose type is indicated.
 - 3. Colors and Patterns: Match Architect's samples.
- B. LEED2009 - Composite Wood Products: Products shall be made without urea formaldehyde.
- C. Plywood Subtop: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:
 - 1. End Splash: Matching backsplash.
- C. Countertops: 1/2-inch- thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch- thick, solid surface material.
- E. 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. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints where indicated. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.
- F. 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. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
 - 1. LEED2009 - 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

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material 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.

3.2 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. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with 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. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. 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 where indicated. 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.
- F. 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.
- G. 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.
- H. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 06 61 16.13

SECTION 06 61 19.13

QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Quartz agglomerate countertops.
 - 2. Quartz agglomerate backsplashes.
 - 3. Quartz agglomerate end splashes.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 2. Product Data: For adhesives, indicating VOC content.
 - 3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- C. 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.
- 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 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.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 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.
 - c. E. I. du Pont de Nemours and Company.
 - d. LG Chemical, Ltd.
 - e. Meganite Inc.
 - f. Samsung Chemical USA, Inc.
 - g. Technistone USA, Inc.
 - h. Transolid Div of Trumbull Industries.
 - 2. Colors and Patterns: Match Architect's samples.
- B. LEED2009 - Composite Wood Products: Products shall be made without urea formaldehyde.
- C. Plywood Subtop: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 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: Straight, slightly eased at top.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. End Splash: Matching backsplash.
- C. Countertops: 3/4-inch- thick, quartz agglomerate with front edge built up with same material.
- D. Backsplashes: 3/4-inch- thick, quartz agglomerate.
- E. Fabricate tops with shop-applied edges and backsplashes 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 where indicated. 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.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.
 - 1. LEED2009 - 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

3.1 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.

3.2 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. Pre-drill 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 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-applied asphalt dampproofing.
 - 2. Protection course.
- B. Dampproofing applications include the following:
 - 1. Foundation walls below grade.
 - 2. Unexposed face of retaining walls.
- C. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for bituminous vapor retarders.
 - 2. Section 04 22 00 "Concrete Unit Masonry" for mortar parge coat on masonry surfaces.
 - 3. Section 07 13 26 "Self-Adhering Sheet Waterproofing" for waterproofing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For coatings, indicating VOC content.

1.4 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

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course molded-sheet drainage panels 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.
- D. LEED2009 - VOC Content: 250 g/L or less.

2.2 HOT-APPLIED ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Owens Corning Roofing and Asphalt, LLC; Trumbull Division.
- B. Hot-Applied Asphalt: ASTM D 449, Type(s) as follows:
 - 1. Foundation Walls Below Grade: Type II.
 - 2. Unexposed Face of Below Grade Retaining Walls: Type II.
 - 3. Unexposed Face of Above Grade Retaining Walls: Type III.

2.3 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: Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch thick.
- G. 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 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

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
 - 1. Test for surface moisture according to ASTM D 4263.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.4 HOT-APPLIED ASPHALT DAMPPROOFING

- A. Do not apply hot asphalt when substrate condition causes foaming.
- B. Kettle Temperature: Comply with dampproofing-material manufacturer's written instructions, and keep at least 25 deg F below the flash point.
- C. Prime masonry and other porous substrates.
- D. Concrete Foundations: Apply a uniform coat of hot asphalt by mopping or spraying at not less than 20 lb or 2.5 gal./100 sq. ft..
 - 1. Apply a second coat to below-grade foundation walls and where first application has failed to produce a smooth surface and uninterrupted coverage. Apply second coat at the rate specified for first coat.
- E. Unexposed Face of Concrete Retaining Walls: Apply a uniform coat of hot asphalt by mopping or spraying at not less than 20 lb or 2.5 gal./100 sq. ft..
 - 1. Apply a second coat to below-grade foundation walls and where first application has failed to produce a smooth surface and uninterrupted coverage. Apply second coat at the rate specified for first coat.

3.5 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.

3.6 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

1.1 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.

1.2 ACTION SUBMITTALS

- A. 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.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For special warranties.

1.4 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.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.5 WARRANTY

- A. 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.

PART 2 - PRODUCTS

2.1 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. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Hydrotech, Inc.; VM60.
 - b. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861.
 - c. Grace Construction Products; W.R. Grace & Co. -- Conn.; Bituthene 3000.
 - d. Henry Company; Blueskin WP 100.
 - e. W.R. Meadows, Inc; SealTight Mel-Rol.
 2. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.2 AUXILIARY MATERIALS

- A. Protection Course: Either of following:

1. 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.
2. Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch thick.
3. Molded-polystyrene board insulation, ASTM C 578, Type I, 0.90-lb/cu. ft. minimum density, 1-inch minimum thickness.

2.3 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel with Polymeric Film: Composite subsurface drainage panel acceptable to waterproofing manufacturer and consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate through the core of 9 to 21 gpm per ft..
- B. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel without Polymeric Film: Composite subsurface drainage panel acceptable to waterproofing manufacturer and consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core, without a polymeric film bonded to the other side; and with a vertical flow rate through the core of 9 to 21 gpm per ft..
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation-Construction Systems; MasterSeal 974 (Pre-2014: Sonoshield DBS 2000).
 - b. Carlisle Coatings & Waterproofing Inc; CCW MiraDRAIN 6000.
 - c. Insulation Solutions, Inc.; .
 - d. Soprema, Inc.; .
 - e. Urethane Polymers International, Inc.; EZE-DRAIN V.
- C. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel with Polymeric Film: Composite subsurface drainage panel acceptable to waterproofing manufacturer and consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a woven-geotextile facing with an apparent opening size not exceeding No. 40 sieve, laminated to one side of the core and a polymeric film bonded to the other side; and with a horizontal flow rate through the core of not less than 2.8 gpm per ft..
- D. Molded-Sheet Collector-Panel System with Polymeric Film: Composite subsurface collector-panel system by same manufacturer as primary molded-sheet drainage panels; consisting of a high-profile, studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven-geotextile facing with an apparent opening size not exceeding No. 40 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate through the core of 9 to 17 gpm per ft. and a minimum horizontal, in-plane flow rate as indicated on Drawings. Provide system with manufacturer's outlets, connectors, tapes, and other accessories to connect primary molded-sheet drainage panels with piped subdrainage system specified in Section 33 46 00 "Subdrainage."

PART 3 - EXECUTION

3.1 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 fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- D. 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.
- E. 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.
 - F. 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.
 - G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.
- 3.2 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION
- A. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.
- 3.3 FIELD QUALITY CONTROL
- A. Testing Agency: Owner will 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 24 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.
- 3.4 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 19 00

WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes MPI-approved water-repellent treatments for the following vertical and horizontal surfaces:
 - 1. Cast-in-place concrete.
 - 2. Precast concrete.
 - 3. Concrete unit masonry.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's printed statement of VOC content.
 - 2. Include manufacturer's standard colors.
 - 3. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.
 - 4. Include printout of current "MPI Approved Products List" for each product category specified in Part 2 that specifies water repellents approved by MPI, with the proposed product highlighted.
- B. Samples: For each type and color of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Applicator.
- B. Product Certificates: For each type of water repellent.
- C. Preconstruction Test Reports: For water-repellent-treated substrates.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Mockups: Prepare mockups of each required water repellent on each type of substrate required to demonstrate aesthetic effects, for preconstruction testing, and to set quality standards for materials and execution.
 - 1. Locate mockups where shown on Drawings .
 - a. Size: 10 sq. ft. each.
 - 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.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing of water repellents on manufacturer's standard substrate assemblies.

1.8 FIELD 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. Concrete surfaces and mortar have cured for not less than 28 days.
 2. Building has been closed in for not less than 30 days before treating wall assemblies.
 3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
 4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
 5. Rain or snow is not predicted within 24 hours.
 6. Not less than 24 hours have passed since surfaces were last wet.
 7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Performance: Water repellents shall meet the following performance requirements as determined by preconstruction testing on manufacturer's standard substrates representing those indicated for this Project.
- B. Water Absorption: Minimum 80 percent reduction of water absorption after 24 hours for treated compared to untreated specimens when tested according to the following:
1. Concrete Masonry Units: ASTM C 140.
- C. Water-Vapor Transmission: Comply with one or both of the following:
1. Maximum 10 percent reduction water-vapor transmission of treated compared to untreated specimens, according to ASTM E 96/E 96M.
 2. Minimum 80 percent water-vapor transmission of treated compared to untreated specimens, according to ASTM D 1653.
- D. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate of treated compared to untreated specimens, according to ASTM E 514/E 514M.
- E. Durability: Maximum 5 percent loss of water-repellent performance after 2500 hours of weathering according to ASTM G 154 compared to water-repellent-treated specimens before weathering.
- F. Chloride-Ion Intrusion in Concrete: NCHRP Report 244, Series II tests.
1. Reduction of Water Absorption: 80 percent.

2.2 PENETRATING WATER REPELLENTS

- A. Silane, Penetrating Water Repellent: Clear, containing 20 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.
1. Products: Subject to compliance with requirements, provide the following :
 - a. Advanced Chemical Technologies, Inc.; Sil-Act ATS-100.
 - b. BASF Construction Chemicals - Building Systems; Enviroseal 20 .
 - c. Chemical Products Industries, Inc.; SW-244-100 VOC.
 - d. Dayton Superior; Weather Worker 40% J29WB.
 - e. Pecora Corporation; KlereSeal 940-S VOC.
 - f. PROSOCO, Inc.; SL100.
 - g. Textured Coatings of America, Inc.; Rainstopper 110 .
 - h. Vexcon Chemicals Inc.; Certi-Vex Penseal 244 40%-AIM.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.

1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
 2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
 3. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.
- B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions.
- C. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.
- D. Coordination with Sealant Joints: 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 required.

3.3 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 coating of water repellent on surfaces to be treated using 15 psi- pressure spray with a fan-type spray nozzle to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

- A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
1. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
- B. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.

3.5 CLEANING

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

END OF SECTION 07 19 00

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Extruded polystyrene foam-plastic board.
 - 2. Glass-fiber blanket.
 - 3. Mineral-wool blanket.
 - 4. Spray-applied cellulosic insulation.
- B. Applications include:
 - 1. Under slab-on-grade.
 - 2. On interior foundation wall surfaces backfilled.
 - 3. In framed construction cavities.
- C. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
 - 2. Section 07 53 23 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for insulation specified as part of roofing construction.
 - 3. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Data: For adhesives, indicating VOC content.

1.4 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- 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 X: ASTM C 578, Type X, 15-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 1. Applications include:
 - a. On interior foundation wall surfaces.
 - 2. Thermal Resistance (R Value): Minimum 5.0/inch.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - 4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET

- A. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. 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, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Guardian Building Products, Inc.
 - c. Johns Manville; a Berkshire Hathaway company.
 - d. Knauf Insulation.
 - e. Owens Corning.

2.3 MINERAL-WOOL BLANKETS

- A. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Roxul Inc.
 - b. Thermafiber Inc.; an Owens Corning company.

2.4 SPRAY-APPLIED CELLULOSIC INSULATION

- A. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50_ percent.

B. Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C 1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), Type II (materials containing a dry adhesive activated by water during installation; intended only for enclosed or covered applications), chemically treated for flame-resistance, processing, and handling characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GreenFiber.
 - b. Hamilton Manufacturing Inc.
 - c. International Cellulose Corp.

2.5 ACCESSORIES

A. Joint Tape: Pressure-sensitive plastic tape recommended by insulation manufacturer for sealing joints and minor penetrations in board insulation.

1. Tape Width: 2-7/8 inches minimum.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

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

3.3 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. If not otherwise indicated, extend insulation a minimum of 36 inches in from exterior walls.
 2. Stagger end joints and tightly abut insulation units.
 3. Seal seams and penetrations with joint tape centered over joints.

3.4 INSTALLATION AT FOUNDATION WALL INTERIOR FACE

- A. On vertical foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 1. If not otherwise indicated, extend insulation a minimum of 36 inches below exterior grade line.

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.
 - b. Interior Walls: Set units with facing placed toward areas of high humidity.
 - B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
 - C. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.
- 3.6 PROTECTION
- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 25 00

WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Building wrap.
 - 2. Flexible flashing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: Show details of building wrap at terminations, openings, and penetrations. Show details of flexible flashing applications.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
 - b. DuPont Building Innovations: E. I. du Pont de Nemours and Company; Tyvek CommercialWrap.
 - c. Ludlow Coated Products; Barricade Building Wrap.
 - d. Pactiv Corporation; GreenGuard Classic Wrap.
 - 2. Water-Vapor Permeance: Not less than 75 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).
 - 3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
 - 4. Allowable UV Exposure Time: Not less than three months.
 - 5. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

- A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 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. DuPont Building Innovations; E. I. du Pont de Nemours and Company; DuPont Flashing Tape.
 - b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Vycor Butyl Self Adhered Flashing.
 - c. Protecto Wrap Company; BT-25 XL.
- B. Rubberized-Asphalt Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 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. Advanced Building Products Inc.; Wind-o-wrap.
 - b. Carlisle Coatings & Waterproofing Inc; CCW-705-TWF Thru-Wall Flashing.
 - c. Grace Construction Products; W.R. Grace & Co. -- Conn.; Vycor Plus Self-Adhered Flashing.
 - d. Polyguard Products, Inc.; Polyguard JT-20 Tape.
- C. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.
- D. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
 1. Seal seams, edges, fasteners, and penetrations with tape.
 2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 1. Prime substrates as recommended by flashing manufacturer.
 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 4. Lap water-resistive barrier over flashing at heads of openings.
 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 07 25 00

SECTION 07 26 16

BELOW-GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes 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. Vapor retarder tape.
- B. Locate vapor retarder where indicated on Drawings.
- C. Related Sections:
 - 1. Section 03 30 00 "Cast-In-Place Concrete" for concrete slabs.

1.3 REFERENCES

- A. ACI - American Concrete Institute:
 - 1. ACI 302.1R, "Guide for Concrete Floor and Slab Construction."

1.4 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 formulaions.
 - 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.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review vapor-retarder installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For vapor retarder and tape.

1.7 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For vapor retarder, signed by manufacturers.
- B. Minutes of preinstallation conference.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Installer must be certified or approved by vapor retarder manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain vapor retarder sheet, tape, sealants, and adhesives from single source from single manufacturer.

2.2 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. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - c. Meadows, W. R., Inc.; Perminator 15 mil.
 - d. Stego Industries, LLC; Stego Wrap 15 mil Class A.
- B. Vapor Retarder Tape: Adhesive tape or pressure-sensitive joint tape recommended by vapor retarder manufacturer for sealing, hanging, seaming, splicing, and patching sheet vapor retarder.

PART 3 - EXECUTION

3.1 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 granular fill 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.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.2 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

1.1 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.

1.2 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.

1.3 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

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 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, tie-ins to installed waterproofing, 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.

PART 3 - EXECUTION

3.1 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. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. Bridge isolation joints 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.

3.3 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. Do not cover air barrier until it has been tested and inspected by testing agency.
- C. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 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 41 13.16

STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes standing-seam metal roof panels.
- B. Related Sections:
 - 1. Section 07 72 53 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.

- D. Sample Warranties: For special warranties.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For metal panels to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
 - B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
 - C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
 - D. Retain strippable protective covering on metal panels during installation.
 - E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.
- 1.9 FIELD CONDITIONS
- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.
- 1.10 COORDINATION
- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
 - B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- 1.11 WARRANTY
- A. Special 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: Twenty years from date of Substantial Completion.
 - B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
 - C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- B. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low -slope roof products.
- C. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
 - 1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
 - 2. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.
- D. 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 1/240 of the span.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 60.
- F. 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.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
 - 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels : Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Berridge Tee-Lock Panel or comparable product by one of the following:
 - a. Advanced Architectural Products.
 - b. Advanced Building Products Inc.
 - c. AEP Span; A BlueScope Steel Company; Design Span AP
 - d. Architectural Building Components.
 - e. Architectural Metal Systems; SS360
 - f. ATAS International, Inc.; 2" Field-Lok
 - g. Berridge Manufacturing Company.
 - h. CENTRIA Architectural Systems, SRS 3
 - i. Dimensional Metals, Inc.
 - j. Englert, Inc.; S3000
 - 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: 0.028 inch.
 - b. Exterior Finish: Two-coat fluoropolymer Metallic fluoropolymer.

- c. Color: SS-1 indicated in the drawings shall be Charcoal Grey and SS-2 indicated in the drawings shall be Acrylic-Coated Galvalume
 - 3. Clips: Two-piece floating to accommodate thermal movement.
 - 4. Panel Coverage: 12 inches or 18 inches.
 - 5. Seam Height: 3 inches
- C. Integral-Standing-Seam Metal Roof Panels : Formed with integral ribs at panel edges and between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and lapping and interconnecting side edges of adjacent panels.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
- B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. 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, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels roof fascia and rake trim.
- E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.
- F. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch Insert dimension nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
 - 1. Insulate roof curb with 1-inch- thick, rigid insulation.
- G. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- H. 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.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for 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 panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

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

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.

2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 - B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
 - C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 PREPARATION
- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.
- 3.3 UNDERLAYMENT INSTALLATION
- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.
 1. Apply over the entire roof surface.
 2. Apply over the roof area indicated below:
 - a. Roof perimeter for a distance up from eaves of 36 inches beyond interior wall line.
 - b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches. Overlap ends of sheets not less than 6 inches.
 - c. Rake edges for a distance of 18 inches.
 - d. Hips and ridges for a distance on each side of 12 inches.
 - e. Roof-to-wall intersections for a distance from wall of 18 inches.
 - f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches.
 - B. Felt Underlayment: Apply at locations indicated on Drawings, in shingle fashion to shed water, and with lapped joints of not less than 2 inches.
 1. Apply over the entire roof surface.
 2. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches, in shingle fashion to shed water.
 - C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
 - D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 "Sheet Metal Flashing and Trim."
- 3.4 METAL PANEL INSTALLATION
- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

- B. Fasteners:
 - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
 - 2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 - 4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 5. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Clipless Metal Panel Installation: Fasten metal panels to supports with screw fasteners at each lapped joint at location and spacing recommended by manufacturer.
- G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- I. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- J. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - 1. Connect downspouts to underground drainage system indicated.
- K. Roof Curbs: Install flashing around bases where they meet metal roof panels.
- L. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

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

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

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

END OF SECTION 07 41 13.16

SECTION 07 42 13.13

FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concealed-fastener, lap-seam metal wall panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. 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.
- D. 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical metal panel assembly as shown on Drawings Insert size, including corner, supports, attachments, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 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.

1.8 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.

1.9 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.

1.10 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. 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.
 - 4. Secondary Metal Framing: Design secondary metal framing for wall panel assembly according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
- C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft..

- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft..
- E. 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.

2.2 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 and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Centria Architectural Systems, Flush-Profile, Concealed-Fastener Metal Wall Panels IW-10A: 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 product indicated on Drawings or comparable product by one of the following:
 - a. Alcoa Inc.
 - b. ATAS International, Inc.
 - c. Berridge Manufacturing Company.
 - d. Fabral.
 - e. Petersen Aluminum Corporation.
 - 2. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Thickness: 0.040 inch.
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Two-coat fluoropolymer.
 - d. Colors: As selected by Architect from manufacturer's full range.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 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.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Aluminum Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 2605. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- 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. Watertight Installation:
 1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
 - G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that 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).
- 3.4 FIELD QUALITY CONTROL
- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
 - C. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
 - D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
 - E. Prepare test and inspection reports.
- 3.5 CLEANING AND PROTECTION
- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
 - C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.13

SECTION 07 42 13.33 - METAL WALL PANELS FOR TRANSPIRED SOLAR COLLECTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes components for constructing transpired solar collector assemblies using the following components:
1. Exposed-fastener, lap-seam, dimpled and slit steel wall panels.
 2. Concealed metal framing and closures for mounting wall panels and forming air plenum.
 3. Accessories including exposed metal flashing, trim, and fasteners.
- B. Related Sections:
1. Section 07 42 13.13 "Formed Metal Wall Panels" for lap-seam metal wall panels not a part of transpired solar collector system.

1.3 REFERENCES

- A. Definitions:
1. Transpired Solar Collectors: A system for preheating building ventilation air using perforated metal panel cladding mounted to building's structural wall with a substantial gap between the two. As outside air is drawn through the perforated panels heated by solar radiation, the air is heated and flows to the top of the wall where it is distributed to the building's interior through conventional ductwork.
 2. Transpired Solar Collector Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete solar energy collection wall system.
 3. Plenum-Tight Installation: Completed transpired solar collector assembly shall allow outside airflow into plenum only through dimpled and slit openings in panels and through joints between exterior face of panels, flashing, and trim. Airflow into plenum from other locations will be considered leakage and will not be accepted.
 4. Solar Absorptivity (SA): The ratio of the solar energy absorbed by the surface to the total of the incident solar energy.
- B. Reference Standards:
1. AAMA - American Architectural Manufacturers Association.
 - a. AAMA 621 Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
 - b. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
 2. ASTM - ASTM International (American Society for Testing and Materials International).
 - a. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - b. ASTM A755/A755M Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - c. ASTM A792/A792M Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - d. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - e. ASTM B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - f. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
 - g. ASTM C645 Standard Specification for Nonstructural Steel Framing Members.
 - h. ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - i. ASTM C1311 Standard Specification for Solvent Release Sealants.

- j. ASTM D1187/D1187M Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- k. ASTM D2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- l. ASTM D4214 Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- m. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- n. ASTM D4214 Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- 3. CSA - CSA Group.
 - a. CSA S136 North American specification for the Design of Cold-Formed Steel Structural Members.
- 4. ICC-SRCC - International Code Council - Solar Rating & Certification Corporation.
 - a. ICC 901/SRCC 100 Solar Thermal Collector standard.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:
 - a. Wall panels and attachments.
 - b. Concealed framing in plenum.
 - c. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 - d. Outside air intakes.
 - e. Penetrations of wall by pipes and utilities.
 - 2. 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.
 - 3. 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installer.
 - 2. Professional engineer.
- B. Delegated-Design Submittal for Structural Performance of Metal Panel Assembly:
 - 1. Include design and analysis data indicating compliance with structural performance requirements, signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Delegated-design submittal may be combined with shop drawings submittal.
- C. Delegated-Design Submittal for Transpired Solar Collector Thermal Efficient Performance: For each metal wall panel type, supporting structure, air plenum configuration, HVAC system configuration, and substrate condition indicated. Include manufacturer's thermal efficiency performance charts showing compliance with outside air intake rate specified under Part 2 Article "Performance Requirements."
 - 1. Annotate efficiency rating charts to clearly identify each condition required for Project.
 - 2. Include design and analysis data indicating compliance with transpired solar collector performance, signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Product Test Reports and Certifications: For transpired solar collector assembly, from ICC-SRCC indicating that metal wall panel system has been evaluated and certified to meet the ICC 901/SRCC 100 Solar Thermal Collector standard.
- E. Field quality-control reports.
- F. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A entity with not less than 10 years experience in the design and manufacturing of building-integrated solar air heating systems and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Installer Qualifications: A entity experienced in installing, erecting, or assembling building-integrated solar air heating systems, whose work has resulted in construction with a record of successful in-service performance. Or an entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Professional Engineer Qualifications for Structural Performance: 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. Professional Engineer Qualifications for Transpired Solar Collector Performance: A professional engineer who is experienced in providing thermal efficiency 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. Professional engineer need not be legally qualified to practice in jurisdiction where Project is located unless required by AHJ.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical metal panel assembly approximately one bay wide by one story high, including supports, attachments, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 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, if any, on metal panels during installation.

1.10 PROJECT 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.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1.11 COORDINATION

- A. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of soffits, and other adjoining work to provide a weatherproof, secure, and noncorrosive installation.

1.12 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 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 bare metal.
 - 2. Finish Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal wall panel, including exposed flashing and trim, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Transpired solar collector assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance:
 - 1. Delegated Design: Engage a qualified professional engineer, as defined in Part 1 Article "Quality Assurance" to engineer transpired solar-collector assemblies for structural conditions indicated. Coordinate with professional engineer for thermal efficiency performance.
 - 2. Design Loads: Provide system capable of withstanding following design loads within limits and under conditions indicated. Metal wall panels shall be capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E1592 or CSA S136.
 - a. Wind Loads: As indicated on Structural Drawings.
 - b. Snow Loads: As indicated on Structural Drawings.

- c. Ice Loads: As indicated on Structural Drawings.
 - d. Maintenance Loads: As indicated on Architectural Drawings exterior building elevations.
 - e. Dead Load of Wall Panels: Obtain weight from panel manufacturer for each type supported.
 - f. Dead Load of Fixtures, Equipment, and Other Building Components: Where indicated attached to wall panels, obtain from manufacturer for each type of component.
3. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.
- C. Thermal Efficiency (Heating Capacity) Performance:
1. Delegated Design: Engage a qualified professional engineer, as defined in Part 1 Article "Quality Assurance" to engineer transpired solar-collector assemblies for heating and ventilating conditions indicated. Coordinate with professional engineer for structural performance.
 2. Metal wall panel system shall be evaluated and certified to meet the ICC 901/SRCC 100 Solar Thermal Collector standard. Specified air flow rate must be within the range of the tested parameters.
 3. Coordinate location of panel support framing and air flow baffles installed in plenum to provide a balanced air flow.
 4. Outside Air Intake: See Mechanical Drawings for outside air intake system, configuration, and flow rate at duct inlet(s).
 5. Solar air heating panel system shall be designed to balance the fresh air flow passing through it; the fresh air shall be ducted to the nearest intake fan(s). The capacity of the total system shall be 5 cubic feet per minute of fresh air per square foot of solar panel. Engineer shall use solar air heating software to model the anticipated heating energy delivered by the system. Engineer shall provide both the input data and the results from the analysis. Acceptable solar heating software includes, but is not limited to, the following:
 - a. RETScreen Clean Energy Management Software.
- D. 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.

2.3 EXPOSED-FASTENER, LAP-SEAM METAL TRANSPIRED WALL PANELS

- A. General: Provide factory-formed metal panels with manufacturer's proprietary perforations, designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for plenum-tight and weathertight installation.
- B. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and flat pan between major ribs. Provide panels formed from either steel or aluminum sheet metal.
1. Steel Sheet Metal Panels:
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) SolarWall by Conserval; SW150 with following dimensional characteristics:
 - a) Major-Rib Spacing: 5.91 inches o.c.
 - b) Panel Coverage: 35.44 inches.
 - c) Panel Height: 1.38 inches.
 - b. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - c. Provide sheet with siliconized polyester exterior finish, not less than 26 ga (0.018 inch) nominal base metal thickness matching following color(s) and solar absorptivity (SA):
 - 1) Charcoal with SA 0.71; SolarWall SWSW56072.
 2. Aluminum Sheet Metal Panels:

- a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Atas; InSpire BW390 with following dimensional characteristics:
 - a) Major-Rib Spacing: 7.875 inches o.c.
 - b) Panel Coverage: 39.375 inches.
 - c) Panel Height: 1.25 inches.
- b. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
- c. Provide sheet with two-coat fluoropolymer exterior finish, not less than 0.032 inch nominal base metal thickness matching following color(s) and solar absorptivity (SA):
 - 1) Charcoal Grey with SA 0.72; ATAS Stock Color 62.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing, Furring, and Air Flow Baffles: 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 unless otherwise indicated.
 1. Provide custom or manufacturer's standard sections as required for support and alignment of metal panel system and for controlling flow of air through plenum.
 2. Nominal Thickness: As required to meet performance requirements but not less than 0.052 inch (18 gage).
 3. Fasteners: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten metal subframing, furring, and baffles to substrates indicated.
- 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 factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
 1. Material: Stainless steel, organic coated plated steel, or other material allowed by Metal Construction Association Technical Bulletin "Fastener Compatibility with Profiled Metal Roof and Wall Panels" for type of sheet metal material and other materials contacting 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 C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.
- F. Metal Protection Materials:

1. Self-Adhering, High-Temperature Sheet Underlayment: 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 sheet metal.
2. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D1187.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal wall panels to form tightly nested joints between panels.
 1. Fabrication Tolerances: Comply with Metal Construction Association's White Paper "Preformed Metal Wall Fabrication/Installation Tolerances."
- 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: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 4. 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.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping. Protective covering for perforated panels need not be strippable.
- 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 the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 1. Silicized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
 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.
- D. Aluminum Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 2605. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of 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.
 3. Verify that waterproof weather barrier has been installed over sheathing or backing substrate to prevent air infiltration and water penetration.
 4. Verify that HVAC intake openings are located where indicated on shop drawings.
 5. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 METAL WALL PANEL INSTALLATION

- A. Interface with Other Work:
1. Coordinate with mechanical heating and ventilation Work to ensure that transpired solar collector system is properly connected to intake air fan inlets and ventilation system.
 2. Coordinate with controls or building automation system Work to ensure that sequence of operation of transpired solar collector system including fans and dampers is as specified.
- B. General: Install metal wall panel assemblies according to manufacturer's written instructions in orientation, sizes, and locations indicated on shop drawings. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Do not begin installation until waterproof weather barrier and flashings that will be concealed by metal wall panel assembly are installed.
 2. Commence metal wall panel assembly installation and install minimum of 300 sq. ft. (27.8 sq. m.) in presence of factory-authorized representative.
 3. Install concealed framing, closures, furring, clips, and other miscellaneous wall panel support members and anchorages according to ASTM C754 and metal wall panel manufacturer's written recommendations.
 4. Where closures form barriers between plenum and concealed spaces in adjacent construction, provide weathertight mounting.
 - a. Flash and seal metal closures at perimeter of plenum and around all openings penetrating plenum.
 - b. Fasten with self-tapping screws. Install with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or metal closure. Install screws in predrilled holes.
 5. Shim or otherwise plumb framing and substrates receiving metal wall panels.
 6. Install screw fasteners in predrilled holes.
 7. Locate and space exposed fastenings in uniform vertical and horizontal alignment.
 8. Install flashing and trim as metal wall panel work proceeds.
 9. Locate panel splices where indicated on shop drawings.
 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 11. Provide escutcheons for pipe and conduit penetrating exterior walls.
 12. Fasteners: Use stainless steel, organic coated plated steel, or other material recommended by Metal Construction Association Technical Bulletin "Fastener Compatibility with Profiled Metal Roof and Wall Panels" for type of sheet metal and other materials contacting fasteners.
- C. Metal Protection:
1. Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer. Galvanic protection may include the following:
 - a. Painting contact surfaces with bituminous coating.
 - b. Applying self-adhering, high-temperature sheet underlayment to each contact surface.
 - c. Other permanent separation recommended by metal wall panel manufacturer.

2. Aluminum Wall Panels: Coat back side of panels with bituminous coating where panels will contact dissimilar materials.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof and plenum-tight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
 1. Seal side joints where indicated on shop drawings.
 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."
- E. Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing indicated on shop drawings.
 1. Lap ribbed sheets one full rib corrugation. Apply panels and associated items for neat and plenum-tight enclosure. Avoid "panel creep" or application not true to line.
 2. Locate and space exposed fasteners in uniform vertical and horizontal alignment.
 3. Install screw fasteners with power tools having controlled torque adjusted prevent damage to screw threads or panels. Install screws in predrilled holes.
 4. At panel splices, nest and fasten panels over back framing with minimum end lap indicated on shop drawings.
- F. Installation Tolerances: Comply with Metal Construction Association's White Paper "Preformed Metal Wall Fabrication/Installation Tolerances."

3.3 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building, weathertight mounting, and to provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 2. At weathertight metal barriers, install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or metal barrier. Install screws in predrilled holes.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect and test completed metal wall panel installation, including accessories.
- B. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels, flashing, and trim are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.33

SECTION 07 53 23

ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Vapor retarder.
 2. Roof insulation.

1.3 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
1. Product Test Reports for Credit SS 7.2: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirement.
 2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
 3. Laboratory Test Reports for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
1. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- D. Samples for Verification: For the following products:
1. Sheet roofing, of color required.
 2. Walkway pads or rolls, of color required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of complying with performance requirements.
- C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes membrane roofing, base flashings, roof insulation, substrate board, and other components of roofing system.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 EPDM ROOFING

- A. EPDM: ASTM D 4637, Type I, nonreinforced, uniform, flexible EPDM sheet.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Firestone Building Products.
 - 2. Thickness: 60 mils, nominal.
 - 3. Exposed Face Color: White on black.

2.3 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber reinforced, water-resistant gypsum substrate, 5/8 inch thick.
 - 1. Products: Subject to compliance with requirements, provide the following :
 - a. USG Corporation; Securock Gypsum-Fiber Roof Board.

- C. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

PART 3 - EXECUTION

3.1 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 roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."
 - 4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

3.4 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
- B. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- D. Fabric-Backed Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.
- H. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.
- I. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- J. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.

3.5 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 53 23

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Formed wall sheet metal fabrications.
 - a. Through-wall flashing.
 - b. Flashing at openings in frame construction.
 - c. Trim at perimeter and in field of facade and siding panels.
 - d. Wall expansion-joint cover.
 - 2. Formed equipment support flashing.
 - 3. Formed overhead-piping safety pans.
 - 4. Miscellaneous materials for sheet metal flashing and trim.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. 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 special conditions.
 - 8. Include details of connections to adjoining work.
 - 9. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.
- D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- E. 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.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 1. Build mockup of following approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - a. Typical roof edge, including:
 - 1) Fascia.
 - 2) Fascia trim.
 - b. Typical roof eave, including:
 - 1) Fascia.
 - 2) Fascia trim.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. 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.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

- a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
- C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.4 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.

2.5 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:
1. Stainless Steel: 0.016 inch thick.
- B. Flashings at Openings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
1. Stainless Steel: 0.016 inch thick.
- C. Trim at Perimeter and in Field of Facade and Siding Panels: Fabricate top, bottom, side, and similar trim to frame and overlap edges of panels. Fabricate vertical and horizontal joint trim to cover gap between panels; fabricate horizontal joint trim to shed water from backside to front face of panel. Fabricate inside and outside corner trim to cover gap between panels and to frame panel edges. Extend back leg of trim not less than 2 inches behind panel. Leg framing panel edges must extend to front face of panel unless indicated otherwise on Drawings. Fabricate from the following materials:
1. Stainless Steel: 0.016 inch thick.
- D. Wall Expansion-Joint Cover: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch thick.

2.6 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Stainless Steel: 0.019 inch thick.
- B. Overhead-Piping Safety Pans: Fabricate from the following materials:
 - 1. Stainless Steel: 0.025 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
- 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.
- 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 strenght, 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 veiw must closely match color of sheet metal finish.

3.3 FORMED WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 04 20 00 "Unit Masonry."
- C. Flashings at Openings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.
- D. Trim at Perimeter and in Field of Facade and Siding Panels: as indicated on Drawings.
- E. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.4 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.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 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 71 00

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 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. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: For roof specialties.
 - 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
 - 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
- D. Samples: For each type of roof specialty and for each color and texture specified.
- E. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- F. Samples for Verification:
 - 1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
 - 2. Include copings made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.2 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section .

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.6 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty.
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than LEED requirements.
- C. FM Approvals' Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-60. Identify materials with FM Approvals' markings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding , concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
 1. Extruded-Aluminum Coping Caps: Extruded aluminum, Insert thickness.

2.3 REGLETS AND COUNTERFLASHINGS

- 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. Hickman Company, W. P.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:
 1. Castle Metal Products.
 2. Cheney Flashing Company.
 3. Fry Reglet Corporation.
 4. Heckmann Building Products, Inc.
 5. Hickman Company, W. P.
 6. Keystone Flashing Company, Inc.
 7. Metal-Era, Inc.
- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding designed to snap into and compress against base flashings with joints lapped, from the following exposed metal:
 1. Stainless Steel: 0.019 inch thick.
 2. Copper: 16 oz./sq. ft. .
- D. Accessories:
 1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
 2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- E. Aluminum Finish: Two-coat fluoropolymer.

1. Color: Match Architect's sample.
- F. Stainless-Steel Finish: No. 2B (bright, cold rolled, unpolished).

2.4 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Coil-Coated Aluminum Sheet Finishes:
 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Two-Coat Mica Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended mica flakes 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.
 - c. Three-Coat Metallic Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - d. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil .
 - C. Aluminum Extrusion Finishes:
 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Three-Coat Metallic Fluoropolymer: AAMA 2604. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 1. Provide uniform, neat seams with minimum exposure of solder and sealant.
 2. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 3. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.

2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
 - D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
 - E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
 - F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.
- 3.2 COPING INSTALLATION
- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
 - B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
 1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inch centers.
 2. Interlock face-leg drip edge into continuous cleat anchored to substrate at 24-inch centers. Anchor back leg of coping with screw fasteners and elastomeric washers at 24-inch centers .
- 3.3 ROOF-EDGE SPECIALITIES INSTALLATION
- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
 - B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
- 3.4 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION
- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- 3.5 REGLET AND COUNTERFLASHING INSTALLATION
- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
 - B. Embedded Reglets: See Section 03 30 00 "Cast-in-Place Concrete" for installation of reglets.
 - C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
 - D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.
- 3.6 CLEANING AND PROTECTION
- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
 - B. Clean and neutralize flux materials. Clean off excess solder and sealants.
 - C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
 - D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 71 29

MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Aluminum roof expansion joints.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wooden curbs or cants for mounting roof expansion joints.
 - 2. Section "" for roofing system.
 - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.
 - 4. Section 07 72 00 "Roof Accessories" for manufactured and prefabricated metal roof curbs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit EQ 4.1: For installation adhesives, documentation including printed statement of VOC content.
- C. Shop Drawings: For roof expansion joints.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
 - 3. Provide isometric drawings of intersections, terminations, and changes in joint direction or planes, depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.
- D. Samples: For each exposed product and for each color specified, 6 inches in size.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Roof expansion joints shall withstand exposure to weather, remain watertight, and resist the movements indicated without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ALUMINUM ROOF EXPANSION JOINTS

- A. Aluminum Roof Expansion Joint : Manufactured, continuous, waterproof, joint-cover assembly; consisting of a formed or extruded metal cover secured to extruded aluminum frames, with water-resistant gasketing between cover and frames, and with provision for securing assembly to substrate and sealing assembly to roofing membrane or flashing. Provide each size and type indicated, factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation. Fabricate each assembly specifically for installation configuration indicated on Drawings.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. C/S Group.
 - d. InPro Corporation (IPC).
 - e. MM Systems Corporation.
 - f. Nystrom, Inc.
 - g. Watson Bowman Acme Corp.
 - 2. Joint Movement Capability: Plus and minus As indicated on Drawings.
 - 3. Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the cover.
 - a. Drain-Tube Assemblies: Equip secondary seal with drain tubes and seals to direct collected moisture as indicated on Drawings.

2.3 MATERIALS

- A. EPDM Membrane: ASTM D 4637, Type standard with manufacturer for application.
- B. Neoprene Membrane: Neoprene sheet recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil; and as standard with roof-expansion-joint manufacturer for application.
- C. PVC Membrane: ASTM D 4434, Type standard with manufacturer for application.
- D. Silicone Extrusions: ASTM D 2000, UV stabilized, and that does not propagate flame.
- E. Adhesives: As recommended by roof-expansion-joint manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
 - 1. Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.
- G. Mineral-Fiber Blanket: ASTM C 665.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine roof-joint openings, inside surfaces of parapets, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.
 - 1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.

2. Install roof expansion joints true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 3. Provide for linear thermal expansion of roof expansion joint materials.
 4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
 5. Provide uniform, neat seams.
 6. Install roof expansion joints to fit substrates and to result in watertight performance.
 7. Torch cutting of roof expansion joints is not permitted.
 8. Do not use graphite pencils to mark aluminum surfaces.
- B. Directional Changes and Other Expansion-Control Joint Systems: Coordinate installation of roof expansion joints with other expansion-control joint systems to result in watertight performance. Install factory-fabricated units at directional changes and at transitions between roof expansion joints and exterior expansion-control joint systems specified in Section 07 95 13.16 "Exterior Expansion Joint Cover Assemblies" to provide continuous, uninterrupted, and watertight joints.
- C. Splices: Splice roof expansion joints with materials provided by roof-expansion-joint manufacturer for this purpose, to provide continuous, uninterrupted, and waterproof joints.
1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.
- D. 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.

3.3 PROTECTION

- A. Protect roof expansion joints from foot traffic, displacement, or other damage.
- B. Remove and replace roof expansion joints and components that become damaged by moisture or otherwise.

END OF SECTION 07 71 29

SECTION 07 72 53

SNOW GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Rail-type, seam-mounted snow guards.

1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guards.
- B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.
 - 1. Include details of rail-type snow guards.
 - 2. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.
- C. Samples: Base, bracket, and 12-inch- long rail.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of snow guard, for tests performed by manufacturer and witnessed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Structural Performance:
 - 1. Snow Loads: As indicated on Drawings.

2.2 RAIL-TYPE SNOW GUARDS

- A. Flat-Mounted, Rail-Type Snow Guards:
 - 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. Alpine SnowGuards; a division of Vermont Slate & Copper Services, Inc.
 - b. Berger Building Products.
 - c. Sieger Snow Guards Inc.
 - d. SnoGuard.
- B. Seam-Mounted, Rail-Type Snow Guards:
 - 1. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with one rail.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
 - 1. Verify compatibility with and suitability of substrates including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions. Space rows as recommended by manufacturer.
- B. Attachment for Standing-Seam Metal Roofing:
 - 1. Seam-Mounted Plastic Snow Guard Pads: Stainless-steel clamps attached to vertical ribs of standing-seam metal roof panels.

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.
- B. Related Requirements:
 - 1. Section 07 84 43 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 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.

1.6 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

2.1 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."

2.2 FM Global in its "Building Materials Approval Guide.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.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. Grabber Construction Products.
 - d. Hilti, Inc.
 - e. HOLDRITE.
 - f. NUCO Inc.
 - g. Passive Fire Protection Partners.
 - h. RectorSeal.
 - i. Specified Technologies, Inc.
 - j. Tremco, Inc.
 - 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. Penetrations in Horizontal Assemblies: 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.
 - D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
 - E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
 - F. LEED2009 - Sealant shall have a VOC content of 250 g/L or less.
 - G. LEED2009 - Sealant 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."
 - H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 1. Permanent forming/damming/backing materials.
 2. Substrate primers.
 3. Collars.
 4. Steel sleeves.

2.3 MIXING

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: 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.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 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.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.

6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Joints in or between fire-resistance-rated constructions.
- B. Related Requirements:
 - 1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
 - 2. Section 07 95 13.13 "Interior Expansion Joint Cover Assemblies" and 07 95 13.16 "Exterior Expansion Joint Cover Assemblies" for fire-resistive architectural joint systems.
 - 3. Section 09 22 16 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 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.

1.6 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

2.1 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."

2.2 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. Grabber Construction Products.
 - d. Hilti, Inc.
 - e. Nelson Firestop; a brand of Emerson Industrial Automation.
 - f. NUCO Inc.
 - g. Passive Fire Protection Partners.
 - h. RectorSeal.
 - i. Specified Technologies, Inc.
 - j. Thermafiber, Inc.; an Owens Corning company.
 - k. Tremco, Inc.
 2. 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. LEED2009 - Sealant shall have a VOC content of 250 g/L or less.
- D. LEED2009 - Sealant 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."
- E. 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

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: 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.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support 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.

3.4 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.

3.5 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - b. Silyl-terminated polyether joint sealants.
 - c. Mildew-resistant joint sealants.
 - d. Butyl joint sealants.
 - e. 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
- C. 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.
- D. 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.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.5 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.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. LEED2009 - 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.

2.2 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.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GE Construction Sealants; SCS2700 SilPruf LM .
 - b. Sika Corporation U.S.; Sikasil WS-290.
- 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.
 - 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 Corning Corporation; 791.
 - b. GE Construction Sealants; Momentive Performance Materials Inc; SCS2000 SilPruf.
 - c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 265 LTS.
 - d. Pecora Corporation; PCS.
 - e. Sika Corporation U.S.; Sikasil WS-295.
- C. JS-003 - Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc; SWS.
- D. JS-004 - Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 758.
 - b. GE Construction Sealants; Momentive Performance Materials Inc; SCS2350.
 - c. Polymeric Systems, Inc.; PSI-631.
 - d. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
 - e. Sherwin-Williams Company (The); White Lightning Silicone Ultra All Purpose Sealant.
- E. JS-009 - Silicone, Acid Curing, S, NS, 25, NT: 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.
 - 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. Bostik, Inc.; Chem-Calk 1200.

- b. Dow Corning Corporation; 999A.
 - c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 100 GC.
 - d. Pecora Corporation; 860.
 - e. Polymeric Systems, Inc.; PSI-601.
 - f. Sika Corporation U.S.; Sikasil-GP.
- F. 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.
- 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 Corning Corporation; NS.
 - b. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 728 NS.
- G. 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.
- 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 Corning Corporation; 799.
 - b. Soudal USA; RTV 50.
- H. 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.
- 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. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 199 PG.
 - b. Sika Corporation U.S.; Sikasil-N Plus US.
- I. 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.
- J. JS-019 - Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 200 SC.
- K. 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.
- 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. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 728 RCS.

2.3 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.
- 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. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 290 FPS-NB.
 - b. Pecora Corporation; 890FTS/TXTR.
 - c. Tremco Incorporated; Spectrem 1.

- 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.
 - 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 Corning Corporation; 756 SMS.
 - b. GE Construction Sealants; Momentive Performance Materials Inc; SilPruf NB.
 - c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 295 FPS NB.
 - d. Pecora Corporation; 864NST.
 - e. Tremco Incorporated; Spectrem 2.
- 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.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790.
- 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.
 - 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. Tremco Incorporated; Spectrem 4-TS.

2.4 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.
 - 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. BASF Construction Chemicals - Building Systems; Sonalastic TX1.
 - b. Bostik, Inc.; Chem-Calk GPS1.
 - c. ER Systems, an ITW Company; Pacific Polymers Elasto-Thane 230 MP.
 - d. Pecora Corporation; Dynatrol I-XL.
 - e. Polymeric Systems, Inc.; Flexiprene 1000.
 - f. Schnee-Morehead, Inc., an ITW company; Permathane SM7108.
 - g. Sherwin-Williams Company (The); Stampede-1.
 - h. Sika Corporation U.S.; Sikaflex Textured Sealant.
 - i. Tremco Incorporated; Dymonic.
- 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.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sika Corporation U.S.; Sikaflex 15LM.
- 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.
 - 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. LymTal International, Inc.; Iso-Flex 330.
- 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.

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. Bostik, Inc.; Chem-Calk 955-SL.
- E. JS-114 - Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Sonolastic SL 1.
 - b. Pecora Corporation; NR-201.
 - c. Polymeric Systems, Inc.; Flexiprene 952.
 - d. Schnee-Morehead, Inc.; an ITW company; Permathane SM7101.
 - e. Sherwin-Williams Company (The); Stampede 1SL.
- 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.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; Dynatrol II.
- 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.
 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. Sherwin-Williams Company (The); Stampede-2NS.
- 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.
 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. Tremco Incorporated; Dymeric 240.
- 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.
 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. Bostik, Inc.; Chem-Calk 505.
 - b. LymTal International, Inc.; Iso-Flex 881.
 - c. Sika Corporation U.S.; Sikaflex - 2c NS EZ Mix.
- 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.
 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. LymTal International, Inc.; Iso-Flex 888QC.
- K. JS-129 - Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik, Inc.; Chem-Calk 555-SL.
 - b. LymTal International, Inc.; Iso-Flex 880 GB.
 - c. Pecora Corporation; Dynatrol II SG

- d. Sherwin-Williams Company (The); Stampede-2SL.
- e. Tremco Incorporated; THC 900/901.

2.5 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.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc; SCS7000.
 - b. Pecora Corporation; DynaTrol I-XL Tru-White.
 - c. Sherwin-Williams Company (The); Stampede 100.
- 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.
 - 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. Tremco Incorporated; Dymonic FC.
- 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.
 - 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. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex STP 25.
 - b. Polymeric Systems, Inc.; Sil-Thane 803.
 - c. Schnee-Morehead, Inc., an ITW company; SM2100.
- 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.
 - 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. Soudal USA; SoudaSeal 150LM.
- 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.
 - 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. Soudal USA; SoudaSeal 50LM.
- 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.
 - 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. Soudal USA; SoudaSeal AP.
- 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.
 - 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. Soudal USA; SoudaSeal CL.

2.6 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.
 - 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 Corning Corporation; 786-M White.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
 - c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 100 WF.
 - d. Soudal USA; RTV GP.
 - e. Tremco Incorporated; Tremsil 200.
- 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.
 - 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. BASF Construction Chemicals - Building Systems; Sonolastic 150.

2.7 BUTYL JOINT SEALANTS

- A. JS-351 - Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
 - 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. Bostik, Inc.; Chem-Calk 300.
 - b. Pecora Corporation; BC-158.

2.8 LATEX JOINT SEALANTS

- A. JS-401 - Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Sonolac.
 - b. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex 600.
 - c. Pecora Corporation; AC-20.
 - d. Sherwin-Williams Company (The); 950A.
 - e. Tremco Incorporated; Tremflex 834.

2.9 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.
 - 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. BASF Construction Chemicals - Building Systems.
 - b. Construction Foam Products, a division of Nomaco, Inc.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:
- 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).
 - 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

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

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

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

4. Provide flush joint profile at 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.

3.4 CLEANING

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

3.5 PROTECTION

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

END OF SECTION 07 92 00

SECTION 07 95 13.13

INTERIOR EXPANSION JOINT ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes following types of expansion joint cover assemblies:
 - 1. For Floors:
 - a. Elastomeric-seal floor joint cover.
 - 2. For Walls:
 - a. Metal-plate wall joint cover.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint assembly.
 - 1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
 - 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples: For each expansion joint cover assembly and for each color and texture specified, full width by 6 inches long in size.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 FLOOR EXPANSION JOINT COVERS

- A. Elastomeric-Seal Floor Joint Cover : Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.
 - 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. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. EMSEAL Joint Systems, Ltd.
 - e. InPro Corporation (IPC).
 - f. MM Systems Corporation.
 - g. Nystrom, Inc.
 - 2. Application: Floor to floor.
 - 3. Installation: Recessed.
 - 4. Load Capacity:

- a. Uniform Load: 50 lb/sq. ft..
- b. Concentrated Load: 300 lb .
- c. Maximum Deflection: 0.0625 inch .
- 5. Exposed Metal:
 - a. Aluminum: Clear anodic, Class I.
 - 1) Color: As selected by Architect from full range of industry colors and color densities.
- 6. Seal: Preformed elastomeric membrane or extrusion.
 - a. Color: As selected by Architect from manufacturer's full range.

2.3 WALL EXPANSION JOINT COVERS

- A. Metal-Plate Wall Joint Cover : Metal cover plate fixed on one side of joint gap and free to slide on other.
 - 1. Application: Wall to wall.
 - 2. Exposed Metal:
 - a. Aluminum: Clear anodic, Class I.
 - 1) Color: As selected by Architect from full range of industry colors and color densities.

2.4 MATERIALS

- A. Aluminum: ASTM B 221 , Alloy 6063-T5 for extrusions; ASTM B 209 , Alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304 for plates, sheet, and strips.
- C. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.7 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
 - 1. Provide where indicated on Drawings.
- B. Attachment Devices:
 - 1. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.
 - 2. Metal Materials: Manufacturer's standard, except furnish stainless-steel where indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint assemblies and materials unless more stringent requirements are indicated.
- B. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- C. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.
- D. Moisture Barrier Drainage: If indicated, provide drainage fittings and connect to drains.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION 07 95 13.13

SECTION 07 95 13.16

EXTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes following types of expansion joint cover assemblies:
 - 1. Exterior elastomeric-seal joint cover
- B. Related Requirements:
 - 1. Section 07 71 29 "Manufactured Roof Expansion Joints" for factory-fabricated roof expansion joint cover assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint cover assembly.
 - 1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
 - 2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- C. Samples: For each exposed expansion joint cover assembly and for each color and texture specified, full width by 6 inches long in size.
- D. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches long in size.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 EXTERIOR EXPANSION JOINT COVERS

- A. Exterior Elastomeric-Seal Joint Cover : Assembly consisting of elastomeric seal anchored to surface-mounted frames fixed to sides of joint gap.
 - 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. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. InPro Corporation (IPC).
 - e. MM Systems Corporation.
 - f. Nystrom, Inc.
 - g. Watson Bowman Acme Corp.
 - 2. Application: Wall to wall.
 - 3. Installation: Recessed.

4. Exposed Metal:
 - a. Aluminum: Clear anodic, Class I.
 - 1) Color: As selected by Architect from full range of industry colors and color densities.
 - b. Stainless steel: Manufacturer's standard.
 - c. Bronze: Manufacturer's standard.
 - d. Brass: Manufacturer's standard.
5. Seal: Preformed elastomeric membrane or extrusion.
 - a. Color: As selected by Architect from manufacturer's full range.

2.3 MATERIALS

- A. Aluminum: ASTM B 221 , Alloy 6063-T5 for extrusions; ASTM B 209 , Alloy 6061-T6 for sheet and plate.
 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304 for plates, sheet, and strips.
- C. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

2.4 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.5 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

2.6 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
 1. Provide where indicated on Drawings.
- B. Attachment Devices:
 1. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.
 2. Metal Materials: Manufacturer's standard, except furnish stainless-steel where indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
 - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
 - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 4. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- D. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.
- E. Moisture Barrier Drainage: If indicated, provide drainage fitting and connect to drains.

3.4 CONNECTIONS

- A. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers specified in Section 07 71 29 "Manufactured Roof Expansion Joints." Install factory-fabricated units at transition between exterior walls and soffits and roof expansion joint cover assemblies.

3.5 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections.

END OF SECTION 07 95 13.16

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes hollow-metal work for the following:
1. Interior doors and frames complying with SDI Standards.
 2. Exterior doors and frames complying with SDI Standards.
 3. Borrowed lite frames.
 4. Louvers for interior doors.
- B. Related Requirements:
1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8 and as follows:

STEEL SHEET THICKNESSES		
Gage (MSG)	Minimum Uncoated Thickness	
	Inch	Mils
20	0.032	32
18	0.042	42
16	0.053	53
14	0.067	67
12	0.093	93
10	0.123	123
7	0.167	167

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

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

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. LEED2009 - Sustainable Design Submittals:
1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

- C. 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.
 - D. 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.
- 1.7 INFORMATIONAL SUBMITTALS
- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- 1.8 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

- 2.1 MANUFACTURERS
- A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.
- 2.2 REGULATORY REQUIREMENTS
- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- 2.3 INTERIOR DOORS AND FRAMES
- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
 - B. Standard-Duty Doors and Frames: SDI A250.8, Level 1. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level C according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.032 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core:
 - 1) Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.

3. Frames:
 - a. Materials: Uncoated, Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
 - b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Face welded Full profile welded.
 4. Exposed Finish: Prime.
 - C. Heavy-Duty Doors and Frames: SDI A250.8, Level 2. At locations indicated in the Door and Frame Schedule.
 1. Physical Performance: Level B according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core:
 - 1) Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 3. Frames:
 - a. Materials: Uncoated Metallic-coated steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Face welded Full profile welded.
 4. Exposed Finish: Prime.
 - D. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations indicated in the Door and Frame Schedule.
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core:
 - 1) Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 3. Frames:
 - a. Materials: Uncoated, Metallic-coated, steel sheet, minimum thickness of 0.053 inch.
 - b. Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Face welded Full profile welded.
 4. Exposed Finish: Prime.
- 2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES
- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
 - B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations indicated in the Door and Frame Schedule.
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core:
 - 1) Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.

- f. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - b. Construction: Full profile welded.
4. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Construction: Face welded.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 3. 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.

2.7 MATERIALS

- A. LEED2009 - Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- I. 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.
- J. Glazing: Comply with requirements in Section 08 80 00 "Glazing."
- K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 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.
 3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
 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. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches 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. 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.
 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 7. 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 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.

2.9 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.

2.10 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
 - 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
 - 3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and 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.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames 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.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 6. 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. 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.
- D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- C. 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

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 - 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- 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. Access Panel Solutions.
 - 2. Acudor Products, Inc.
 - 3. Alfab, Inc.
 - 4. Babcock-Davis.
 - 5. Cendrex Inc.
 - 6. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
 - 7. Jensen Industries; Div. of Broan-Nutone, LLC.
 - 8. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 - 9. Karp Associates, Inc.
 - 10. Larsen's Manufacturing Company.
 - 11. Maxam Metal Products Limited.
 - 12. Metropolitan Door Industries Corp.
 - 13. MIFAB, Inc.
 - 14. Milcor Inc.
 - 15. Nystrom, Inc.
 - 16. Williams Bros. Corporation of America (The).
- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Flush Access Doors with Concealed Flanges Insert drawing designation:

1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
 2. Locations: Wall and ceiling.
 3. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
 - a. Finish: Factory prime Factory finish.
 4. Frame Material: Same material and thickness as door.
 5. Hinges: Manufacturer's standard.
 6. Hardware: Latch.
- D. Aluminum Flush Access Doors Insert drawing designation:
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. Aluminum Sheet for Door: Nominal 0.045 inch.
 - a. Finish: Clear anodic.
 4. Frame Material: Same material, thickness, and finish as door.
 5. Hinges: Manufacturer's standard.
 6. Hardware: Latch.
- E. Exterior Flush Access Doors Insert drawing designation:
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: as indicated on drawings.
 4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
 - a. Finish: Factory prime Factory finish.
 5. Frame Material: Same material, thickness, and finish as door.
 6. Hinges: Manufacturer's standard.
 7. Hardware: Latch Lock.
- F. Hardware:
1. Latch: Cam latch operated by knurled knob.
 2. Lock: Cylinder.

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- C. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- 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.

2.4 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. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.5 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.
 - 2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat.
- E. Aluminum Finishes:
 - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Counter doors.
- B. Related Requirements:
1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.
 2. Section 09 91 23 "Interior Painting" for finish painting of factory-primed doors.

1.3 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.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

2.1 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.

2.2 COUNTER DOOR ASSEMBLY Insert drawing designation

- 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:

- a. ACME Rolling Doors.
 - b. Alpine Overhead Doors, Inc.
 - c. Alumatec Pacific Products.
 - d. Amarr Garage Doors.
 - e. C.H.I. Overhead Doors.
 - f. City-Gates.
 - g. Clopay Building Products.
 - h. Cookson Company.
 - i. Cornell Iron Works, Inc.
 - j. Lawrence Roll-Up Doors, Inc.
 - k. McKeon Rolling Steel Door Company, Inc.
 - l. Metro Door.
 - m. Overhead Door Corporation.
 - n. QMI Security Solutions.
 - o. Raynor.
 - p. Wayne-Dalton Corp.
- B. Operation Cycles: Door components and operators capable of operating for not less than . 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. STC Rating: 26.
- D. Door Curtain Material: Galvanized steel.
- E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated hot-dip galvanized steel and finished to match door.
- F. Hood: Match curtain material and finish.
- 1. Shape: As shown on Drawings.
 - 2. Mounting: Face of wall.
- G. Integral Frame, Hood, and Fascia: Galvanized steel.
- 1. Mounting: Face of wall.
- H. Sill Configuration: Integral metal sill.
- I. Locking Devices: Equip door with locking device assembly.
- 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside and outside with cylinders.
- J. Manual Door Operator: Chain-hoist operator.
- 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.
- K. Door Finish:
- 1. Aluminum Finish: .
 - 2. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
 - 3. Factory Prime Finish: Manufacturer's standard color.

2.3 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. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.

2.4 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.
- B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):
 - 1. Galvanized Steel: Hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.

2.5 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Cylinders specified in Section 08 71 00 "Door Hardware".
 - 2. Keys: Three for each cylinder.

2.6 COUNTER DOOR ACCESSORIES

- A. Integral Metal Sill: Fabricate sills as integral part of frame assembly of Type 304 stainless steel in manufacturer's standard thickness with No. 4 finish.

2.7 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless 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.

2.8 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate 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.

3.2 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.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

END OF SECTION 08 33 13

SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Insulated service doors, motor operated .
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.
 - 2. Section 09 91 13 "Exterior Painting" for finish painting of exterior factory-primed doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, 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, 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.
 - 4. Show locations of controls, locking devices, and other accessories.
- C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Curtain slats.
 - 2. Bottom bar with sensor edge.
 - 3. Guides.
 - 4. Brackets.
 - 5. Hood.
 - 6. Locking device(s).
 - 7. Include similar Samples of accessories involving color selection.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
1. Obtain operators and controls from overhead coiling door manufacturer.

2.2 SERVICE DOORS NON-FIRE RATED, INSULATED, MOTOR OPERATED

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking insulated metal slats.
1. Basis-of-Design Product: Subject to compliance with requirements, provide:
 - a. Overhead Door Corporation, Stromtite insulated Heavy-Duty, Model 625.
 - b. Or comparable product by one of the following:
 - 1) ACME Rolling Doors.
 - 2) Alpine Overhead Doors, Inc.
 - 3) Alumatec Pacific Products.
 - 4) Amarr Garage Doors.
 - 5) ASTA Door Corporation.
 - 6) C.H.I. Overhead Doors.
 - 7) City-Gates.
 - 8) Clopay Building Products.
 - 9) Cookson Company.
 - 10) Cornell Iron Works, Inc.
 - 11) Janus International Corporation.
 - 12) Lawrence Roll-Up Doors, Inc.
 - 13) McKeon Rolling Steel Door Company, Inc.
 - 14) Metro Door.
 - 15) Overhead Door Corporation.
 - 16) QMI Security Solutions.
 - 17) Raynor.
 - 18) Southwestern Rolling Steel Door Co.
 - 19) Wayne-Dalton Corp.
 - B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. 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. Air Infiltration: Meets ASHRAE 90.1 & IECC 2012/2015 C402.4.3 air leakage < 1.00 cfm/ft2.
 - D. STC Rating: 21.
 - E. Curtain R-Value: 7.7, U Value: 0.13.
 - F. Door Curtain Slats:
 1. Slat Exterior Facing Material:
 - a. Galvanized Steel: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
 2. Profile: Flat.
 3. Center-To-Center Height: 1-7/8-inch to 3-1/4-inch.
 4. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.
 5. Slat Interior Facing Material:
 - a. Galvanized Steel: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; minimum sheet thickness of 0.010 inch.
 - G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick.
 1. Fabricate from hot-dip galvanized steel.

2. Finish to match door.
- H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- I. Locking Devices: Equip door with the following:
 1. 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. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.
- J. Electric Door Operator:
 1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
 2. Operator Location(s): As shown 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: Interior, wet, and humid.
 - b. Electrical Characteristics:
 - 1) Phase: Single phase.
 - 2) Volts: 208 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: Chain type.
 6. Obstruction Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
 - a. Automatic Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - 1) Exposure: Wet and humid.
 7. Control Station(s), Mounting Location(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, Wet and Humid Conditions: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated. Locate where shown on the Drawings.
 - b. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated. Locate where shown on the Drawings.
- K. Curtain Accessories: Equip door with the following:
 1. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
 - a. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field- installed on the header.
 - b. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.
- L. Door Finish:
 1. Steel: Baked-enamel or powder-coated finish; color matching Architect's sample.
 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.3 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.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, 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.
- 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.

2.5 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.

2.6 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.
 - 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.
- D. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- E. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- 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.

2.7 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.

2.8 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Perform 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.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.6 DEMONSTRATION AND TRAINING

- A. Train Owner's personnel to operate overhead coiling doors.
- B. Train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23

SECTION 08 36 13

SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes electrically operated sectional doors.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.

1.3 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 Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Flat door sections with sensor edge on bottom section.
 - 2. Frame for paneled door sections; of each width of stile and rail required.
 - 3. Panel for raised-panel door sections; not smaller than required to show raised-panel profile.

1.4 INFORMATIONAL SUBMITTALS

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

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 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.

1.7 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: Ten (10) 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: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain sectional doors from single source from single manufacturer.
1. Obtain operators and controls from sectional door manufacturer.

2.2 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: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
2. Testing: According to ASTM E 330 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.
- C. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- D. Thermal Values: R-Value -17.50, U-Value - 0.057
- E. Glazing SHGC: 0.63

2.3 OPERATIONAL REQUIREMENTS

- A. Sequence of Door Operation - Wash Bay:
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.
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.
- B. Sequence of Door Operation - Maintenance Bay:
1. Entering: Door shall open automatically upon activation by vehicle detector. Door shall close immediately upon passage of vehicle.
2. Exiting: Door shall open automatically upon activation by vehicle detector. Door shall close immediately upon passage of vehicle.
- C. 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.

2.4 DOOR ASSEMBLY

- A. Operation Cycles: Door components and operators capable of operating for not less than 20,000. 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.
- B. Air Infiltration: Maximum rate of 0.09 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283 .
- C. Installed R-Value: 17.5 deg F x h x sq. ft./Btu .
- D. Steel Sections: Zinc-coated (galvanized) steel sheet with G60 zinc coating.
 - 1. Section Thickness: 2 inches.
 - 2. Exterior-Face, Steel Sheet Thickness: 0.015 inch (.38 mm) nominal coated thickness.
 - a. Surface: Manufacturer's standard.
 - 3. Insulation: Foamed in place with PVC thermal break and weather-tight ship-lap design meeting notes.
 - 4. Interior Facing Material: Zinc-coated (galvanized) steel sheet with a nominal coated thickness of manufacturer's recommended dimension to comply with performance requirements.
- E. Track Configuration: Standard-lift Low-headroom High-lift Contour track.
- F. Weatherseals: Fitted to bottom and top and around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.
- G. Windows: Approximately 24 by 11 inches and spaced apart the approximate distance as indicated on Drawings; in one row(s) at height indicated on Drawings; installed with glazing of the following type:
 - 1. Clear Polycarbonate Plastic: 3-mm-thick, transparent, fire-retardant, UV-resistant, polycarbonate sheet manufactured by extrusion process.
- H. Roller-Tire Material: Manufacturer's standard.
- I. Locking Devices: Equip door with locking device assembly.
 - 1. Locking Device Assembly: Single-jamb side locking bars, operable from outside only, with cylinder.
- J. Counterbalance Type: Torsion spring.
- K. Electric Door Operator:
 - 1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
 - 2. Operator Type: Manufacturer's standard for door requirements.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
 - 4. Motor Exposure: Interior, clean, and dry.
 - 5. Emergency Manual Operation: Chain type.
 - 6. Obstruction-Detection Device: Automatic photoelectric sensor.
 - 7. Control Station: Interior-side mounted or Where indicated on Drawings.
 - 8. Other Equipment: Audible and visual signals Portable, radio-control system.
- L. Door Finish:
 - 1. Baked-Enamel or Powder-Coat Finish: Color and gloss as selected by Architect from manufacturer's full range.
 - 2. Finish of Interior Facing Material: Match finish of exterior section face.

2.5 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.

2.6 STEEL DOOR SECTIONS

- A. Exterior Section Faces and Frames: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.
 - 1. 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.
 - 2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.

- B. Section Ends and Intermediate Stiles: Enclose open ends of sections with thermally broken 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.
- C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile.
- D. 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.
- E. Provide reinforcement for hardware attachment.
- F. 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 E 84. Enclose insulation completely within steel sections and the interior facing material, with no exposed insulation.
- G. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated thickness.
- H. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.7 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, 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 ball-bearing roller guides for required door type, size, weight, and loading.
 - 1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 zinc coating.
 - 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: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.
 - a. 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.
- B. Removable Center Posts: Manufacturer's standard carry-away type for multiple doors in one opening.
- C. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
- D. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.

2.8 HARDWARE

- A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch-nominal coated thickness 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: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, 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.

2.9 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders specified in Section 08 71 00 "Door Hardware".
 2. Keys: Three for each cylinder.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.10 COUNTERBALANCE MECHANISM

- A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.
- B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting 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.
- C. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.
- 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.
- F. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.11 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-rewired 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. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Company; Model RHX :
 2. Comply with NFPA 70.
 3. 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. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
1. Electrical Characteristics:
 - a. Phase: Polyphase.
 - b. Volts: 460 V.
 - c. Hertz: 60.
 2. Motor Size: Minimum size as indicated. If not indicated, 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.
 3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
 5. Use adjustable motor-mounting bases for belt-driven operators.
- E. 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. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. 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.
- G. Control Station: 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."
 1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf .
- I. 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.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.
- L. Portable, Radio-Control System: Consisting of one of the following:
 1. Three-channel universal coaxial receiver to open, close, and stop door.
 2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.
 3. Remote antenna and mounting kit.

2.12 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.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install 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.
- 3.3 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.
- 3.4 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 A 780/A 780M.
- 3.5 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Storefront framing for exterior storefronts.
 - 2. Storefront framing for interior storefronts.
 - 3. Storefront framing for window walls.
 - 4. Storefront framing for punched openings.
 - 5. Insulated spandrel panels set in storefront framing.
 - 6. Exterior manual-swing entrance doors and door-frame units.
 - 7. Interior manual-swing entrance doors and door-frame units.
 - 8. Glazing gaskets and sealants for storefront framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
- C. 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.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.4 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.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.

1.7 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: Two 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

2.1 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.
- 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 6.24 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 0.57 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.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer Trifab VG 451/451T; or comparable product by one of the following.
 - 1. EFCO Corporation.
 - 2. Kawneer North America.
 - 3. Oldcastle Building Envelope.
 - 4. TRACO.
 - 5. YKK AP America Inc.
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 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.
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Centered.

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.
1. Construction: Nonthermal.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Centered.
 4. Finish: Finish Type 01 - Clear anodic finish.
 5. Fabrication Method: Field-fabricated stick system.
- C. Window Wall Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Centered.
 4. Finish: Finish Type 02 - Clear anodic finish.
 5. Fabrication Method: Field-fabricated stick system.
- D. Punched Window Openings Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Centered.
 4. Finish: Finish Type 02 - Clear anodic finish.
 5. Fabrication Method: Field-fabricated stick system.
- E. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- F. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- G. 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.

2.4 ENTRANCE DOOR SYSTEMS

- A. Exterior Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Door Construction: 2- to 2-1/4-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.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 2. Door Design: As indicated.
 3. Glazing Stops and Gaskets: , snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
- B. Interior Entrance Doors: Matching exterior entrance doors.

C. Interior Entrance Doors: Manufacturer's standard glazed entrance doors for manual-sliding operation.

1. Door Design:

- a. Basis of Design Product: ExamSlide High Performance Barn (Sliding) Door System by AD Systems.
- b. Wall Thickness: 5/8" GWB + 6" MTL STUD + 5/8" GWB
- c. Door Thickness: 1 3/4".
- d. Frame Profile: Extruded aluminum frame wrap frame with integral vertical jamb (stile pocket).
- e. Finish: Painted Hardcoat (Kynar) Finish. Meets AAMA 2604 Standard Colors: Light Sequin 789G048.
- f. Door Leaf: Factory machined for hardware including pilot and function holes.
 - 1) Aluminum Stile & Rail Door: 3-1/2" stiles plus 1/2" stop.
 - 2) Glazing: Monolithic Clear Tempered Glazing (GL-4T).
- g. Door Components
 - 1) Single Top Track: AD Systems extruded aluminum track by AD Systems.
 - 2) Valances: Extruded aluminum with integral end caps.
 - a) Standard square valance.
 - 3) Top Rollers: tandem nylon roller sized to match door weight.
 - 4) Concealed Floor Guide: Integral Jamb floor guide by AD Systems.
 - 5) Soft-Closer: Soft and self-closing damper mechanism at one sides of door leaf.
 - 6) Handles:
 - a) AD Systems Standard Straight Pull: 12 long x 1 diameter. Finish: US32D Satin Stainless Steel.
 - 7) Door Locks:
 - a) ADA-4 Self Latching - Thumbturn with Key Lock & Lever.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."
- B. 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 and not more than 15 lbf to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- C. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.6 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: Comply with Section 08 80 00 "Glazing."
- C. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- D. Glazing Sealants: Comply with Section 08 80 00 "Glazing."
- E. Glazing Sealants: As recommended by manufacturer.
 1. LEED2009 - Sealant shall have a VOC content of 250 g/L or less.

2.7 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.
1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 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 exterior.
 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 stripping 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.

2.9 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

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.
- D. Base of door side to be flush or minimal. Rubber Base acceptable.
- E. Examine surfaces to receive top and bottom guide.

- F. Do not begin installation until unacceptable conditions are corrected.
- G.

3.2 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.
7. Install sliding doors in accordance with manufacturer's instructions at locations indicated on the Drawings.
8. Install sliding doors plumb, level, square, and in proper alignment.
9. Install sliding doors to close against walls without gaps
10. Install sliding doors to open and close smoothly.
11. Anchor sliding doors securely in place to supports. Required: Fire treated 2 x 6 blocking required full length of track.

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. Adjusting

1. Adjust sliding doors for proper operation in accordance with manufacturer's instructions.
2. Adjust sliding doors to operate smoothly without binding.
3. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

D. Cleaning

1. Clean sliding doors promptly after installation in accordance with manufacturer's instructions.
2. Do not use harsh cleaning materials or methods that could damage materials or finish.

E. Protection

1. Protect installed sliding doors from damage during construction.

F. Set continuous sill members and flashing in full mastic sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

G. Install components plumb and true in alignment with established lines and grades.

H. Install glazing as specified in Section 08 80 00 "Glazing."

I. 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.

3.3 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.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Assist in performing 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 will be tested according to AAMA 501.2 and must not evidence water penetration.
 - a. Assist in performing a minimum of three tests in areas as directed by Architect.
 - b. Assist in performing tests in each test area as directed by Architect. Assist in performing at least three tests.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Owner's agency will prepare test and inspection reports.

END OF SECTION 08 41 13

SECTION 08 45 23

FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following:
 - 1. Aluminum-framed assemblies incorporating fiberglass-sandwich panels as follows:
 - a. Wall assemblies.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum components of panel assemblies.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. 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.
- D. Samples: In manufacturer's standard size.
 - 1. For each type of fiberglass-sandwich panel.
 - 2. For each type of exposed finish for framing members.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For fiberglass-sandwich-panel assemblies from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.7 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: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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:
 - 1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.14 as determined according to NFRC 100.

2.2 PERFORMANCE REQUIREMENTS, GENERAL

- A. Structural Loads: As indicated on Drawings.
- B. Deflection Limits: As indicated for each assembly type specified below.
- C. 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.
- D. 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 6.24 lbf/sq. ft. .
- E. 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): 120 deg F, ambient; 180 deg F, material surfaces.
- F. Energy Performance: As indicated for each assembly type specified below.

2.3 FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

- A. Fiberglass-Sandwich-Panel Assemblies: Translucent assemblies that are supported by aluminum framing and glazed with fiberglass-sandwich panels.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
 - a. Kalwall Corporation.

2.4 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.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308.
- 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. Concealed Flashing: Corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

- F. AAEExposed Flashing and Closures: As indicated for each assembly type specified below.
- G. Framing Gaskets: As indicated for each assembly type specified below.
- H. Frame-System Sealants: As recommended in writing by manufacturer.
 - 1. LEED2009 - Sealant shall have a VOC content of 250 g/L or less.
 - 2. LEED2009 - Sealant 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. 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.

2.5 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.
- 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.

2.6 WALL ASSEMBLIES

- A. Wall Fiberglass-Sandwich-Panel Assemblies: Vertical translucent assemblies that are supported by aluminum framing and glazed with fiberglass-sandwich panels.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall Corporation, Shoji, ; product name or designation or comparable product by one of the following:
 - a. Kalwall Corporation.
 - b. Major Industries, Inc.
- B. Assembly Performance:
 - 1. Deflection Limits: Limited to 1/60 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 0.14 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 0.7 as determined according to NFRC 201.
- C. Fiberglass-Sandwich Panels:
1. Panel Thickness: 2-3/4 inches.
 2. Grid Core:
 - a. I-Beam Construction: Thermally broken, extruded aluminum.
 - b. Grid Pattern: Inline rectangle, nominal 12 by 24 inches.
 3. Exterior Face Sheet:
 - a. Thickness: 0.070 inch.
 - b. Color: Crystal.
 - c. Protective Weathering Surface: Manufacturer's standard.
 4. Interior Face Sheet:
 - a. Thickness: 0.045 inch.
 - b. Color: Crystal.
- D. Aluminum Framing System:
1. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
 - a. Construction: Thermally broken, extruded aluminum.
 - b. Finish: KCRF #79, "Aluminum"
 2. Exposed Flashing and Closures: Aluminum sheet not less than 0.040 inch thick, finished to match framing.
 3. Framing Gaskets: Manufacturer's standard.

2.7 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 coped or mitered.
 - c. Internal guttering systems or other means to drain water passing through joints, and moisture migrating within 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.

2.8 ALUMINUM FINISHES

- A. Finish - High Performance Architectural Corrosion Resistant Finish: Meet AAMA 2605 criteria. spray-applied, air-dried, two-part system with flouropolymer resins.

PART 3 - EXECUTION

3.1 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.

3.2 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. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install components plumb and true in alignment with established lines and elevations.
- D. 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.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, panel assemblies will be tested according to AAMA 501.2 and must not show evidence of water penetration.
 - 2. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas will be tested according to ASTM E 1105.
 - a. Test Procedures: Assist in testing under uniform static-air pressure.
 - b. Static-Air-Pressure Difference: Per manufacturers standard requirement.
 - c. 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, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Owner's agency will prepare test and inspection reports.

END OF SECTION 08 45 23

SECTION 08 62 23

TUBULAR SKYLIGHTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes 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. Duct layouts are approximate and must be finalized by Contractor.
 - 1. Tubular Skylight - TSA-1: .
 - a. Sunlight collection domes.
 - b. Light guide tubes.
 - c. Light diffusers.
 - d. Light dimmer controls.
 - e. Suspension system.
 - 2. Accessories.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood framed curbs.
 - 2. Division 07 roofing Section(s) for flashing and roofing terminating at tubular skylight curbs and dome flashing.
 - 3. Section 07 71 00 "Roof Specialties" for manufactured roof curbs.

1.3 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.

1.4 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440, NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights.
- B. AAMA 1607 Voluntary Installation Guidelines for Unit Skylights.
- C. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute:
 - 1. ASCE/SEI 7 Minimum Design Loads for Buildings and other Structures.
- D. ASTM - ASTM International (American Society for Testing and Materials International):
 - 1. ASTM A463/A463M Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process.
 - 2. ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 3. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. ASTM A792/A792M Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 5. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 6. ASTM C635/C635M Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings/
 - 7. ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - 8. ASTM D1929 Standard Test Method for Determining Ignition Temperature of Plastics.

9. ASTM D2843 Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
 10. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 11. ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings.
 12. ASTM E308 Standard Practice for Computing the Colors of Objects by Using the CIE System.
 13. ASTM E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
 14. ASTM E1190 Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
 15. ASTM E1651 Standard Test Method for Total Luminous Reflectance Factor by Use of 30/t Integrating-Sphere Geometry.
- E. ICC - International Code Council:
1. ICC AC16 - Acceptance Criteria for Plastic Glazed Skylights.
- F. NFPA - National Fire Protection Association:
1. NFPA 70 National Electrical Code (NEC)
- G. UL - Underwriters Laboratories Inc.:
1. UL 181 - Factory Made Air Ducts and Air Connectors.
- 1.5 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.
- 1.6 PREINSTALLATION MEETINGS
- A. Preinstallation Conference: Conduct conference at Project site prior to installation of roof deck and delivery of tubular skylights.
- 1.7 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. LEED2009 - Sustainable Design Submittals:
1. Product Data: For recycled content of metal, indicating postconsumer and preconsumer recycled content and cost.
 2. Product Data: For field applied sealants, indicating VOC content.
 3. Laboratory Test Reports: For field applied sealants, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For tubular skylight work.
1. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
 2. Motor Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - a. Wiring Diagrams: For power and control wiring for dimmers.
- D. 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.
- E. Product Schedule: For tubular skylights. Use same room, space, and tubular skylight designations indicated on Drawings.

1.8 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.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tubular skylights and light dimmers to include in maintenance manuals.

1.10 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating tubular skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists, by labels, by test reports, and by calculations.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.12 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.

1.13 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

2.1 MANUFACTURERS

- A. Source Limitations: Obtain tubular skylights through single source from single manufacturer.
- B. Substitutions: Comply with Section 01 25 13 "Substitution Procedures".

2.2 PERFORMANCE REQUIREMENTS AND DESIGN CRITERIA

- A. Tubular skylight shall comply with ICC AC16.
- B. Tubular skylights shall be separated from each other by a distance of not less than 4 feet. Distance shall be measured in a horizontal plane from edges of glazing of light collection domes.
- C. Seismic Performance: Portion of tubular skylight extending below and suspended from roof deck or other overhead structure shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. Seismic Design Category: See Structural Drawing's Sheet .
- D. Unit Tubular Skylight Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 1. Performance Class and Grade: As specified for each tubular skylight type specified.
 2. Certification: AAMA-, WDMA-, or CSA-certified unit tubular skylights with label attached to each.
- E. Tubular Skylight Thermal Transmittance Standard: NFRC 100 values as indicated for each tubular skylight type specified.
- F. Tubular Skylight Solar Heat-Gain Coefficient (SHGC) Standard: NFRC 200 values as indicated for each tubular skylight type specified.
- G. Fall Protection: Tubular skylights shall meet applicable requirements of 29 CFR Part 1910.23 - Guarding floor and wall openings and holes.
- H. 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.
- I. Metal Components:
 1. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- J. Field Applied Sealants:
 1. LEED2009 - VOC Content: Sealants and sealant primers shall comply with the following:
 - a. Architectural sealants shall have a VOC content of 250 g/L or less.
 - b. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 - c. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
 2. LEED2009 - Sealant 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."
- K. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on plastic glazing and glazing framing.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- L. Comply with additional performance requirements and design criteria indicated for each tubular skylight type specified.
- M. 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 "Illuminance Performance" paragraph below.
- N. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Elite Solar Systems, Inc. (www.elitesolarsystems.com).

2. Natural Light Energy Systems (www.natural-light-skylights.com).
 3. ODL, Inc. (www.odl.com).
 4. Solatube International, Inc. (www.solatube.com).
 5. VELUX America Inc. (suntunnelskylights.veluxusa.com).
- O. Tubular Skylight Type, Performance Class, and Grade:
1. Open Ceiling: Diffusers do not penetrate ceilings.
 - a. Performance Class and Grade: Class TDDOC-PG 30.
 2. Closed Ceiling: Diffuser penetrate ceilings.
 - a. Performance Class and Grade: Class TDDCC-PG 30.
- P. Thermal Transmittance Performance: NFRC 100 maximum U-factor of 0.50 Btu/sq. ft. x h x deg F.
- Q. Solar Heat-Gain Coefficient (SHGC) Performance: NFRC 200 maximum SHGC of 0.40.
- R. 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.
 4. Maximum/Minimum Illuminance Ratio at Workplane Height: 5/1.
 5. Minimum Average Illuminance at Workplane Height: 30 Fc.
 6. Workpoint Distribution:
 - a. Workpoint Spacing: Not greater than 2 ft. o.c.
 - b. Number of Workpoints: Not less than 150.
- S. 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 improved 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 (3.2 mm).

- 2) Inner Dome:
 - a) Acrylic or Polycarbonate Plastic: Minimum 0.115 inch (3 mm).
 - b) PETG Plastic: Minimum 0.040 inch (1 mm).
- 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 sunlight at midday. Supplemental reflective or optical devices will be accepted.
6. Glazing Gaskets, Seals, and Sealant: Manufacturer's standard.
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. Security Guards: Manufacturer's standard steel or stainless steel rods or wires installed across inside of dome assembly.
 - a. Rod diameter: Minimum 0.375 inch (95 mm) diameter.
 - b. Steel Finish: Powder coat or enamel.
 - c. Stainless Steel Finish: Mill or better.
11. 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.
 - a. Material and Finish: Matching curb cap flashing .
12. 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: 33 inches x 33 inches.

- T. 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: 21 inch (530 mm).
 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.
- U. Light Diffusers:
1. Open Ceilings: Portion of tubular skylight unit that illuminates interior space indicated. An assembly with a light diffusing lens and trim or housing to connect lens directly 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. Lens Size: Approximately same diameter of light guide tube to which it attaches.
 - b. Exposed Trim:
 - 1) Material: Manufacturer's standard painted metal. Plastic will not be accepted.
 - 2) Color: White.
 - c. Diffuser Lens Type and Material:
 - 1) Glass:
 - 2) Plastic, Prismatic, White: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives.
 - 3) Plastic, Prismatic, Clear: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives. Designed to maximize light output and diffusion.
 - a) Visible Light Transmission: Greater than 90 percent.
 - b) Lens Thickness: 0.100 inch (2.5 mm).
 - 4) Plastic, Frosted: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives. Designed to maximize light output and diffusion.
 - a) Visible Light Transmission: Greater than 90 percent.

- b) Lens Thickness: 0.100 inch (2.5 mm).
 - 5) 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 (0.6 mm).
 - 6) Plastic for Secondary Diffuser: Clear, impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives.
 - a) Visible Light Transmission: Greater than 90 percent.
 - b) Lens Thickness: 0.060 inch (1.5 mm).
- 2. 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.
 - 2) Nominal 24 by 24 inches designed for installation in gypsum board ceiling, with manufacturer's standard exposed flange trim.
 - 3) Nominal 24 by 48 inches designed for installation in suspended ceiling grid.
 - 4) Nominal 24 by 48 inches designed for installation in gypsum board ceiling, with manufacturer's standard exposed flange trim.
 - 5) 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. Plastic will not be accepted.
 - 2) Color: White.
 - c. Diffusing Lens Type and Material:
 - 1) Glass:
 - 2) Plastic, Prismatic, White: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives.
 - 3) Plastic, Prismatic, Clear: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives. Designed to maximize light output and diffusion.
 - a) Visible Light Transmission: Greater than 90 percent.
 - b) Lens Thickness: 0.100 inch (2.5 mm).
 - 4) Plastic, Frosted, White: Impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives.
 - 5) 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 (0.6 mm).
 - 6) Plastic for Secondary Diffuser: Clear, impact resistant acrylic or polycarbonate plastic, formulated with UV absorbing or inhibiting additives.
 - a) Visible Light Transmission: Greater than 90 percent.
 - b) Lens Thickness: 0.060 inch (1.5 mm).
- 3. 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.
4. 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.
- V. 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/cablings.
- W. 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.

2.3 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. 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. Avery Dennison Corporation, Specialty Tapes Division.
 - b. Compac Corporation.
 - c. Ideal Tape Co., Inc., an American Biltrite Company.
 - d. Knauf Insulation.
 - e. Venture Tape.
 2. Width: 2 inches.
 3. Thickness: 2 mils aluminum foil; 3.7 mils overall.

4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. 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.

2.4 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

3.1 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.

3.2 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. 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.

3.3 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. Special Seismic Inspection: After installation of suspended tubular skylight components, test for seismic design compliance in accordance with ASCE/SEI 7, 11A.1.3.9 Architectural Components.
 1. Perform periodic special inspection during the installation of tubular skylight suspension systems.
- D. Work will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.4 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Mechanical and electrified door hardware for:
 - a. Swinging doors.
 - b. Sliding doors.
 - c. Gates.
 - 2. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
- B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:
 - 1. Windows
 - 2. Cabinets (casework), including locks in cabinets
 - 3. Signage
 - 4. Toilet accessories
 - 5. Overhead doors
- C. Related Sections:
 - 1. Division 01 Section "General Requirements"
 - 2. Division 06 Section "Finish Carpentry"
 - 3. Division 08 Section "Hollow Metal Doors and Frames"
 - 4. Division 08 Section "Flush Wood Doors"
 - 5. Division 08 Section "Aluminum Framed Entrances and Storefront Doors".
 - 6. Division 26 Sections for connections to electrical power system and for low-voltage wiring.
 - 7. Division 28 Sections for coordination with other components of electronic access control system.

1.3 REFERENCES

- A. Fire/Life Safety
 - 1. NFPA - National Fire Protection Association
 - a. NFPA 70 - National Electric Code
 - b. NFPA 80 - Standard for Fire Doors and Fire Windows
 - c. NFPA 101 - Life Safety Code
 - d. NFPA 105 - Smoke and Draft Control Door Assemblies
 - 2. International Building Code (IBC) 2015
 - 3. All applicable State and Local Building Codes.
- B. 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
- C. Accessibility
1. ADA - 2010 ADA Standards for Accessible Design.
 2. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- D. DHI - Door and Hardware Institute
1. Sequence and Format for the Hardware Schedule
 2. Recommended Locations for Builders Hardware
 3. Key Systems and Nomenclature
- E. ANSI - American National Standards Institute
1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.4 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: Product data including manufacturers' 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 Point to Point 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) Riser Diagrams with 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.
 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 in like-new condition. 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. 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 how door will operate on egress, ingress, and fire and smoke alarm connection.
 - 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 prepared for door hardware installation.
- C. Informational Submittals:
- 1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
 - 2. Product Certificates for electrified door hardware, signed by manufacturer:
 - 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. Certificates of compliance 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. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.

5. 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. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 - e. Final approved hardware schedule, edited to reflect conditions as-installed.
 - f. Final keying schedule
 - g. Copies of floor plans with keying nomenclature
 - h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110/120 volts.
 - i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

- A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.
1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
 - a. Where no additional products or manufacturers are listed in product category, requirements for "No Substitute" govern product selection.
 2. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.
- B. 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: Coordinate 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.
- C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.
- D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).

2. Can provide installation and technical data to Architect and other related subcontractors.
 3. Can inspect and verify components are in working order upon completion of installation.
 4. Capable of producing wiring diagrams.
 5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
 2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- F. 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 and are identical to 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.
- G. 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.
1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
- H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
- J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
 2. Maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.
- K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Attendees: Owner, Contractor, Architect, Installer, Owner's security consultant and Supplier's Architectural Hardware Consultant.
 2. 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.

- L. Pre-installation Conference: Conduct conference at project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. 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.
- M. 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.
 - a. Attendees: Door hardware supplier, door hardware installer, Contractor.
 - b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.
 - 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.
 - a. Attendees: Electrified door hardware supplier, Door and frame supplier, Electrified door hardware installer, Electrical subcontractor, Owner, Owner's Security/Access Control Consultant, Architect and Contractor.
 - b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

1.6 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, but not yet installed. 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.

1.7 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory 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 hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
- F. Direct shipments not permitted, unless approved by Contractor.

1.8 WARRANTY

- A. Special 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: Years from date of Substantial Completion, for durations indicated.
 - a. Closers:
 - 1) Mechanical: 30 years.
 - 2) Electrified: 2 years.
 - b. Exit Devices:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - c. Locksets:
 - 1) Mechanical: 7 years.
 - 2) Electrified: 1 year.
 - d. Balance of Hardware: 1 year.
 - 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 MAINTENANCE

- A. Maintenance Tools:
 - 1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute" and or "Owner's Standard".
 - 1. Where "No Substitute" and or "Owners Standard" is noted, submittals and substitution requests for other products will not be considered.

- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer " or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

Item	Scheduled Manufacturer	Acceptable Manufacturer
Hinges	Ives (IVE)	Bommer, Hager
Continuous Hinges	Ives (IVE)	Select, Stanley
Electric Power Transfers	Von Duprin (VON)	ABH, Securitron
Locks and Latches	Schlage (SCH)	Best, Sargent
Exit Devices & Accessories	Von Duprin (VON)	Precision, Sargent
Door Closers	LCN (LCN)	Corbin/Russwin, Sargent
Low Energy Auto Operators	LCN (LCN)	Norton, Besam
Door Trim	Ives (IVE)	Burns, Trimco
Overhead Stops	Glynn-Johnson (GLY)	Dorma, Rixson
Protection Plates	Ives (IVE)	Burns, Trimco
Stops & Holders	Ives (IVE)	Burns, Trimco
Silencers	Ives (IVE)	Burns, Trimco
Gasketing/Weatherstrip/Thresholds	Zero (ZER)	NGP, Reese
Key Cabinets	Lund (LUN)	HPC, Telkee

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. 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.

2.2 MATERIALS

- A. Fasteners
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 - 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
 - 4. Install hardware with fasteners provided by hardware manufacturer.
- B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
 - 1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
 - 2. Use materials which match materials of adjacent modified areas.
 - 3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
- C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.3 HINGES

- A. Provide five-knuckle, ball bearing hinges.
 - 1. Manufacturers and Products:
 - a. Scheduled Manufacturer and Product: Ives 5BB1/5BB1HW series
 - b. Acceptable Manufacturers and Products: Bommer BB5000/BB5004 series, Hager BB179/BB1168 series.
- B. Requirements:
 - 1. 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
 - 2. 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
 - 3. 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
 - 4. 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.
 - 5. 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.
 - 6. 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
 - 7. 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.
 - 8. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
 - 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, unless specified in hollow metal frame specification.
 - 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.

2.4 CONTINUOUS HINGES

- A. Aluminum Geared
 - 1. Manufacturers:
 - a. Scheduled Manufacturer: Ives 112HD / 224HD series

- b. Acceptable Manufacturers: Select SL series, Stanley 660 series
2. Requirements:
- a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.25, Grade 1.
 - b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.
 - 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 without door/frame reinforcements, 600 pounds with door/frame reinforcements, 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 with symmetrical hole pattern.

2.5 ELECTRIC POWER TRANSFER

- A. Manufacturers:
- a. Scheduled Manufacturer: Von Duprin - EPT 10
 - b. Acceptable Manufacturers: ABH - PT1000, Securitron CEPT-10
- B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
- C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.6 FLUSH BOLTS

- A. Manufacturers:
- 1. Scheduled Manufacturer: Ives
 - 2. Acceptable Manufacturers: Burns, Trimco
- 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.

2.7 COORDINATORS

- A. Manufacturers:
- 1. Scheduled Manufacturer: Ives
 - 2. Acceptable Manufacturers: Burns, Trimco
- B. Requirements:
- 1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.

2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

2.8 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage ND series.
2. Acceptable Manufacturers and Products: Best 93K series, Sargent 11- Line.

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 - Sparta (SPA)
 - b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.9 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 35A/98 series.
2. Acceptable Manufacturers and Products: Precision Apex series, Sargent 80 series.

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 cylindrical 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. Rim Exit Devices: provide devices with damper controlled re-latching to reduce operational noise. Where lever trim is specified, provide damper controlled lever return.
15. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
 - a. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.10 CYLINDERS, CORES AND KEYS

A. Manufacturers:

1. Scheduled Manufacturer: Schlage, Everest 29
2. Acceptable Manufacturers: Best - Preferred Patented, Sargent - DG1

B. Requirements:

1. Provide cylinders/cores, from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
 - a. Conventional Patented Open: Standard cylinder and or interchangeable core with open keyway, as scheduled in the hardware sets.
 - b. Features: Cylinders/cores shall incorporate the following features.
3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected until the year 2029.
4. Nickel silver bottom pins.
5. Project Cylinder/Core Distribution: Provide cylinders/cores complying with the following requirements in Project locations as indicated.
 - a. Interior Doors: Standard or interchangeable cores with Everest 29 patent-restricted keyway, as scheduled in the hardware sets
 - b. Exterior Doors: Standard or interchangeable cores with Everest 29 patent-restricted keyway, as scheduled in the hardware sets.
 - c. Replaceable Construction Cores.
 - d. 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.
 - e. Contractor and Owner's Representative will replace temporary construction cores with permanent cores. Contractor to return all temporary cores to the original supplier.

C. Construction Keying:

1. Temporary Construction Cylinder Keying.
 - a. Where non-interchangeable core cylinders are used; Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.

- 1) Split Key or Lost Ball Construction Keying System.
 - 2) 3 construction control keys, and extractor tools or keys as required to void construction keying.
 - 3) 12 construction change (day) keys.
- b. Owner or Owner's Representative will void operation of temporary construction keys.
2. Where Interchangeable core cylinders are used; Replaceable Construction Cores.
- a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - 1) 3 construction control keys
 - 2) 12 construction change (day) keys.
 - b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.11 KEYING

- 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. Keying system as directed by the Owner.
 2. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall 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)
 4. Identification:
 - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.
 - b. Identification stamping provisions must be approved by the Architect and Owner.
 - c. Stamp 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 shall be cause for replacement of keys involved at no additional cost to Owner.
 - e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
 5. Quantity: Furnish in the following quantities.
 - a. Change (Day) Keys: Three (3) per cylinder/core.
 - b. Permanent Control Keys: Five (5)
 - c. Top Level Master Keys: Five (5)
 - d. Master or Grandmaster Keys per master group: Five (5)
 - e. Additional Cut Keys as directed by owner: Ten (10) each

2.12 KEY CONTROL SYSTEM

- A. Manufacturers:

1. Scheduled Manufacturer: Lund
 2. Acceptable Manufacturers: HPC, Telkee
- B. Requirements: Per school building
1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
 - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.

2.13 DOOR CLOSERS

- A. Manufacturers and Products:
1. Scheduled Manufacturer and Product: LCN 4040XP series.
 2. Acceptable Manufacturers and Products: Corbin Russwin DC3000 series, Sargent 281 series less Pressure Relief Valve (PRV).
- B. Requirements:
1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. 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 3/4 inch (19 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.
 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 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.

2.14 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

- A. Manufacturers and Products:
1. Scheduled Manufacturer and Product: LCN 4600 series
 2. Acceptable Manufacturers: Norton 6000 series, Besam Power Swing.
- 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.

2.15 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

B. Requirements:

1. Provide push plates 6 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 6 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.16 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives 8400
2. Acceptable Manufacturers: Burns .050, Trimco K0050

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick 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 1 1/2 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 1 1/2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - c. Armor Plates: 34 inches (914 mm) high by 1 1/2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.17 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

- A. Manufacturers:
 1. Scheduled Manufacturers: Glynn-Johnson
 2. Acceptable Manufacturers: Dorma, Rixson
- B. Requirements:
 1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
 2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
 3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
 4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.18 DOOR STOPS AND HOLDERS

- A. Manufacturers:
 1. Scheduled Manufacturer: Ives
 2. Acceptable Manufacturers: Burns, Trimco
- 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.

2.19 THRESHOLDS, WEATHER-STRIPPING, GASKETING

- A. Manufacturers:
 1. Scheduled Manufacturer: Zero International
 2. Acceptable Manufacturers: National Guard Products, Reese
- B. Requirements:
 1. Provide thresholds, weather-stripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
 2. 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

3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.20 SILENCERS

- A. Manufacturers:
 1. Scheduled Manufacturer: Ives
 2. Acceptable Manufacturers: Burns, Trimco
- 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.

2.21 FINISHES

- A. Finish:
 1. Generally, Dull Chrome, US26D / BHMA 626 and Stainless Steel US32D / BHMA 630.
Provide finish for each item as indicated and or specified in the hardware sets.

PART 3 - EXECUTION

3.1 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. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Where on-site modification of doors and frames is required:
 1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
 2. Field modify and prepare existing door and frame for new hardware being installed.
 3. When modifications are exposed to view, use concealed fasteners, when possible.
 4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
 - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
 - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

- A. All hardware will be installed by qualified tradesmen, skilled in application of commercial grade hardware. A pre-installation meeting shall be conducted by the manufacturer's rep. The manufacturer's rep shall also conduct a post construction review of all doors as part of the punch list process.
- B. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated 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.
- I. 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.
- J. Wiring: Coordinate with Division 26 and Division 28 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.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
- M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- N. 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.
 - 1. Configuration: Provide power supplies as specified in the hardware sets.
- O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- P. 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.

- Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- S. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

- A. Final Inspection: Contractor shall engage qualified Hardware Manufacturers Representative to perform inspections and to prepare inspection reports.
 - 1. Hardware Manufacturers 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.

3.5 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. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately six (6) months after date of Substantial Completion, Installer's Architectural Hardware Consultant and or installer shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 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.

3.7 DEMONSTRATION

- A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

- A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
- B. List of manufacturers used in hardware schedule:
 - 1. Ives <http://us.allegion.com/brands/ives/Pages/default.aspx>
 - 2. Glynn Johnson <http://us.allegion.com/brands/glynn-johnson/pages/default.aspx>
 - 3. LCN <http://us.allegion.com/brands/lcn/pages/default.aspx>
 - 4. Schlage <http://us.allegion.com/brands/schlage/Pages/default.aspx>

- 5. Von Duprin http://us.allegion.com/brands/von_duprin/Pages/default.aspx
- 6. Zero International <http://www.zerointernational.com/catalogcadlibrary.aspx>

C. Hardware Sets as follows:

Hardware Set No. 001

For use on door #(s):

1001A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	EXIT DEVICE	9847-EO-LBR	626	VON
1	EA	EXIT DEVICE	9847-NL-OP-LBR-110MD	626	VON
1	EA	RIM CYLINDER	20-057 - Blocking Ring as required.	626	SCH
2	EA	OFFSET DOOR PULL	8190HD 12" - (Type "O" Mounting)	630	IVE
2	EA	DOOR CLOSER	4040XP SHCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30 - As required	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61 - As required	689	LCN
1	EA	WEATHER-STRIPPING	By Aluminum Door/Frame Mfgr.		B/O
1	EA	ASTRAGAL	Meeting Stile Gasketing by Aluminum Door Mfgr.		B/O

Hardware Set No. 002

For use on door #(s):

1001B 1015

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	EXIT DEVICE	98-L-17	626	VON
1	EA	RIM CYLINDER	20-057 - Blocking Ring as required.	626	SCH
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP TJ - (Top Jamb Mount))	689	LCN
1	EA	MOUNTING PLATE	4040XP-18G - As required	689	LCN
1	EA	WEATHER-STRIPPING	By Aluminum Door/Frame Mfgr.		B/O
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A-E-V3-224	A	ZER
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE

Description of Operation:

- 1. No Access Control at this location. Door Position Switch Only.
- 2. Access by mechanical key only.

Hardware Set No. 003

For use on door #(s):

1001D 1003 1004 1005 1007 1008

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND50PD SPA	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 004

For use on door #(s):

1001E 1084B 1095B 1096A 1118D 1145A
 1353

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24VDC	630	VON
1	EA	LOCK GUARD	LG14	630	IVE
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	RAIN DRIP - HEAD	142AA	AA	ZER
1	EA	WEATHER-STRIPPING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A-E-V3-224	A	ZER
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. Access only when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times by rotating inside lever handle.
6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 005

For use on door #(s):

1055C 1057 1065C 1084A 1084C 1110C
 1144C 1145E

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24VDC	630	VON
1	EA	LOCK GUARD	LG14	630	IVE
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	RAIN DRIP - HEAD	142AA	AA	ZER
1	EA	WEATHER-STRIPPING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A-E-V3-224	A	ZER
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times by rotating inside lever handle.
6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 006

For use on door #(s):

1002

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONSTANT LATCHING FLUSH BOLTS	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	ND70PD SPA	626	SCH
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	ASTRAGAL	Overlapping Metal Astragal by HM Door Mfr.	PRI	B/O
2	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 007

For use on door #(s):

1009 1041B 1121 1123

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 008

For use on door #(s):

1010 1029 1122

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	EXIT DEVICE	98-NL-OP-110MD	626	VON
1	EA	RIM CYLINDER	20-057 - Blocking Ring as required.	626	SCH
1	EA	ELECTRIC STRIKE	6300 FSE 12/24VDC	630	VON
1	EA	OFFSET DOOR PULL	8190HD 12" - (Type "O" Mounting)	630	IVE
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	AUTO OPERATOR	4642 WMS 120VAC	689	LCN
2	EA	ACTUATOR, JAMB/MULLION MOUNT	8310-818T	630	FAL
2	EA	SURFACE MOUNT BOX	8310-819S	689	FAL
1	EA	WEATHER-STRIPPING	By Aluminum Door/Frame Mfgr.		B/O
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A-E-V3-224	A	ZER
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to card reader, Or by Mechanical Key, Or when opening is unlocked by Head End Access Control System.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times depressing exit device push bar.
6. Opening shall have an low energy automatic operator for occasional handicap assistance.
 The auto operator actuators shall be wired through the building Head End Access Control System.
 The Head End Access Control System. will control the actuators and determine when they active or inactive, and how they interface with the electric strikes.
7. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 009

For use on door #(s):

1011 1028 1122B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	DUMMY PUSH BAR	350	626	VON
1	EA	OFFSET DOOR PULL	8190HD 12" - (Type "O" Mounting)	630	IVE
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	AUTO OPERATOR	4642 WMS 120VAC	689	LCN
2	EA	ACTUATOR, JAMB/MULLION MOUNT	8310-818T	630	FAL
2	EA	SURFACE MOUNT BOX	8310-819S	689	FAL
1	EA	WEATHER-STRIPPING	Provided by Aluminum Door/Frame Mfgr.		B/O

Description of Operation:

1. Push/Pull vestibule doors.
2. Opening to have low energy automatic operator for occasional handicap assistance when required.
3. Both actuators to be wired to the automatic operator in a standard configuration, and shall be active at all times.
4. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 010

For use on door #(s):

1012 1017

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24VDC	630	VON
1	EA	DOOR CLOSER	4040XP EDA	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times by rotating inside lever handle.
6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 011

For use on door #(s):

1013 1120B 1120C 1145C 1145D

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24VDC	630	VON
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	545A-E-V3-224	A	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times by rotating inside lever handle.
6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 012

For use on door #(s): 1014 1143

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24VDC	630	VON
1	EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked

- by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
 5. Free egress maintained at all times by rotating inside lever handle.
 6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 013

For use on door #(s): 1015B

Each To Have:

Qty	EA	Description	Catalog Number	Finish	Mfr
1	EA	NOTE	All Hardware by Door Mfgr.		B/O

Hardware Set No. 014

For use on door #(s): 1015C

Each To Have:

Qty	EA	Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	SGL CYL DEADBOLT	B660P	626	SCH
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	DOOR CLOSER	4040XP EDA	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP/HOLDER	WS40	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 015

For use on door #(s):
 1018 1019 1020 1124

Each To Have:

Qty	EA	Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S SPA	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 016

For use on door #(s):
 1021 1031

Each To Have:

Qty	EA	Description	Catalog Number	Finish	Mfr
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3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP/HOLDER	WS40	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 017

For use on door #(s):

1023

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	DOOR CLOSER	4040XP EDA	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP/HOLDER	WS40	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 018

For use on door #(s):

1025A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	SET	CONSTANT LATCHING FLUSH BOLTS	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6223 FSE 12VDC	630	VON
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	FIRE/LIFE CLOSER	4040SE ST-2806 WMS - (Pull Side Mount)	689	LCN
1	EA	DOOR CLOSER	4040XP T - (Pull Side Mount)	689	LCN
2	EA	ARMOR PLATE	8400 34" X 1" LDW B-CS	630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7850 - Voltage as required.	689	LCN
1	EA	ASTRAGAL	Overlapping Metal Astragal by HM Door Mfr.	PRI	B/O
2	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times by rotating inside lever handle.
6. Opening shall be held open by electronic hold open wall magnets and or electronic hold open door closers.
7. Wall Magnets and or door closers to be wired to, and take power from the Building Head End Access Control System. Verify and match voltage of wall magnet to the voltage provided by the Head End Access Control System.
 - a. When the Head End Access Control System is activated, power to the wall magnets and or door closers is terminated.
The Doors will automatically close and lock from the ingress side of the opening.
 - b. When the building security system is reset, power to the wall magnets is automatically restored.
The Doors can be placed back into the hold open position and resume normal function.
8. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 019

For use on door #(s):

1025B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	EXIT DEVICE	98-L-NL-17	626	VON
1	EA	RIM CYLINDER	20-057 - Blocking Ring as required.	626	SCH
1	EA	ELECTRIC STRIKE	6300 FSE 12/24VDC	630	VON
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	RAIN DRIP - HEAD	142AA	AA	ZER
1	EA	WEATHER-STRIPPING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A-E-V3-224	A	ZER
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be

- programmed to lock/unlock at owners discretion.
- 3. When secure; Access by presenting a valid credential to card reader, Or by Mechanical Key, Or when opening is unlocked by Head End Access Control System.
- 4. Power for electric strike provided by access control integrator under Division 28.
- 5. Free egress maintained at all times depressing exit device push bar.
- 6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 020

For use on door #(s):

1025C	1055D	1055E	1065B	1065D	1077
1078	1079	1080	1081	1082	1083
1087	1088	1089	1090	1091	1092
1093	1095A	1096B	1100B	1100C	1118A
1118B	1119A	1119B	1144B	1146A	1146B
1147A	1147B	1150A	1150B	1150C	1150D
1296	1357				

Each To Have:

Qty	Description	Catalog Number	Finish	Mfr
1 EA	NOTE	All Hardware by Overhead Door Mfr.		B/O

Hardware Set No. 021

For use on door #(s):

1026B

Each To Have:

Qty	Description	Catalog Number	Finish	Mfr
3 EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1 EA	ELECTRIC STRIKE	6400 FSE 12/24VDC	630	VON
1 EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1 EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1 EA	WALL STOP	WS406/407CVX	630	IVE
1 EA	GASKETING	488SBK PSA	BK	ZER
1 EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1 EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

- 1. Normally secure, access controlled opening.
- 2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
- 3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked

- by Head End Access Control System, or by mechanical key.
- 4. Power for electric strike provided by access control integrator under Division 28.
- 5. Free egress maintained at all times by rotating inside lever handle.
- 6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 022

For use on door #(s):

1027 1043B 1098A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70PD SPA	626	SCH
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	DOOR CLOSER	4040XP REG ST-1630 - (Pull Side Mount)	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 023

For use on door #(s):

1027C

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	SET	CONSTANT LATCHING FLUSH BOLTS	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6223 FSE 12VDC	630	VON
2	EA	DOOR CLOSER	4040XP SHCUSH	689	LCN
2	EA	ARMOR PLATE	8400 34" X 1" LDW B-CS	630	IVE
1	EA	ASTRAGAL	Overlapping Metal Astragal by HM Door Mfr.	PRI	B/O
2	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.

5. Free egress maintained at all times by rotating inside lever handle.
6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 024

For use on door #(s):

1030A 1030B 1096E

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONSTANT LATCHING FLUSH BOLTS	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
2	EA	OVERHEAD STOP	100S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 025

For use on door #(s):

1032

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S SPA	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 026

For use on door #(s):

1037

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24VDC	630	VON
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O

1 EA CARD READER Specified and Provided by Division 28. B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times by rotating inside lever handle.
6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 027

For use on door #(s):

1038A 1103 1144A 1352 1354

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 028

For use on door #(s):

1041A 1042A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70PD SPA	626	SCH
1	EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 029

For use on door #(s):

1043A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70PD SPA	626	SCH
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 030

For use on door #(s):

1043C 1120A 1145B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	545A-E-V3-224	A	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Set No. 031

For use on door #(s):

1043D

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 032

For use on door #(s):

1054A 1150E 1150F

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	RAIN DRIP - HEAD	142AA	AA	ZER
1	EA	WEATHER-STRIPPING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A-E-V3-224	A	ZER

Hardware Set No. 033

For use on door #(s):

1054B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONSTANT LATCHING FLUSH BOLTS	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB1F	689	IVE
2	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	ASTRAGAL	Overlapping Metal Astragal by HM Door Mfr.	PRI	B/O
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Set No. 034

For use on door #(s):

1055A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	DOOR CLOSER	4040XP EDA	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 035

For use on door #(s):
1055B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	PIVOT SET	7255 SET	626	IVE
2	EA	PUSH PLATE	8200 6" X 16"	630	IVE
2	EA	CONCEALED CLOSER	6033 BUMP WMS	689	LCN
4	EA	ARMOR PLATE	8400 42" X 1" LDW B-CS	630	IVE
4	EA	FLOOR STOP	FS18L	BLK	IVE

Hardware Set No. 036

For use on door #(s):
1056

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	EXIT DEVICE	98-L-F-17	626	VON
1	EA	RIM CYLINDER	20-057 - Blocking Ring as required.	626	SCH
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Set No. 037

For use on door #(s):
1065A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 038

For use on door #(s):

1066B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	EXIT DEVICE	9847-EO-F-LBR	626	VON
1	EA	EXIT DEVICE	9847-L-F-LBR-17	626	VON
1	EA	RIM CYLINDER	20-057 - Blocking Ring as required.	626	SCH
2	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	ASTRAGAL	326AA	AA	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Set No. 039

For use on door #(s):

1084D

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD	628	IVE
2	EA	PUSH PLATE	8200 6" X 16"	630	IVE
2	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
2	EA	ARMOR PLATE	8400 42" X 1" LDW B-CS	630	IVE
1	EA	ASTRAGAL	139A	A	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Set No. 040

For use on door #(s):

1084E

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70PD SPA	626	SCH
1	EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 041

For use on door #(s):

1085 SECURITY GATE

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24VDC	630	VON

1	EA	DOOR POS. SWITCH	7766	628	SCE
1	EA	NOTE	Balance of Hardware including all hinges or pivots, closing devices, mounting brackets and reinforcements by Gate or Tool Cage Door Mfr.		B/O
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled tool box storage cage door.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times by rotating inside lever handle.
6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 042

For use on door #(s):

1095C 1100D

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 043

For use on door #(s):

1096C

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S SPA	626	SCH
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	DOOR CLOSER	4040XP REG ST-1630 - (Pull Side Mount)	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Set No. 044

For use on door #(s):

1096Q 1368 1369

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70PD SPA	626	SCH
1	EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	RAIN DRIP - TOE	11A	A	ZER
1	EA	RAIN DRIP - HEAD	142AA	AA	ZER
1	EA	WEATHER-STRIPPING	188SBK PSA	BK	ZER
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	655A-E-V3-224	A	ZER
1	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE

Hardware Set No. 045

For use on door #(s):

1097

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	SET	CONSTANT LATCHING FLUSH BOLTS	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	ELECTRIC STRIKE	6223 FSE 12VDC	630	VON
1	EA	LOCK GUARD	LG14	630	IVE
2	EA	DOOR CLOSER	4040XP SHCUSH	689	LCN
2	EA	ARMOR PLATE	8400 34" X 1" LDW B-CS	630	IVE
1	EA	WEATHER-STRIPPING	188SBK PSA	BK	ZER
1	EA	ASTRAGAL	Overlapping Metal Astragal by HM Door Mfgr.	PRI	B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	655A-E-V3-224	A	ZER
2	EA	DOOR POS. SWITCH	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
1	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to the card reader, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Power for electric strike provided by access control integrator under Division 28.
5. Free egress maintained at all times by rotating inside lever handle.
6. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 046

For use on door #(s):

1098B

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	CONSTANT LATCHING FLUSH BOLTS	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	ND70PD SPA	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	DOOR CLOSER	4040XP SHCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	ASTRAGAL	Overlapping Metal Astragal by HM Door Mfr.	PRI	B/O
2	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 047

For use on door #(s):

1099

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S SPA	626	SCH
1	EA	DOOR CLOSER	4040XP REG - (Pull Side Mount)	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 048

For use on door #(s):

1110A

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EXIT DEVICE	RX-98-L-NL-F-17-ALK 12VDC - Hardwired	626	VON
1	EA	RIM CYLINDER	20-057 - Blocking Ring as required.	626	SCH
1	EA	MORTISE CYLINDER	20-061 - CAM & Blocking Ring as required.	626	SCH
1	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	545A-E-V3-224	A	ZER

1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	POWER SUPPLY	Power for Electric Strike provided under Division 28.		B/O
2	EA	CARD READER	Specified and Provided by Division 28.		B/O

Description of Operation:

1. Normally secure, access controlled opening.
2. Opening is controlled (Locked/Unlocked) by Head End Access Control System, and can be programmed to lock/unlock at owners discretion.
3. When secure; Access by presenting a valid credential to either card reader from either side of the opening, or when opening is unlocked by Head End Access Control System, or by mechanical key.
4. Push side card reader shunts the ALK Alarm for card carrying staff and employees.
5. Pull side card reader releases the electric strike.
6. Power for electric strike and hardwired ALK Exit Alarm Kit to be provided by access control integrator under Division 28.
7. Free egress maintained at all times by rotating inside lever handle.
8. Electrical Riser Diagram required per specifications 087100, section 1.4.B.2.a

Hardware Set No. 049

For use on door #(s):

1137

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	DOOR CLOSER	4040XP CUSH - Template Door Closer for 90 Degree Dead-stop.	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 050

For use on door #(s):

1140

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	DOOR CLOSER	4040XP SHCUSH	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 051

For use on door #(s):

1141

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	DOOR CLOSER	4040XP EDA	689	LCN
1	EA	PROTECTION PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Set No. 052

For use on door #(s):

1355

Each To Have:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	SINGLE DUMMY TRIM	ND170 SPA	626	SCH
2	EA	DOOR CLOSER	4040XP SCUSH	689	LCN
2	EA	ARMOR PLATE	8400 34" X 1" LDW B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for the following:
 - a. Windows.
 - b. Doors.
 - c. Interior borrowed lites.
 - d. Storefront framing.
 - 2. Glazing sealants and accessories.
 - 3. Monolithic Glass Units: See end of Section for detailed glass schedule.
 - a. GL-4: Clear annealed float glass.
 - b. GL-4T: Clear fully tempered float glass.
 - 4. Insulating Glass Units: See end of Section for detailed glass schedule.
 - a. GL-1: Low-E-coated, clear insulating glass.
 - b. GL-2T: Low-E-coated, tinted insulating glass.
 - c. GL-5: Ceramic-coated, low-E, insulating spandrel glass.
- B. Related Requirements:
 - 1. Section 08 41 26 "All-Glass Entrances and Storefronts."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- D. Glazing Accessory Samples: For sealants, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 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.

PART 2 - PRODUCTS

2.1 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. AGC Glass Company North America, Inc.
 - 2. Berkowitz, JE, LP.
 - 3. Cardinal Glass Industries.
 - 4. Cristacurva Glass.
 - 5. Dlubak Corporation.
 - 6. Gardner Glass Products, Inc.
 - 7. General Glass International.
 - 8. Glasswerks LA, Inc.
 - 9. Glaz-Tech Industries.
 - 10. Guardian Industries Corp.
 - 11. Hartung Glass Industries.
 - 12. Northwestern Industries, Inc.
 - 13. Oldcastle BuildingEnvelope.
 - 14. Pilkington North America Inc.
 - 15. PPG Industries, Inc.
 - 16. Saint-Gobain Corporation.
 - 17. Schott North America, Inc.
 - 18. Tecnoglass S. A.
 - 19. Trulite Glass & Aluminum Solutions.
 - 20. 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.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. 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. 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.
2. 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.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: "Glazing Manual."
- B. 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.
- C. 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.

2.4 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. LEED2009 - Sealant shall have a VOC content of 250 g/L or less.
 5. LEED2009 - Sealant 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."
 6. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 1. Application Limitations: _.
- C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 1. Application Limitations:
 - a. Not for use at expansion joints.
- D. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 1. Application Limitations:
 - a. Not for use at expansion joints.
- E. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 1. Application Limitations:
 - a. Interior exposure only.
 - b. Not for use at expansion joints.

2.5 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.

2.6 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."

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 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

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.

- 4. Effective sealing between joints of glass-framing members.
 - B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 PREPARATION
- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
 - B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.
- 3.3 GLAZING, GENERAL
- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
 - B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
 - C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
 - D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 - E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 - F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 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.
- 3.4 TAPE GLAZING
- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
 - B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
 - C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
 - D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
 - E. Do not remove release paper from tape until right before each glazing unit is installed.
 - F. Apply heel bead of elastomeric sealant.
 - G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
 - H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

- A. Glass Type GL-4: Clear annealed float glass.
 - 1. Minimum Thickness: 6 mm.
- B. Glass Type GL-4T: Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.

3.9 INSULATING GLASS SCHEDULE

- A. Glass Type GL-1: Low-E-coated, clear insulating glass.
 - 1. Basis-of-Design Product: Vitro; Solarban 70XL.
 - 2. Overall Unit Thickness: 1 inch.
 - 3. Outdoor Lite: Annealed float glass.
 - 4. Interspace Content: Argon.
 - 5. Indoor Lite: Annealed float glass.
 - 6. Low-E Coating: Pyrolytic on second surface.
 - 7. Winter Nighttime U-Factor: .28 maximum.

8. Summer Daytime U-Factor: .26 maximum.
 9. Visible Light Transmittance: .50 percent minimum.
 10. Solar Heat Gain Coefficient: .25 maximum.
- B. Glass Type GL-2T: Low-E-coated, tinted insulating glass.
1. Basis-of-Design Product: Vitro; Solarban 70XL.
 2. Overall Unit Thickness: 1 inch.
 3. Outdoor Lite: Tinted fully tempered float glass.
 4. Interspace Content: Argon.
 5. Indoor Lite: Clear fully tempered float glass.
 6. Low-E Coating: Pyrolytic on second surface.
 7. Winter Nighttime U-Factor: .28 maximum.
 8. Summer Daytime U-Factor: .26 maximum.
 9. Visible Light Transmittance: .50 percent minimum.
 10. Solar Heat Gain Coefficient: .25 maximum.
 11. Safety glazing required.
- C. Glass Type GL-5: Ceramic-coated, low-E, insulating spandrel glass.
1. Basis-of-Design Product: Vitro; Solarban 70XL.
 2. Coating Color: Match Architect's samples.
 3. Overall Unit Thickness: 1 inch.
 4. Outdoor Lite: Annealed float glass.
 5. Interspace Content: Argon.
 6. Indoor Lite: Annealed float glass.
 7. Low-E Coating: Pyrolytic on second surface.
 8. Opaque Coating Location: Fourth surface.
 9. Winter Nighttime U-Factor: .28 maximum.
 10. Summer Daytime U-Factor: .26 maximum.

END OF SECTION 08 80 00

SECTION 08 91 19

FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fixed, extruded-aluminum louvers of the following type(s):
 - a. Horizontal, nondrainable-blade louvers.
 - b. Horizontal, drainable-blade louvers.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).
- C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- D. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
- B. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Component Importance Factor: 1.5.
- C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
- D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Nondrainable-Blade Louver :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Air Balance Inc.; a Mestek company.
 - b. Air Flow Company, Inc.
 - c. Airolite Company, LLC (The).
 - d. All-Lite Architectural Products.
 - e. American Warming and Ventilating; a Mestek company.
 - f. Architectural Louvers; Harray, LLC.
 - g. Arrow United Industries; a division of Mestek, Inc.
 - h. Carnes Company, Inc.
 - i. Cesco Products; a division of Mestek, Inc.
 - j. Construction Specialties, Inc.
 - k. Dowco Products Group; Safe Air of Illinois.
 - l. Greenheck Fan Corporation.
 - m. Louvers & Dampers; a division of Mestek, Inc.
 - n. Metal Form Manufacturing, Inc.
 - o. NCA Manufacturing, Inc.
 - p. Nystrom, Inc.
 - q. Pottorff.
 - r. Reliable Products, Inc.
 - s. Ruskin Company; Tomkins PLC.
 - t. United Enertech.
 - u. Vent Products Co., Inc.
2. Louver Depth: 6 inches.
3. Blade Profile: Blade with center baffle.
4. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
5. Mullion Type: Exposed.
6. Louver Performance Ratings:
- a. Free Area: Not less than 8.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
 - b. Point of Beginning Water Penetration: Not less than 1000 fpm.

- c. Air Performance: Not more than 0.10-inch wg static pressure drop at 1000 fpm free-area exhaust velocity.
- B. Horizontal, Drainable-Blade Louver :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a Mestek company.
 - b. Air Flow Company, Inc.
 - c. Airolite Company, LLC (The).
 - d. All-Lite Architectural Products.
 - e. American Warming and Ventilating; a Mestek company.
 - f. Architectural Louvers; Harray, LLC.
 - g. Arrow United Industries; a division of Mestek, Inc.
 - h. Carnes Company, Inc.
 - i. Cesco Products; a division of Mestek, Inc.
 - j. Construction Specialties, Inc.
 - k. Dowco Products Group; Safe Air of Illinois.
 - l. Greenheck Fan Corporation.
 - m. Industrial Louvers, Inc.
 - n. Louvers & Dampers; a division of Mestek, Inc.
 - o. Metal Form Manufacturing, Inc.
 - p. NCA Manufacturing, Inc.
 - q. Nystrom, Inc.
 - r. Pottorff.
 - s. Reliable Products, Inc.
 - t. Ruskin Company; Tomkins PLC.
 - u. United Enertech.
 - v. Vent Products Co., Inc.
 - 2. Louver Depth: 6 inches.
 - 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
 - 4. Mullion Type: Exposed.
 - 5. Louver Performance Ratings:
 - a. Free Area: Not less than 8.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
 - b. Point of Beginning Water Penetration: Not less than 1000 fpm .
 - c. Air Performance: Not more than 0.10-inch wg static pressure drop at 1000 fpm free-area intake velocity.
 - d. Air Performance: Not more than 0.15-inch wg static pressure drop at 1000-fpm free-area intake velocity.
 - 6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 - 1. Screen Location for Fixed Louvers: Interior face and exterior face, refer to drawings for locations.
 - 2. Screening Type: Bird screening.
- B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 - 1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Rewirable frames with a driven spline or insert.

2.5 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.

2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern where indicated.
 2. Horizontal Mullions: Provide horizontal mullions at joints where indicated.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- G. Provide subsills made of same material as louvers for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- C. High-Performance Organic Finish: -coat fluoropolymer finish complying with AAMA 2605 and containing not less than 50 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum board ceilings, soffits, and grid systems.
- B. Components used with fire-resistance-rated head of wall systems (other than top metal runner assembly) are specified in Section 07 84 43 "Joint Firestopping."
- C. Contractor's Discretion:
 - 1. Steel Framing: Provide framing fabricated from smooth or dimpled sheet.
 - 2. Partition Head of Wall Systems:
 - a. For fire-resistance-rated head of wall systems (at Partition Types R###) provide joint firestopping utilizing slip-type head joints of any type indicated or firestop track of any type indicated, except:
 - 1) Where head of wall is exposed to view, provide joint firestopping specified for exposed locations only.
 - b. 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 smooth sheet steel.
 - b. Metal framing fabricated from dimpled sheet steel.
 - c. Proprietary grid suspension system.
- D. Related Requirements:
 - 1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 DEFINITIONS

- A. Partition types 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 rated).
 - 4. Types F### for Furred partitions.
- B. Steel sheet thickness for metal framing specified in this Section is for uncoated flat steel sheet. Where Drawings indicate framing metal by gage thickness then comply with minimum thickness indicated in table below.

STEEL SHEET THICKNESSES				
DW = Drywall ST = Structural	Flat Steel Sheet			Gage Equivalent for Dimpled Steel Sheet
	Uncoated Thickness	Minimum Thickness	Design Thickness	
Gage				Uncoated Thickness

	Inch	Mils	Inch	Inch
25	0.018	18	0.0188	0.015
22	0.027	27	0.0283	-
20 DW	0.030	30	0.0312	0.025
20 ST	0.033	33	0.0346	0.028
18	0.043	43	0.0451	-
16	0.054	54	0.0566	-
14	0.068	68	0.0713	-
12	0.097	97	0.1017	-
10	0.118	118	0.1242	-

- C. Tie wire and hanger wire diameters (uncoated) and corresponding U.S. steel wire gage shall be as indicated in the table below:

WIRE DIAMETER					
	Minimum Steel Base Metal (Uncoated) Diameter			Minimum Steel Base Metal (Uncoated) Diameter	
Gage	Inch		Gage	Inch	
20	0.0348		13	0.0915	
19	0.0410		12	0.1055	
18	0.0475		11	0.1205	
17	0.0540		10	0.1350	
16	0.0625		9	0.1483	
14	0.0800		8	0.1620	

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 B. LEED2009 - Sustainable Design Submittals:
 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following from ICC-ES.
 1. Dimpled steel studs and runners furnished.
 2. Proprietary firestop tracks furnished.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
 B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. LEED2009 - Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
 B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 2. Protective Coating:

- a. At Framed Assemblies Abutting Dry Spaces: ASTM A 653/A 653M, G40 or coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
 - b. At Framed Assemblies Abutting Wet or Humid Spaces: ASTM A 653/A 653M, G60. Wet or humid spaces include but are not limited to the following:
 - 1) Toilet rooms
 - 2) Bath rooms.
 - 3) Shower rooms.
 - 4) Locker rooms abutting shower rooms and bath rooms.
- C. Studs and Runners: ASTM C 645.
- 1. Steel Studs and Runners:
 - a. Manufacturers: Subject to compliance with requirements, provide the following:
 - 1) MRI Steel Framing, LLC.
 - b. 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-metal thickness based on Limiting Wall Height of stud.
 - c. Depth: As indicated on Drawings.
 - 2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: As indicated on manufacturer prepared limiting wall height table, see Part 1 Article "Action Submittals."
 - b. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
- 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs. Only products reported under ICC-ES will be accepted.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
- 1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MRI Steel Framing, LLC.
 - 2. 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.
- G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
- 1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MRI Steel Framing, LLC.
 - 2. Depth: 1-1/2 inches unless indicated otherwise on Drawings.
 - 3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
- 1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. MRI Steel Framing, LLC.
2. Minimum Base-Metal Thickness: 0.018 inch unless indicated otherwise on Drawings.
3. Depth: As indicated on Drawings.
- I. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MRI Steel Framing, LLC.
 2. Configuration: As indicated on Drawings.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.
 1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MRI Steel Framing, LLC.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, 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. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, chemical anchor Postinstalled, expansion anchor.
 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Hanger Attachments to 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 ceiling systems weighing no more than 2.5 psf.
- D. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
 1. Depth: 1-1/2 inches.
- F. Furring Channels (Furring Members):
 1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. 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.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - 2. 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.
 - 3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

- F. Z-Furring Members:
 - 1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches o.c.
 - 2. 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.
 - 3. 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 and cut insulation to fit.
- G. 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.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Hangers: 48 inches o.c.
 - 2. Carrying Channels (Main Runners): 48 inches o.c.
 - 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Fasten hangers to concrete filled metal decks using power-actuated fasteners that extend through metal decking into concrete.
 - 5. Fasten hangers to metal roof deck using postinstalled eye lag type screws fastened only through bottom flute of deck.
 - 6. Do not attach hangers to steel roof decking serving as finished roof (no roofing applied to deck).
 - 7. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 8. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 9. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. 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.

END OF SECTION 09 22 16

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Exterior gypsum board for exterior ceilings and soffits.
 - 3. Tile backing panels.
 - 4. Texture finishes.
- 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."
- C. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for gypsum sheathing for exterior walls.
 - 2. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
 - 3. Section 09 30 13 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 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.
 - 3. Shower rooms.
 - 4. Locker rooms abutting shower rooms and bath rooms.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Product Data: For adhesives and sealants, indicating VOC content.
- C. Samples: For the following products:
 - 1. Aluminum Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
 - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.5 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.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 65 percent.
- B. LEED2009 - Regional Materials: Products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corporation.
 - 3. Georgia-Pacific Building Products.
 - 4. Lafarge North America Inc.
 - 5. National Gypsum Company.
 - 6. PABCO Gypsum.
 - 7. Temple-Inland Building Product by Georgia-Pacific.
 - 8. USG Corporation.
- B. Gypsum Wallboard, Regular Type: ASTM C 1396/C 1396M.
 - 1. Thickness: As indicated on Drawing's Partition Type sheets.
 - 2. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: As indicated on Drawing's Partition Type sheets.
 - 2. Long Edges: Tapered.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch.

2. Long Edges: Tapered.
 - E. Abuse-Resistant Gypsum Board, Type X, 5/8 inch: ASTM C 1629/C 1629M, Level 2.
 1. Long Edges: Tapered.
 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 - F. Impact-Resistant Gypsum Board, Type X, 5/8 inch: ASTM C 1629/C 1629M, Level 3.
 1. Long Edges: Tapered.
 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 - G. 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.
 4. Application: Painted walls and partitions in wet and humid spaces.
 - H. 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.
 - I. Acoustically Enhanced Gypsum Board, Regular Type, 5/8 inch: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
 1. Long Edges: Tapered.
- 2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS
- A. Exterior Gypsum Soffit Board, Type X, 5/8 inch: ASTM C 1396/C 1396M, with manufacturer's standard edges.
 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. American Gypsum.
 - b. CertainTeed Corporation.
 - c. Georgia-Pacific Building Products.
 - d. Lafarge North America Inc.
 - e. National Gypsum Company.
 - f. PABCO Gypsum.
 - g. Temple-Inland Building Product by Georgia-Pacific.
 - h. USG Corporation.
- 2.5 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.
- 2.6 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. Exterior Trim: ASTM C 1047.
 1. Material: Any of the following:
 - a. Hot-dip galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead.
- C. 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.
- D. Aluminum Trim:
 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. Fry Reglet Corporation.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 3. Profiles and Dimensions:
 - a. As indicated on Drawings.
 4. Finish:
 - a. Class II clear anodic finish.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. 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 taping 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:
 - 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.
 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 Exterior Applications:
 1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
- E. 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.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws 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.
 2. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 65 percent.
- 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. LEED2009 - Sealant shall have a VOC content of 250 g/L or less.

2.9 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8 inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2 inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. 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.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated on Drawings.
 - 2. Type X: As indicated on Drawings.
 - 3. Ceiling Type: As indicated on Drawings.
 - 4. Abuse-Resistant Type: As indicated on Drawings.
 - 5. Impact-Resistant Type: As indicated on Drawings.
 - 6. Acoustically Enhanced Type: 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.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.

3.5 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.

3.6 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 unless otherwise indicated.
 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.
- D. Exterior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
- E. Aluminum Trim: Install in locations indicated on Drawings.

3.7 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 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."
 - 3. 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."

3.8 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.9 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes the following for interior applications:
 - 1. Ceramic tile.
 - 2. Tile backing panels.
 - 3. Waterproof membrane.
 - 4. Crack isolation membrane.
 - 5. Metal edge strips.
- B. See end of Section for TILE INSTALLATION SCHEDULE(S).
- C. Related Requirements:
 - 1. Section 09 29 00 "Gypsum Board" for cementitious backer units and moisture- and mold-resistant gypsum backing board.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
- C. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 36 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
 - 3. Full-size units of each type of trim and accessory for each color and finish required.
 - 4. Metal edge strips in 6-inch lengths.

1.5 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.

1.6 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.

1.7 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

2.1 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) Fabric-reinforced, fluid-applied membrane.
 - 2) Fluid-applied membrane.
 - b. Crack isolation membrane of following type(s):
 - 1) Fabric-reinforced, fluid-applied membrane.
 - c. 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.
 - d. Grout materials of the following type(s):
 - 1) Standard cement 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. Chlorinated polyethylene sheet waterproof membrane.
 - b. PVC sheet waterproof membrane.
 - c. Polyethylene sheet waterproof membrane.
 - d. Tile backing panels.
 - e. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements.
- 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.

2.3 TILE PRODUCTS

- A. Ceramic Tile Type - FT-# & WT-#:
 - 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.
 - 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. Base Cap for Thinset Mortar Installations: Surface bullnose or beveled.
 - b. Wainscot Cap for Thinset Mortar Installations: Surface bullnose or beveled.
 - c. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
 - d. External Corners for Thinset Mortar Installations: Surface bullnose or beveled.
 - e. Internal Corners: Field-buttet square corners.

2.4 TILE BACKING PANELS

- A. Tile backing panels are specified under Section 09 29 00 "Gypsum Board."

2.5 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. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric.
 - 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. Noble Company (The); Nobleseal TS.
 - b. Noble Company (The); Noble Deck.
 - 2. Nominal Thickness: 0.030 inch.
- C. PVC Sheet: PVC heat-fused on both sides to facings of nonwoven polyester.
 - 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. Compotite Corporation; Composeal Gold.
 - b. Noble Company (The); Wall Seal.
 - 2. Nominal Thickness: 0.025 inch.
- D. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
 - 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. Schluter Systems L.P.; KERDI.
- E. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

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. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - c. MAPEI Corporation; Mapelastic 400 or Mapelastic HPG with MAPEI Fiberglass Mesh.
 - F. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 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. Custom Building Products; RedGuard Waterproofing and Crack Prevention Membrane.
 - b. Laticrete International, Inc.; Laticrete Hydro Ban or Hydro Barrier.
 - c. MAPEI Corporation; Mapelastic AquaDefense or Mapelastic HPG.
- 2.6 CRACK ISOLATION MEMBRANE
- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
 - B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
 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. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - b. Laticrete International, Inc.; Laticrete Blue 92 Anti-Fracture Membrane, 9235 Waterproof Membrane, or Crack Suppression Kit.
 - c. MAPEI Corporation; Mapelastic HPG with MAPEI Fiberglass Mesh.
- 2.7 SETTING MATERIALS
- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 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. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Building Products; ProLite Fortified Thin-Set.
 - b. Laticrete International, Inc.; 255 MultiMax.
 - c. MAPEI Corporation; GraniRapid Thin-Set System.
 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site or,
 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
 - C. 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 of 5/8 inch.
 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 Mortar.
 - b. Or comparable products by one of the following:

- 1) Laticrete International, Inc.
 - 2) MAPEI Corporation.
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site or,
 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.

2.8 VAPOR RETARDER

- A. Polyethylene Vapor Retarders: ASTM D 4397, 10-mil-thick sheet, with maximum permeance rating of 0.1 perm.

2.9 GROUT MATERIALS

- A. Standard Cement Grout: ANSI A118.6.
 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. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.

2.10 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
- C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.11 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of 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 comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. 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.

3.3 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 marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. 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: 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.
- J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints at following locations according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
 - 1. Floors.
 - 2. Walls in showers.

3.4 TILE BACKING PANEL INSTALLATION

- A. Tile backing panel installation is specified under Section 09 29 00 "Gypsum Board."

3.5 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.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.7 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.

3.8 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.

3.9 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Ceramic Tile Installation: TCNA F113; tile on bond coat mortar on concrete substrate.
 - a. Ceramic Tile Type:
 - 1) As indicated on Drawings.
 - b. Crack Isolation Membrane:
 - 1) PVC sheet.
 - 2) Polyethylene sheet.
 - 3) Corrugated polyethylene.
 - 4) Fluid-applied membrane.
 - 5) Latex-portland cement crack-resistant mortar.
 - c. Mortar:
 - 1) For Tiles Less than 15 inches Size: Modified dry-set mortar (thinset) or latex-portland cement mortar (thinset).
 - 2) For Tiles 15 inches Size and Greater: Medium-bed, modified dry-set mortar or medium-bed, latex-portland cement mortar.
 - d. Grout:
 - 1) Sand-portland cement grout.
 - 2) Standard cement 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.
 - e. Application: Floors except showers.
 - B. 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) For Tiles Less than 15 inches Size: Modified dry-set mortar (thinset) or latex-portland cement mortar (thinset).
 - 2) For Tiles 15 inches Size and Greater: Medium-bed, modified dry-set mortar or medium-bed, latex-portland cement mortar.
 - c. Grout:
 - 1) Sand-portland cement grout; for joints 1/8 inch wide or greater.
 - 2) Standard cement 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.
 - 3) Grout for pregrouted tile sheets.
 - d. Application: Dry spaces.
 - C. Wall and Built-up Shower Receptor Installations:
 - 1. Ceramic Tile Installation: TCNA B415; wall tile on mortar bond coat on waterproof membrane on cementitious backer unit or fiber-cement 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) For Tiles Less than 15 inches Size: Modified dry-set mortar (thinset) or latex-portland cement mortar (thinset).
 - 2) For Tiles 15 inches Size and Greater: Medium-bed, modified dry-set mortar or medium-bed, latex-portland cement mortar.
 - c. Shower Receptor Cement Mortar Bed Reinforced with Wire Fabric: Portland cement mortar with or without latex additive at Contractors option.
 - d. Shower Receptor Waterproof Membrane: One of following:
 - 1) Chlorinated polyethylene sheet.
 - 2) PVC sheet.
 - 3) Polyethylene sheet.
 - 4) Fabric-reinforced, modified-bituminous sheet.
 - 5) Fluid-applied membrane.
 - 6) Latex-portland cement waterproof mortar.
 - e. Grout:
 - 1) Sand-portland cement grout; for joints 1/8 inch wide or greater.
 - 2) Standard cement 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.
 - 3) Grout for pregrouted tile sheets.
 - f. Application: Showers base and walls.

END OF SECTION 09 30 13

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes suspended ceiling system(s) with the following:
 - 1. Acoustical Panels - ACT-1 for Closed Plan.
 - 2. Acoustical Panels - ACT-1 for Open Plan.
 - 3. Exposed suspension system for ACT-1 for Closed Plan.
 - 4. Exposed suspension system for ACT-1 for Open Plan.
 - 5. Metal edge moldings and trim.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch square 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.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Class A: Flame spread index 0 - 25; smoke developed index 0 - 450.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system 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.

2.3 ACOUSTICAL PANELS - ACT-1 FOR CLOSED PLAN

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Ultima Tegular Fine Texture or comparable product by one of the following:
 - 1. CertainTeed Corp.
 - 2. Chicago Metallic Corporation.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- C. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with fiberglass-fabric overlay on face.
 - 2. Pattern: E (lightly textured).
- D. Color: White.
- E. LR: Not less than 0.85.
- F. NRC: Not less than 0.70 .
- G. CAC: Not less than 35.
- H. Edge/Joint Detail: Tegular.
- I. Thickness: 3/4 inch.
- J. Modular Size: 24 by 24 inches .

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Hanger Attachments to 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.

- a. 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.
 - b. Use of this screw shall be limited to ceiling systems weighing no more than 2.5 psf.
 - c. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
 - 1) I-LAG Brand Eye Lag Screws, 750 SD; Doc's Marketing Corp.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. 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.

2.5 METAL SUSPENSION SYSTEM - ACT-1 FOR CLOSED PLAN

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc., Suprafine or comparable product by one of the following:
1. CertainTeed Corp.
 2. Chicago Metallic Corporation.
 3. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Narrow-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 9/16-inch wide metal caps on flanges.
1. Structural Classification: Intermediate-duty system.
 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 3. Face Design: Flat, flush.
 4. Cap Material: Steel or aluminum cold-rolled sheet.
 5. Cap Finish: Painted white .

2.6 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 circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Fasten hangers to metal roof deck using postinstalled eye lag type screws fastened only through bottom flute of deck.
 - 9. 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.
 - 10. 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. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 FIELD QUALITY CONTROL

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

- B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 54 27

SUSPENDED GYPSUM PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes suspended ceiling system(s) with the following:
 - 1. Gypsum Panels - GPC-1.
 - 2. Exposed suspension system for GPC-1.
 - 3. Metal edge moldings and trim.
- B. Related Requirements:
 - 1. Section 09 51 13 "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Gypsum 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.

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Gypsum Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver gypsum 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 gypsum panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle gypsum panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gypsum panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Class A: Flame spread index 0 - 25; smoke developed index 0 - 450.

2.2 GYPSUM PANELS, GENERAL

- A. Source Limitations: Obtain each type of gypsum ceiling panel and supporting suspension system from single source from single manufacturer.
- B. Gypsum 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. Gypsum Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of gypsum panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 GYPSUM PANELS - GPC-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide:
 - 1. CertainTeed Corp; Performa Vinylrock.
- B. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type XX, other types; described as high-density, ceramic- and mineral-base panels with scrubbable finish, resistant to heat, moisture, and corrosive fumes.
 - 2. Pattern: G (smooth).
- D. Color: White .
- E. LR: Not less than 0.75.
- F. CAC: Not less than 35.
- G. Edge/Joint Detail: Square.
- H. Thickness: 1/2 inch.
- I. Modular Size: As indicated on Drawings.
- J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide gypsum panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 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.
 - 1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" for metal suspension system components in the following spaces:
 - a. Toilet rooms.
 - b. Bath rooms.
 - c. Shower rooms.
 - d. Locker rooms abutting shower rooms and bath rooms.

- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
 - d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
 3. Hanger Attachments to 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.
 - a. 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.
 - b. Use of this screw shall be limited to ceiling systems weighing no more than 2.5 psf.
 - c. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
 - 1) I-LAG Brand Eye Lag Screws, 750 SD; Doc's Marketing Corp.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. 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.

2.5 METAL SUSPENSION SYSTEM - GPC-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide:
1. CertainTeed Corp; 15/16" Classic Environmental Stab System.
- B. LEED2009 - Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.
- C. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized according to ASTM A 653/A 653M, G60 coating designation; with prefinished, cold-rolled, 15/16-inch wide aluminum caps on flanges.
1. Structural Classification: Intermediate-duty system.
 2. Face Design: Flat, flush.
 3. Face Finish: Painted white .

2.6 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 gypsum panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which gypsum 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 gypsum panel ceilings.
- B. Examine gypsum panels before installation. Reject gypsum panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of gypsum panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install gypsum 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. Fasten hangers to concrete filled metal decks using power-actuated fasteners or post-installed expansion anchors that extend through metal decking into concrete.
 - 9. Fasten hangers to metal roof deck using postinstalled eye lag type screws fastened only through bottom flute of deck.
 - 10. 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.
 - 11. 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 gypsum panel ceiling area and where necessary to conceal edges of gypsum 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 gypsum panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

3.4 CLEANING

- A. Clean exposed surfaces of gypsum 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 54 27

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoset-rubber base.
 - 2. Thermoplastic-rubber base.
 - 3. Rubber molding accessories.
- B. Product Option: Provide thermoset-rubber or thermoplastic-rubber base, either at Contractor's discretion.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
- C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 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

2.1 THERMOSET-RUBBER BASE

- A. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style and Location:

- a. Style B, Cove .
- B. Thickness: 0.125 inch.
- C. Height: As indicated on Drawings.
- D. Lengths: Coils in manufacturer's standard length.
- E. Outside Corners: Job formed.
- F. Inside Corners: Job formed.
- G. Colors: As indicated by manufacturer's designations on Drawings Finish Legend.

2.2 THERMOPLASTIC-RUBBER BASE

- A. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
 - 1. Group: I (solid, homogeneous).
 - 2. Style and Location:
 - a. Style B, Cove .
- B. Thickness: 0.125 inch.
- C. Height: As indicated on Drawings.
- D. Lengths: Coils in manufacturer's standard length.
- E. Outside Corners: Job formed.
- F. Inside Corners: Job formed.
- G. Colors: As indicated by manufacturer's designations on Drawings Finish Schedule.

2.3 RUBBER MOLDING ACCESSORY

- A. Profile and Dimensions: As indicated.
- B. Basis of Design Products: Subject to compliance with requirements, provide the following:
 - 1. Roppe Corporation, USA.
 - 2. Or comparable products by, but not limited to, the following:
 - a. VPI, LLC, Floor Products Division.
- C. Description:
 - 1. 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".
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 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. LEED2009 - Adhesives shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. 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.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.

- 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 65 19

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Rubber floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - LEED Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
- C. Samples for Initial Selection: For each type of floor tile indicated.
- D. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.7 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 floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RUBBER FLOOR TILE

- A. Basis of Design Product: Subject to compliance with requirements, Nora Systems, Inc.; Norament. Comparable or equal products shall be submitted as a Substitution Request for approval by Architect prior to procurement.
- B. Tile Standard: ASTM F 1344, Class I-A, homogeneous rubber tile, solid color or Class I-B, homogeneous rubber tile, through mottled.
- C. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer per ASTM D 2240.
- D. Wearing Surface: Smooth or Textured.
- E. Thickness: Nominal 0.14 inch.
- F. Size: 39.53 inch by 39.53 inch square.
- G. Colors and Patterns: As indicated on drawings.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
 - 1. LEED2009 - Adhesives shall have a VOC content of 60 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 65 36

STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Static-dissipative, rubber floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Product Data: For chemical-bonding compounds, indicating VOC content.
- C. Samples for Initial Selection: For each type of static-control resilient flooring.
- D. Samples for Verification: For each type of static-control resilient flooring, of size indicated below:
 - 1. Floor Tile: Full-size units.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store static-control resilient flooring 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. Floor Tile: Store on flat surfaces.

1.8 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive static-control resilient flooring during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

- C. Close spaces to traffic during static-control resilient flooring installation.
- D. Close spaces to traffic for 48 hours after static-control resilient flooring installation.
- E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Static-Dissipative Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.
 - 1. Electrical Resistance: Test per ASTM F 150 with 100-V applied voltage.
 - a. Average greater than 1 megohm and less than or equal to 1000 megohms when test specimens are tested surface to ground.
 - 2. Static Generation: Less than 300 V when tested per AATCC-134 at 20 percent relative humidity with conductive footwear.
 - 3. Static Decay: 5000 to zero V in less than 0.25 seconds when tested per FED-STD-101C/4046.1.

2.2 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS

- A. Static-Dissipative Rubber Floor Tile: ASTM F 1344; except in manufacturer's standard hardness when tested per ASTM D 2240 using Shore, Type A durometer.
 - 1. Smooth-Surface Floor Tile: Class I-B (homogenous rubber, through-mottled pattern).
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Nora Systems; Noraplan Sentica ED.
 - b. Thickness: Not less than 0.08 inch.
 - c. Size: 24 by 24 inches.
 - d. Seaming Method: Standard.
 - e. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.
 - 1. LEED2009 - Adhesives VOC Content:
 - a. Rubber Flooring: 60 g/L or less.
- C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion or static-control characteristics of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions and with oversight by manufacturer's representative to ensure adhesion of static-control resilient flooring and electrical continuity of floor-covering systems.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with floor-covering 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 substrates pass testing.
 - 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 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 measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
 - 1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

- A. Install static-control resilient flooring according to manufacturer's written instructions and with oversight by manufacturer's representative.
- B. Embed grounding strips in static-control adhesive. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.
- C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings. Extend static-control resilient flooring to center of door openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 FLOOR-TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
 - 1. Lay floor tiles square with room axis .
- C. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.
- B. Perform the following operations immediately after completing static-control resilient flooring:

1. Remove static-control adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
1. Do not wax static-control resilient flooring.
- D. Cover static-control resilient flooring until Substantial Completion.

END OF SECTION 09 65 36

SECTION 09 65 66

RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Rubber floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
- C. Samples for Verification: For each type, color, and pattern of flooring specified, 6-inch- square in size and of same thickness and material indicated for the Work.

1.4 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. Floor Tile: Furnish no fewer than 1 box for each 50 boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.

1.5 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 storing.
- B. Store materials to prevent deterioration.
 - 1. Store tiles on flat surfaces.

1.6 FIELD CONDITIONS

- A. Adhesively Applied Products:
 - 1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
 - 2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F or more than 95 deg F.
 - 3. Close spaces to traffic during flooring installation.
 - 4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.
- B. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RUBBER FLOOR TILE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite; a Tarkett company; Triumph Multi-Functional & Sports Rubber Tiles or comparable product by, but not limited to, one of the following:
 - 1. Nora Systems, Inc.
 - 2. Sport Court.
- B. Description: Athletic flooring consisting of modular rubber tiles with smooth edges for adhered application.
- C. Material: Rubber wear layer and rubber shock-absorbent layer, vulcanized together.
- D. Traffic-Surface Texture: Textured.
- E. Size: 24 inches square.
- F. Thickness: 3/8 inch.
- G. Weight: Not less than 13bs. per tile.
- H. Color and Pattern: As indicated by manufacturer's designations indicated on Drawings Finish Schedule.

2.2 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- B. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.
 - 1. LEED2009 - Adhesives shall have a VOC content of 60 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, 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.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
 - 3. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
 - 1. Do not install flooring until it is the same temperature as space where it is to be installed.

- F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOORING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.4 FLOOR TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis.
- B. Discard broken, cracked, chipped, or deformed tiles.
- C. Tile Matching: Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged if so numbered.
- D. Adhered Floor Tile: Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 - 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from flooring surfaces.
 - 2. Sweep and vacuum flooring thoroughly.
 - 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 65 66

SECTION 09 67 23.37

RESINOUS FLOORING FOR WASH BAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes resinous flooring system EF-1 for wash bays and the following:
 - 1. Abrading concrete substrates.
 - 2. Chasing concrete substrates (key-cut termination).

1.3 REFERENCE STANDARDS

- A. ASTM - ASTM International (American Society for Testing and Materials International).
 - 1. ASTM C 307 Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - 2. ASTM C 579 Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 3. ASTM C 580 Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 4. ASTM D 635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - 5. ASTM D 2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
 - 6. ASTM D 4060 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - 7. ASTM D 4226 Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products.
 - 8. ASTM D 4258 Standard Practice for Surface Cleaning Concrete for Coating.
 - 9. ASTM D 4259 Standard Practice for Abrading Concrete.
 - 10. ASTM D 4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 - 11. ASTM D 4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 12. ASTM F 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 13. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
 - 14. ASTM G 21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. ICI - International Concrete Repair Institute.
 - 1. ICRI 310.2R Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review flooring requirements including materials, surface preparation, substrate condition, minimum curing period, installation procedures, coordination with other work, and protection and repairs.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. LEED2009 - Sustainable Design Submittals:

1. Product Data for Credit IEQ 4.2: For liquid-applied flooring components, documentation including printed statement of VOC content.
 - C. Samples for Initial Selection: For each type of exposed finish required.
 - D. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- 1.7 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 and mixing with other components.
- 1.8 FIELD CONDITIONS
- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
 - B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
 - C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

- 2.1 PERFORMANCE REQUIREMENTS
- A. LEED2009 - 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).
 - B. Flammability: Self-extinguishing according to ASTM D 635.
- 2.2 MANUFACTURERS
- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- 2.3 RESINOUS FLOORING FOR WASH BAYS - EF-1
- A. Resinous Flooring System: Abrasion-, impact-, thermal-shock-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Tennant Co. (Tennant); Eco-Crete Cementitious-Polyurethane Flooring System using products indicated below or equal by another manufacturer.
 - B. System Characteristics:
 1. Pigment Colors: As selected by Architect from manufacturer's full range .
 2. Wearing Surface: Textured for slip resistance.
 3. Overall System Thickness: 1/4 inch.
 - C. Cove Base Primer:
 1. Basis-of-Design Product: Tennant; Eco-Crete TC.
 2. Resin: Urethane.
 3. Formulation Description: High solids.
 4. Type: Clear.
 5. Application Method: Troweled.
 6. Number of Coats: One.

7. Thickness of Coat (Dry/Wet): 15 mils.
 8. Filler: Manufacturer's standard.
- D. Cove Base Body Coat:
1. Basis-of-Design Product: Tennant; Eco-Crete CB.
 2. Resin: Urethane.
 3. Formulation Description: High solids.
 4. Type: Pigmented.
 5. Application Method: Troweled.
 6. Number of Coats: One.
 7. Thickness of Coats (Dry/Wet): 3/16 inch.
 8. Filler: Manufacturer's standard.
- E. Crack Control Reinforcing Membrane: As recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
- F. Floor Body Coat/Primer:
1. Basis-of-Design Product: Tennant; Eco-Crete SF.
 2. Resin: Urethane.
 3. Formulation Description: High solids.
 4. Type: Pigmented.
 5. Application Method: Self-leveling slurry with broadcast aggregates.
 6. Number of Coats: One.
 7. Thickness of Coat (Dry/Wet): 3/16 inch.
 8. Aggregates: Natural silica, 30 to 40 mesh.
- G. System Sealing coat.
1. Basis-of-Design Product: Tennant; Eco-Crete TC.
 2. Resin: Urethane.
 3. Formulation Description: High solids.
 4. Type: Pigmented.
 5. Number of Coats: One.
 6. Thickness of Coat (Dry/Wet): 15 mils.
- H. System Topcoat:
1. Basis-of-Design Product: Tennant; Eco-Crete HTS 100
 2. Resin: Urethane.
 3. Formulation Description: High solids.
 4. Type: Pigmented.
 5. Number of Coats: One.
 6. Thickness of Coats (Dry/Wet): 3 mils.
 7. Finish: Matte.
- I. Basis of Design System Physical Properties: Provide resinous flooring system with the following minimum or better physical property requirements when tested according to test methods indicated:
1. Compressive Strength: 8,200 psi minimum according to ASTM C 579.
 2. Tensile Strength: 975 psi minimum according to ASTM C 307.
 3. Flexural Modulus of Elasticity: 2,500 psi minimum according to ASTM C 580.
 4. Impact Resistance: Greater than 160 in-lbs according to ASTM D 4226.
 5. Bond Strength: 100 percent concrete failure according to ASTM D 4541.
 6. Resistance to Fungi Growth: Passes, rating of 1, according to ASTM G 21.
 7. Temperature Resistance: To 200 deg F.
 8. Abrasion Resistance (Topcoat): 18.0 mg. maximum weight loss according to ASTM D 4060 (using CS-17 Taber abrasion wheel, 1,000 gram load, 1,000 revolutions).
 9. Coefficient of Friction (COF) (Topcoat): 0.63 according to ASTM D 2047.

2.4 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Protect adjacent surfaces and adjoining walls from contact with resinous flooring materials.
- C. Concrete Substrates: Provide sound concrete surfaces free of contaminants incompatible with resinous flooring.
 - 1. Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D 4259. Do not acid etch.
 - a. Minimum Concrete Surface Profile (CSP): CSP 5 per ICRI 310.2R.
 - b. Remove grease, oil, paints, and other penetrating contaminants from concrete.
 - c. Remove concrete fins, ridges, and other projections.
 - d. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
 - e. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 - 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
 - b. Plastic Sheet Test: ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
 - c. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- D. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - 1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- E. Concrete Chasing (Key-Cut Termination): Where resinous flooring terminates in field of concrete surface provide a recess for resinous materials to key into by sawing or cutting a chase (key-cut) 1/4-inch wide by 1/4-inch deep.
- F. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION, GENERAL

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

3.3 RESINOUS FLOORING APPLICATION FOR WASH BAYS - EF-1

- A. Crack Control Reinforcing Membrane: Apply reinforcing membrane to substrate cracks according to manufacturer's written instructions and details.

- B. Integral Cove Base: Apply cove base primer and body coat in thicknesses indicated under Part 2 Article "Resinous Flooring For Wash Bays."
 - 1. Apply to wall and other vertical surfaces before applying flooring.
 - 2. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base.
 - 3. Round internal and external corners.
 - 4. When body coat is cured, remove trowel marks and roughness using method recommended by manufacturer.
 - 5. Base Height: 6 inches.
 - C. Floor Body Coat/Primer: Apply self-leveling slurry body coat in thickness indicated under Part 2 Article "Resinous Flooring For Wash Bays." Broadcast aggregates over wet slurry, to rejection, in accordance with manufacturer's written instructions. After resin is cured, remove excess aggregates to provide surface texture indicated.
 - D. System Seal Coat: Apply sealcoat over body coat in number of coats and thickness indicated under Part 2 Article "Resinous Flooring For Wash Bays."
 - E. System Topcoat: Apply topcoat over seal coat in number of coats and thickness indicated under Part 2 Article "Resinous Flooring For Wash Bays" and to produce wearing surface indicated.
- 3.4 PROTECTION
- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23.37

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following:
 - 1. Modular carpet tile - ESD-1.
 - 2. Modular carpet tile - WCPT-1.
- B. Related Requirements:
 - 1. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 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 written installation recommendations for each type of substrate.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. 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. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- 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.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

1.5 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.

1.6 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..

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104 Section 4.0 "Storage and Handling."

1.9 FIELD CONDITIONS

- A. Comply with CRI 104 Section 7.0 "Site Conditions" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE - ESD-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Static Smart Flooring by Julie Industries.
- B. Color: Match Architect's samples.
- C. Pattern: Match Architect's samples.
- D. Primary Backing/Backcoating: Manufacturer's standard composite materials.
- E. Secondary Backing: Manufacturer's standard material.
- F. Size: 24 by 24 inches.

- G. Applied Soil-Resistance Treatment: Manufacturer's standard material.
- H. Antimicrobial Treatment: Manufacturer's standard material.
- I. Sustainable Design Requirements:
 - 1. LEED2009 - Carpet and cushion shall comply with testing and product requirements of CRI's "Green Label Plus" testing program.
- J. Performance Characteristics: As follows:
 - 1. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
 - 2. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
 - 3. Resistance to Insects: Comply with AATCC 24.
 - 4. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

2.2 CARPET TILE - WCPT-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Mohawk Group, Step UP II Walk-off carpet .
- B. Color: Match Architect's samples.
- C. Pattern: Match Architect's samples.
- D. Primary Backing/Backcoating: Manufacturer's standard composite materials .
- E. Secondary Backing: Manufacturer's standard material.
- F. Size: 24 by 24 inches.
- G. Applied Soil-Resistance Treatment: Manufacturer's standard material.
- H. Antimicrobial Treatment: Manufacturer's standard material.
- I. Sustainable Design Requirements:
 - 1. LEED2009 - Carpet and cushion shall comply with testing and product requirements of CRI's "Green Label Plus" testing program.
- J. Performance Characteristics: As follows:
 - 1. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
 - 2. Resistance to Insects: Comply with AATCC 24.

2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. LEED2009 - Adhesives shall have a VOC content of 50 g/L or less.
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

- a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Sections 7.0, "Site Conditions" and 8.0 "Substrate Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 10, "Carpet Tile Installation," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method, ESD-1:
 1. As recommended in writing by carpet tile manufacturer.
- C. Installation Method, - WCPT-1:
 1. As recommended in writing by carpet tile manufacturer.
- D. Maintain dye lot integrity. Do not mix dye lots in same area.
- E. Maintain pile-direction patterns indicated on Drawings.
- F. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- G. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- I. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 11, "Post Installation."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 13

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates.
 - 1. Concrete.
 - a. Non-traffic bearing surfaces.
 - b. Traffic bearing surfaces including pavements and steps.
 - 2. Concrete masonry units (CMUs).
 - 3. Steel and iron.
 - 4. Galvanized metal.
 - 5. Aluminum (not anodized or otherwise coated).
 - 6. Copper (excluding roofs).
 - 7. Stainless steel.
 - 8. Fiberglass.
 - 9. Plastic.
 - 10. Gypsum sheathing board.
 - 11. Bituminous-coated surfaces.
- B. See EXTERIOR PAINTING SCHEDULE at end of Section.
- C. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates.
 - 2. Section 05 12 13 "Architecturally Exposed Structural Steel Framing" for shop priming of metal substrates.
 - 3. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 4. Section 05 51 13 "Metal Pan Stairs" for shop priming metal pan stairs.
 - 5. Section 05 51 16 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
 - 6. Section 05 51 19 "Metal Grating Stairs" for shop priming metal grating stairs.
 - 7. Section 05 52 13 "Pipe and Tube Railings" for shop painting pipe and tube railings.
 - 8. Section 05 53 13 "Bar Gratings" for shop priming metal gratings.
 - 9. Section 05 53 16 "Plank Gratings" for shop priming metal gratings.
 - 10. Section 05 53 19 "Expanded Metal Gratings" for shop priming metal gratings.
 - 11. Section 09 96 00 "High-Performance (Epoxy) Coatings" for coating systems with one or more epoxy resin components.
 - 12. Section 09 93 00 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.
 - 13. Section 09 96 53 "Elastomeric Coatings" for elastic coating systems.

1.3 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.

1.4 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.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- 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

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Dunn-Edwards Corporation.
- 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.

2.2 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 Exterior Finish Schedule .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Concrete Masonry Units (CMUs): 12 percent.
 - 3. Gypsum Sheathing Board: 12 percent.
- C. Exterior Gypsum Sheathing Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- 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 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.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Plastic Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 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.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Bearing Surfaces.
1. Latex System MPI EXT 3.1A/K:
 - a. Prime Coat: One of following:
 - 1) Primer, alkali resistant, water based, MPI #3 for 3.1A.
 - 2) Latex, exterior, matching topcoat for 3.1K.
 - b. Intermediate Coat: Latex, exterior, matching topcoat. Apply for 3.1K. For 3.1A apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated.
 - 1) Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 2) Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15 or Latex, exterior, high performance architectural, low sheen (MPI Gloss Level 3-4), MPI #315.
 - 3) Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11 or Latex, exterior, high performance Architectural, semi-gloss (MPI Gloss Level 5), MPI #311.
 - 4) Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.
- B. Concrete Substrates, Traffic Bearing Surfaces: Includes pavements and steps.
1. Latex Floor Paint System MPI EXT 3.2A:
 - a. Prime Coat: Floor paint, latex, matching topcoat.
 - b. Intermediate Coat: Floor paint, latex, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated.
 - 1) Floor paint, latex, low gloss (maximum MPI Gloss Level 3), MPI #60.
 - 2) Floor paint, latex, gloss, MPI #68.
 - d. Non-Skid Additive: Include manufacturer's standard additive to increase skid resistance of painted surface.
 2. Latex Deck Coating System MPI EXT 3.2B:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Deck coating, latex, MPI #127.
 - d. Non-Skid Additive: Include manufacturer's standard additive to increase skid resistance of painted surface.
- C. CMU Substrates.
1. Latex System MPI EXT 4.2A/L:
 - a. Prime Coat: One of following:
 - 1) Block filler, latex, interior/exterior, MPI #4 for 4.2A. Apply over rough textured CMU.
 - 2) Primer, alkali resistant, water based, MPI #3 for 4.2L. Apply over smooth textured CMU.
 - b. Intermediate Coat: Latex, exterior, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated.
 - 1) Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 2) Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15 or Latex, exterior, high performance architectural, low sheen (MPI Gloss Level 3-4), MPI #315.
 - 3) Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11 or Latex, exterior, high performance Architectural, semi-gloss (MPI Gloss Level 5), MPI #311.
 - 4) Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.
- D. 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.
- E. Galvanized-Metal Substrates.
1. Latex System MPI EXT 5.3A/H:
 - a. Prime Coat: One of following:
 - 1) Primer, galvanized, cementitious, MPI #26 for 5.3A.
 - 2) Primer, galvanized, water based, MPI #134 for 5.3H.
 - 3) Shop primer specified in Section where substrate is specified.
 - b. Intermediate Coat: Latex, exterior, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated:
 - 1) Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 2) Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15 or Latex, exterior, high performance architectural, low sheen (MPI Gloss Level 3-4), MPI #315.
 - 3) Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11 or Latex, exterior, high performance Architectural, semi-gloss (MPI Gloss Level 5), MPI #311.

- 4) Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.
- F. Aluminum Substrates (Not Anodized or Otherwise Coated).
 - 1. Water-Based Light Industrial Coating System MPI EXT 5.4G:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat. Apply where Premium Grade system is indicated.
 - 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.
- G. Copper Substrates (Excluding Roofs).
 - 1. Water-Based Light Industrial Coating System MPI EXT 5.5G:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat. Apply where Premium Grade system is indicated.
 - 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.
- H. Stainless-Steel Substrates.
 - 1. Water-Based Light Industrial Coating System MPI EXT 5.6G:
 - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat. Apply where Premium Grade system is indicated.
 - 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.
- I. Fiberglass Substrates.
 - 1. Latex System MPI EXT 6.7A:
 - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - b. Intermediate Coat: Latex, exterior, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated:
 - 1) Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 2) Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15 or Latex, exterior, high performance architectural, low sheen (MPI Gloss Level 3-4), MPI #315.
 - 3) Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11 or Latex, exterior, high performance Architectural, semi-gloss (MPI Gloss Level 5), MPI #311.
 - 4) Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.
- J. Plastic Substrates: Includes trim fabrications.
 - 1. Latex System MPI EXT 6.8A/AA:
 - a. Prime Coat: One of following:
 - 1) Primer, bonding, water based, MPI #17 for 6.8A.
 - 2) Primer, bonding, solvent based, MPI #69 for 6.8AA.
 - b. Intermediate Coat: Latex, exterior, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated:
 - 1) Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 2) Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15 or Latex, exterior, high performance architectural, low sheen (MPI Gloss Level 3-4), MPI #315.

- 3) Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11 or Latex, exterior, high performance Architectural, semi-gloss (MPI Gloss Level 5), MPI #311.
 - 4) Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.
- K. Exterior Gypsum Sheathing Board Substrates.
1. Latex System MPI EXT 9.2A:
 - a. Prime Coat: Primer, latex for exterior wood (reduced), MPI #6.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: One of following matching gloss level indicated:
 - 1) Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 2) Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15 or Latex, exterior, high performance architectural, low sheen (MPI Gloss Level 3-4), MPI #315.
 - 3) Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11 or Latex, exterior, high performance Architectural, semi-gloss (MPI Gloss Level 5), MPI #311.
 - 4) Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.
- L. Exterior Bituminous-Coated Substrates.
1. Latex System MPI EXT 10.2A:
 - a. Prime Coat: Primer, rust inhibitive, water based, MPI #107.
 - b. Intermediate Coat: Latex, exterior, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated:
 - 1) Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
 - 2) Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15 or Latex, exterior, high performance architectural, low sheen (MPI Gloss Level 3-4), MPI #315.
 - 3) Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11 or Latex, exterior, high performance Architectural, semi-gloss (MPI Gloss Level 5), MPI #311.
 - 4) Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.

END OF SECTION 09 91 13

SECTION 09 91 23

INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates.
 - 1. Concrete.
 - a. Non-traffic bearing surfaces.
 - b. Traffic bearing surfaces including floors and stairs.
 - 2. Concrete masonry units (CMUs).
 - 3. Steel and iron.
 - 4. Gypsum board.
- B. See INTERIOR PAINTING SCHEDULE at end of Section.
- C. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming structural steel.
 - 2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 05 51 13 "Metal Pan Stairs" for shop priming metal pan stairs.
 - 4. Section 05 52 13 "Pipe and Tube Railings" for shop painting pipe and tube railings.

1.3 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.

1.4 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. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
- 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 and application area.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Behr Process Corporation.
 2. Benjamin Moore & Co.
 3. Dulux (formerly ICI Paints); a brand of AkzoNobel.
 4. Dunn-Edwards Corporation.
 5. Duron, Inc.
 6. Glidden Professional.
 7. PPG Paints.
 8. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
 9. Sherwin-Williams Company (The).
 10. Valspar Corporation.
- 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/Manufactory_index.shtml). Equivalent products not included in the "MPI Approved Products Lists" shall be submitted as substitution requests.

2.2 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. LEED2009 - 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.
 6. Zinc-Rich Industrial Maintenance Primers: 340 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 .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. 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.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. 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.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. 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. Equipment Rooms: Paint the following work where exposed:
 - 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.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 2. 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.
 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces.
 1. Latex System MPI INT 3.1A/E:
 - a. Prime Coat: One of following:
 - 1) Primer, alkali resistant, water based, MPI #3.
 - 2) Latex, interior, matching topcoat.
 - b. Intermediate Coat: Latex, interior, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated.
 - 1) Latex, interior, flat (MPI Gloss Level 1), MPI #53.

- 2) Latex, interior (MPI Gloss Level 2), MPI #44.
 - 3) Latex, interior (MPI Gloss Level 3), MPI #52.
 - 4) Latex, interior (MPI Gloss Level 4), MPI #43.
 - 5) Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
 - 6) Latex, interior, gloss (MPI Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.
- B. Concrete Substrates, Traffic Surfaces.
1. Latex Floor Enamel System MPI INT 3.2A:
 - a. Prime Coat: Floor paint, latex, matching topcoat.
 - b. Intermediate Coat: Floor paint, latex, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated.
 - 1) Floor paint, latex, low gloss (maximum MPI Gloss Level 4), MPI #60.
 - 2) Floor paint, latex, gloss (minimum MPI Gloss Level 5), MPI #68.
 - d. Non-Slip Aggregate: Apply where indicated in accordance with paint manufacturer's written recommendations.
- C. CMU Substrates.
1. Latex System MPI INT 4.2A:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - b. Intermediate Coat: Latex, interior, matching topcoat. Apply where Premium Grade system is indicated.
 - c. Topcoat: One of following matching gloss level indicated.
 - 1) Latex, interior, flat (MPI Gloss Level 1), MPI #53.
 - 2) Latex, interior (MPI Gloss Level 2), MPI #44.
 - 3) Latex, interior (MPI Gloss Level 3), MPI #52.
 - 4) Latex, interior (MPI Gloss Level 4), MPI #43.
 - 5) Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
 - 6) Latex, interior, gloss (MPI Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.
- D. 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.
- E. 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.

END OF SECTION 09 91 23

SECTION 09 91 26 - PAVEMENT MARKINGS FOR STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes painted markings applied to pavements in garages and building structures.
 - 1. Application to pavements in structures exposed to weather is included in this Section.

1.2 DEFINITIONS

- A. Pavement(s): In this Section the term "pavement(s)" refers to traffic bearing surfaces such as elevated decks and slabs-on-grade that are part of a garage or building structure. The structure may be enclosed or it may be open to weather (e.g. top level of parking garage).

1.3 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at ambient or surface temperature as follows:
 - 1. Alkyd Materials: Minimum 40 deg F and not exceeding 95 deg F.
 - 2. Water-Based Materials: Minimum 55 deg F and not exceeding 95 deg F.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Sweep and clean surface to eliminate loose material and dust.
- C. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges and no overspray.
 - 1. Apply waterborne emulsion or latex pavement-marking paint at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 2. Apply alkyd pavement marking paint at manufacturer's recommended rates to provide a minimum wet film thickness of 10 mils.

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 09 91 26

SECTION 10 11 16.13

FIXED MARKERBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fixed markerboards.
- B. Related Requirements:
 - 1. Section 10 12 00 "Display Cases" for individually framed and enclosed, wall-mounted bulletin boards and for tackboards within display cases.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
 - 2. Include electrical characteristics for motorized units.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
 - 2. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that the product contains no urea formaldehyde.
- C. 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. Show locations and layout of special-purpose graphics.
 - 4. Include sections of typical trim members.
 - 5. Include wiring diagrams for power and control wiring.
- D. Samples for Verification: For each type of visual display unit indicated.
 - 1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch- long sections of each trim profile.
 - 3. Display Rail: 6-inch- long section of each type.
 - 4. Rail Support System: 6-inch- long sections.
 - 5. Accessories: Full-size Sample of each type of accessory.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 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.

1.8 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.

1.9 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 2. Warranty Period: 50 years from date of Substantial Completion.
 3. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.

2.2 VISUAL DISPLAY BOARD ASSEMBLY

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Claridge Products and Equipment, Inc.
- B. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
1. Color: White.
- C. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; standard size and shape.
1. Aluminum Finish: Clear anodic finish.
- D. Chalktray: Manufacturer's standard; continuous.
1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

2.3 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 finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

2.4 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. 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.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- C. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 11 16.13

SECTION 10 12 00

DISPLAY CASES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Display cases.

1.3 DEFINITIONS

- A. Display Case: Glazed cabinet with tackboard panel back surface and adjustable shelves.
- B. Tackboard Panel: A material for holding push-pins or tacks typically consisting of a facing; such as fabric, vinyl, or cork; adhered to a substrate; such as fiberboard, hardboard, particleboard.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases. Include furnished specialties and accessories.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For display cases.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show location of seams and joints in tackboard panels.
 - 3. Include sections of typical trim members.
 - 4. Include diagrams for wiring of illuminated display cases.
- D. Samples for Verification: For each type of exposed finish for the following.
 - 1. Tackboard Panel: Not less than 8-1/2 by 11 inches, with facing and substrate indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch- long sections of each trim profile including corner section.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For display cases to include in maintenance manuals.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install display cases for indoor installations 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 openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain display cases from single source from single manufacturer.

2.2 DISPLAY CASE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Waddell Furniture, a Ghent Manufacturing Company, Inc., Recessed Display Case or comparable product by one of the following:
 - 1. A-1 Visual Systems.
 - 2. AARCO Products, Inc.
 - 3. ADP Lemco, Inc.
 - 4. Architectural School Products Ltd.
 - 5. Best-Rite; MooreCo, Inc.
 - 6. Claridge Products and Equipment, Inc.
 - 7. Ghent Manufacturing, Inc.
 - 8. Nelson-Harkins Industries.
 - 9. Newline Products, Inc.
 - 10. Platinum Visual Systems.
 - 11. Poblocki Sign Company.
 - 12. Tablet & Ticket Co. (The).
- B. Recessed Display Case: Factory-fabricated display case; with finished interior, operable glazed doors at front, and trim on face to cover edge of recessed opening.
 - 1. Display Case Cabinet: .
 - a. Veneer Species: with finish.
- C. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
 - 1. Thickness: Not less than 6 mm thick.
 - 2. Number of Doors: As indicated on Drawings.
- D. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
 - 1. Shelf Depth: 6 inches.
 - 2. Number of Shelves: As indicated on Drawings.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards extending full height of display case.
- F. Back Panel: laminate.
- G. Size: 96 inches wide, by 48 inches high, by 6 inches deep.

2.3 MATERIALS

- A. LEED2009 - Composite Wood Products: Products shall be made without urea formaldehyde.
- B. LEED2009 - Composite Wood Products: Products 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."
- C. Particleboard: ANSI A208.1, Grade M-1.
- D. Hardwood Plywood: HPVA HP-1.
- E. Extruded-Aluminum Bars and Shapes: ASTM B 221, Alloy 6063.
- F. Aluminum Tubing: ASTM B 429/B 429M, Alloy 6063.
- G. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- H. High-Pressure Plastic Laminate: NEMA LD 3.
- I. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

- J. LEED2009 - Adhesives: Do not use adhesives that contain urea formaldehyde.
- K. LEED2009 - Adhesives: Use adhesives that meet 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."

2.4 FABRICATION

- A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, 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 illuminated units.
- C. Examine walls and partitions for proper backing for display cases.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units 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. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches o.c.
- C. Floor-Mounted Display Cases: Attach display cases with to floor with concealed anchors.
- D. Comply with requirements specified elsewhere for connecting illuminated display cases.
- E. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION 10 12 00

SECTION 10 14 19

DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 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 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. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Dimensional Characters: Half-size Sample of each type of dimensional character.
 - 2. Exposed Accessories: Half-size Sample of each accessory type.
 - 3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.
- E. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

1.2 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

1.3 CLOSEOUT SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of products.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.2 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 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 oval countersunk screws and bolts with tamper-resistant 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. LEED2009 - 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.

2.3 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 match sign-background color unless otherwise indicated.
 2. Stainless-Steel Brackets: Factory finish brackets to match sign background finish unless otherwise indicated.

2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. 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.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 19

SECTION 10 14 23

PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Panel signs.
 - 2. Room-identification signs.
- B. Related Requirements:
 - 1. Section 10 14 26 "Post and Panel/Pylon Signage" for freestanding signs.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 2. Product Data: For adhesives, indicating VOC content.
- C. 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.
- D. 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.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Panel Signs: Not less than 12 inches square, including corner.
 - 2. Room-Identification Signs: Full-size Sample.
 - 3. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.
 - 4. Variable Component Materials: 8-inch Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 - 5. Exposed Accessories: Half-size Sample of each accessory type.

- 1.6 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For Installer.
- 1.7 CLOSEOUT SUBMITTALS
 - A. Maintenance Data: For signs to include in maintenance manuals.
- 1.8 QUALITY ASSURANCE
 - A. Installer Qualifications: Manufacturer of products.
- 1.9 FIELD CONDITIONS
 - A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.
- 1.10 WARRANTY
 - A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 PANEL SIGNS, GENERAL
 - A. LEED 2009 - Regional Materials: Products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- 2.2 SIGNS
 - 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. Ace Sign Systems, Inc.
 - 2. Advance Corporation; Braille-Tac Division.
 - 3. Allen Industries Architectural Signage.
 - 4. Allen Markings International.
 - 5. APCO Graphics, Inc.
 - 6. ASE, Inc.
 - 7. ASI Sign Systems, Inc.
 - 8. Best Sign Systems Inc.
 - 9. Bunting Graphicsry, Inc.
 - 10. Clarke Systems.
 - 11. Diskey Architectural Signage Inc.
 - 12. Fossil Industries, Inc.
 - 13. InPro Corporation (IPC).
 - 14. Mohawk Sign Systems.
 - 15. Nelson-Harkins Industries.
 - 16. Poblocki Sign Company, LLC.
 - 17. Seton Identification Products.
 - 18. Stamprite Supersine; a division of Stamp Rite Inc.
 - 19. Vista System.
 - 20. Vomar Products, Inc.

- B. Panel Sign : Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Basis-of-Design Product: Indicated on Drawings.
 - 2. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition, Horizontal Edges: As indicated .
 - b. Corner Condition in Elevation: As indicated.
 - 3. Frame: .
 - a. Frame Depth: As indicated.
 - b. Profile: Square.
 - c. Corner Condition in Elevation: Rounded to radius indicated.
 - 4. Mounting: with .
 - 5. Surface Finish and Applied Graphics:
 - a. Integral Sheet Color: As selected by Architect from full range of industry colors.
 - 6. Text and Typeface: Accessible raised characters and Braille Insert requirement. Finish raised characters to contrast with background color, and finish Braille to match background color.
 - 7. 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.
- C. Room-Identification Sign : Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Basis-of-Design Product: Indicated on Drawings.
 - 2. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Rounded to radius indicated.
 - 3. Frame: .
 - a. Frame Depth: As indicated.
 - b. Profile: Square.
 - c. Corner Condition in Elevation: Rounded to radius indicated.
 - 4. Mounting: Manufacturer's standard method for substrates indicated Surface mounted to wall with concealed anchors adhesive.
 - 5. Text and Typeface: Accessible raised characters and Braille Insert requirement. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 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.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel 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 screws and bolts with tamper-resistant Allen-head slots unless otherwise indicated.
 - 4. 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. 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.
- 5. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.
- B. Adhesive: As recommended by sign manufacturer.
 - 1. LEED 2009 - Adhesives shall have a VOC content of 70 g/L or less.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace signs for stability and for securing fasteners.
 - 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 - 1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
 - 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
 - 3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by Owner.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 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.

2.8 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.
- B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.
- 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

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 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.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls .
- 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. 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.

4. 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.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 23

SECTION 10 14 26 -

POST AND PANEL/PYLON SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Nonilluminated post-and-panel signs.

1.3 DEFINITIONS

- A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.4 COORDINATION

- A. Furnish templates and tolerance information 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.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For signage.
 - 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 half size.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For signs indicated in "Performance Requirements" Article.
 - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

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

1.8 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.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.10 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design sign structure and anchorage of post-and-panel sign type(s) Insert drawing designation of sign(s) according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
1. Uniform Wind Load: As indicated on Drawings.
 2. Concentrated Horizontal Load: As indicated on Drawings.
 3. Other Design Load: As indicated on Drawings.
 4. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Accessibility Standard: Comply with applicable provisions in the ABA standards of the Federal agency having jurisdiction.

2.2 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.3 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 unless otherwise indicated:
1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish stainless-steel 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 screws and bolts with tamper-resistant, slots unless otherwise indicated.
 4. Inserts: Furnish inserts to be set by other installers into concrete or masonry work.

- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on as appropriate for the substrate.
 - 1. Uses: Securing signs with imposed loads to structure.
 - 2. Type: .
- C. Anchoring Materials:
 - 1. 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.
 - 2. 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.
 - a. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.4 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in locations concealed from view after final assembly.
 - 2. Mill joints to 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 joints of flux, and dress exposed and contact surfaces.
 - 4. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
 - 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
- B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.
 - 1. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
 - 2. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.
 - 3. Continuously weld joints and seams unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs.
- C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.
- D. Verify that electrical service is correctly sized and located to accommodate signs.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, 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 components are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLING POSTS

- A. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet.
- B. Direct-Burial Method:
 - 1. Excavation: Excavate posthole to dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating an additional 12 inches, backfilling with satisfactory soil or well-graded aggregate, and compacting to original subgrade elevation.
 - 2. Setting in Earth: Set post in position, support to prevent movement, and backfill with satisfactory soil or well-graded aggregate as recommended in writing by manufacturer. Place and compact backfill in 6-inch lifts, compacting each lift.
 - 3. Setting in Cast-in-Place Concrete: Set post in position, support to prevent movement, and place concrete for concrete foundation as indicated on Drawings.
 - 4. Setting in Preformed Hole in Concrete Foundation: Form or core drill holes in concrete foundation not less than 3/4 inch larger than outside dimension of post for installing posts in concrete. Set post in position, shim to prevent movement, and fill annular space between post and hole with nonshrink, nonmetallic grout anchoring cement, mixed and placed to comply with manufacturer's written instructions.
 - a. Cover anchorage joint in concrete foundations with flange of same metal and finish as post, welded to post after placing anchoring material.
 - b. Leave anchorage joint exposed with 1/8-inch anchoring material sloped away from post.
- C. Reverse-Sleeve Method: Set post in position over the projecting insert and support post to prevent movement, drill posts and inserts for through bolts, and install and tighten through bolts.

3.4 INSTALLING PYLONS

- A. Vertical Tolerance: Install pylons plumb within a tolerance of 1/16 inch in 3 feet.
- B. Attachment with Preset Anchor Bolts: Set pylon base in position over anchor bolts projecting from concrete foundation, shim and support pylon to prevent movement, place washers and nuts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.
- C. Attachment with Drilled-in-Place Anchor Bolts: Set pylon base in position over concrete foundation, locate and drill anchor holes, shim and support pylon to prevent movement, place washers and anchor bolts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.

3.5 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 26

SECTION 10 21 13.17

PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Phenolic-core toilet compartments configured as toilet enclosures entrance screens urinal screens.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" Section 06 10 53 "Miscellaneous Rough Carpentry" for blocking overhead support of floor-and-ceiling-anchored compartments.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. 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 centerlines of toilet fixtures.
 - 4. Show locations of floor drains.
 - 5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.
- D. 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.
 - 2. Each type of hardware and accessory.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 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

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

- B. Recycled Content of Phenolic-Core Panel: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 65 percent.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARTMENTS

- 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. Accurate Partitions Corporation.
 - 2. All American Metal Corp.
 - 3. American Sanitary Partition Corporation.
 - 4. Ampco, Inc.
 - 5. Bobrick Washroom Equipment, Inc.
 - 6. Bradley Corporation; Mills Partitions.
 - 7. Decolam.
 - 8. Flush Metal Partition Corp.
 - 9. General Partitions Mfg. Corp.
 - 10. Global Steel Products Corp.
 - 11. Knickerbocker Partition Corporation.
 - 12. Marlite.
 - 13. Metpar Corp.
 - 14. Partition Systems Incorporated of South Carolina; Columbia Partitions.
 - 15. Scranton Products.
 - 16. Spec-Rite Designs, LLC; DesignRite Partitions.
 - 17. Tex-Lam Manufacturing, Inc.
 - 18. Weis-Robart Partitions, Inc.
- B. Toilet-Enclosure Style: Floor anchored.
- C. Entrance-Screen Style: Floor anchored.
- D. Urinal-Screen Style: Wall hung.
- E. Pilaster : Formed from stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
- F. Phenolic-Panel Finish:
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard through-color core matching face sheet.
 - 2. Edge Color: Through-color matching facing sheet color.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
 - 1. Material: Chrome-plated zamac.
 - 2. Hinges: Manufacturer's standard 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.
 - 3. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance-screen doors.
 - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

2.4 MATERIALS

- A. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) 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

3.1 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.

3.2 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.
- B. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters 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.

3.3 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 and doors in entrance screens to return doors to fully closed position.

END OF SECTION 10 21 13.17

SECTION 10 26 00

WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Corner guards.
 - a. Surface-mounted, plastic-cover corner guards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
 - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.
- B. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- C. Shop Drawings: For each type of wall and door protection showing locations and extent.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show handrail design and support spacing required to withstand structural loads.
- D. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.
 - 1. Include Samples of accent strips and accessories to verify color selection.
- E. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
 - 1. Corner Guards: 12 inches long. Include example top caps.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of handrail.
- B. Material Certificates: For each type of exposed plastic material.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 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. Surface-Mounted, Plastic-Cover Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch- long units.

2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.7 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.
 - a. Store covers for the following in a vertical position:
 - 1) Surface-mounted, plastic-cover corner guards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 CORNER GUARDS

- A. Surface-Mounted, Plastic-Cover Corner Guards : Manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Activar Construction Products Group, Inc.
 - b. American Floor Products Co., Inc.
 - c. Construction Specialties, Inc.
 - d. InPro Corporation.
 - e. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - f. Musson Rubber Company.
 - g. Nystrom Building Products.
 - h. Pawling Corporation.
 - i. WallGuard.com.
 - j. wallProtex.
 2. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:
 - a. Activar Construction Products Group, Inc.
 - b. American Floor Products Co., Inc.
 - c. Construction Specialties, Inc.
 - d. InPro Corporation.
 - e. Korogard Wall Protection Systems; a division of RJF International Corporation.
 - f. Musson Rubber Company.
 - g. Nystrom Building Products.
 - h. Pawling Corporation.
 - i. WallGuard.com.
 - j. wallProtex.
 3. Cover: Extruded rigid plastic, minimum 0.100-inch wall thickness; in dimensions and profiles indicated on Drawings.
 - a. Profile: Nominal 2-inch- long leg and 1/4-inch corner radius.
 - b. Height: 4feet.
 - c. Color and Texture: As selected by Architect from manufacturer's full range.

4. Continuous Retainer: One-piece extruded plastic.
5. Retainer Clips: Manufacturer's standard impact-absorbing clips.
6. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.3 FABRICATION

- A. Fabricate 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.

2.4 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

3.1 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.

3.2 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.

3.3 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 top caps as required to ensure tight seams.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
 - a. Combination toilet tissue/seat-cover dispenser and sanitary-napkin waste receptacle, surface mounted.
 - b. Paper towel (folded) dispenser.
 - c. Liquid-soap dispenser, horizontally oriented, surface mounted.
 - d. Grab bar with concealed fastener mounting flanges.
 - e. Sanitary napkin and tampon vendor, semirecessed.
 - f. Mirror unit.
 - g. Coat hook.
2. Public-use shower room accessories.
 - a. Products indicated on Drawings.
 - b. Shower curtain rod.
 - c. Shower curtain.
 - d. Folding shower seat.
 - e. Soap dish.
 - f. Robe hook.
 - g. Grab bar with concealed fastener mounting flanges.
3. Warm-air dryers.
 - a. Warm-air dryer.
4. Underlavatory guards.
 - a. Rigid plastic guard.
5. Custodial accessories.
 - a. Utility shelf.
 - b. Mop and broom holder.

B. Related Requirements:

1. Section 09 30 13 "Ceramic Tiling" for ceramic toilet and bath accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.

1.5 CLOSEOUT SUBMITTALS

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

1.6 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. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A&J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.; ASI Group.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Brey-Krause Manufacturing Co.
 - 5. GAMCO Specialty Accessories; a division of Bobrick.
 - 6. Sloan Valve Company.
 - 7. Tubular Specialties Manufacturing, Inc.
- C. Products indicated on Drawings.
- D. Combination Toilet Tissue/Seat-Cover Dispenser, Surface Mounted:
 - 1. Description: Combination unit with double-roll toilet tissue dispenser and the following:
 - a. Seat-cover dispenser with minimum capacity of 500 single or half-fold seat covers.
 - 2. Mounting: Surface mounted.
 - 3. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch- diameter tissue rolls.
 - 4. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant spindles.
 - 5. Lockset: Tumbler type.
- E. Combination Toilet Tissue/Seat-Cover Dispenser, Partition Mounted:
 - 1. Description: Combination unit with double-roll toilet tissue dispenser and the following:
 - a. Seat-cover dispenser with minimum capacity of 500 _ single or half-fold seat covers.
 - 2. Mounting: Partition mounted, dual access with two tissue rolls per compartment.
 - 3. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch- diameter tissue rolls.
 - 4. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant spindles].
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 - 6. Lockset: Tumbler type.
- F. Combination Toilet Tissue/Seat-Cover Dispenser, Partition Mounted for Accessible Compartment:
 - 1. Description: Combination unit with double-roll toilet tissue dispenser and the following:
 - a. Seat-cover dispenser with minimum capacity of 500 single or half-fold seat covers.
 - 2. Mounting: Partition mounted, dual access with two tissue rolls per compartment and with one side that mounts flush with partition of accessible compartment.
 - 3. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch- diameter tissue rolls.
 - 4. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant spindles.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin)..
 - 6. Lockset: Tumbler type.
- G. Combination Toilet Tissue/Seat-Cover Dispenser and Sanitary-Napkin Waste Receptacle, Surface Mounted:

1. Description: Combination unit with double-roll toilet tissue dispenser and the following:
 - a. Removable sanitary-napkin waste receptacle with self-closing, disposal-opening cover.
 - b. Seat-cover dispenser with minimum capacity of 500 single or half-fold seat covers.
 2. Mounting: Surface mounted.
 3. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch- diameter tissue rolls.
 4. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant spindles.
 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 6. Lockset: Tumbler type.
- H. Combination Toilet Tissue/Seat-Cover Dispenser and Sanitary-Napkin Waste Receptacle, Partition Mounted:
1. Description: Combination unit with double-roll toilet tissue dispenser and the following:
 - a. Removable sanitary-napkin waste receptacle with self-closing, disposal-opening cover.
 - b. Seat-cover dispenser with minimum capacity of 500 single or half-fold seat covers.
 2. Mounting: Partition mounted, dual access with two tissue rolls per compartment.
 3. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch- diameter tissue rolls.
 4. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant spindles..
 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 6. Lockset: Tumbler type.
- I. Combination Toilet Tissue/Seat-Cover Dispenser and Sanitary-Napkin Waste Receptacle, Partition Mounted for Accessible Compartment:
1. Description: Combination unit with double-roll toilet tissue dispenser and the following:
 - a. Removable sanitary-napkin waste receptacle with self-closing, disposal-opening cover.
 - b. Seat-cover dispenser with minimum capacity of 500 single or half-fold seat covers.
 2. Mounting: Partition mounted, dual access with two tissue rolls per compartment and with one side that mounts flush with partition of accessible compartment.
 3. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch- diameter tissue rolls.
 4. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant spindles.
 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 6. Lockset: Tumbler type.
- J. Combination Towel (Folded) Dispenser/Small Waste Receptacle, Surface Mounted:
1. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
 2. Mounting: Surface mounted with stainless-steel collar.
 - a. Designed for nominal 4-inch wall depth.
 3. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
 4. Minimum Waste-Receptacle Capacity: 4 gal..
 5. Material and Finish: Stainless steel, No. 4 finish (satin)
 6. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.
- K. Combination Towel (Folded) Dispenser/Medium Waste Receptacle, Semirecessed Mounted:
1. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
 2. Mounting: Semirecessed.
 - a. Designed for nominal 4-inch wall depth.
 3. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
 4. Minimum Waste-Receptacle Capacity: 12 gal..
 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 6. Liner: Reusable, vinyl waste-receptacle liner.
 7. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.
- L. Liquid-Soap Dispenser, Horizontally Oriented, Surface Mounted:
1. Description: Designed for dispensing antibacterial soap in liquid or lotion form.
 2. Mounting: Horizontally oriented, surface mounted.
 3. Capacity: 40 oz.
 4. Lockset: Tumbler type.
 5. Refill Indicator: Window type.

- M. Grab Bar with Concealed Fastener Mounting Flanges:
 - 1. Mounting: Flanges with concealed fasteners.
 - 2. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 - 3. Configuration and Length: As indicated on Drawings.
- N. Sanitary Napkin and Tampon Vendor, Semirecessed:
 - 1. Mounting: Semirecessed.
 - 2. Operation: No coin (free).
 - 3. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
- O. Mirror Unit:
 - 1. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.
 - 2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
 - 3. Size: As indicated on Drawings.

2.2 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. A&J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.; ASI Group.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. GAMCO Specialty Accessories; a division of Bobrick.
 - 6. Tubular Specialties Manufacturing, Inc.

2.3 WARM-AIR DRYERS

- 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. A&J Washroom Accessories, Inc.
 - 2. American Dryer, Inc.
 - 3. American Specialties, Inc.; ASI Group.
 - 4. Bobrick Washroom Equipment, Inc.
 - 5. Bradley Corporation.
 - 6. Dyson Inc.
 - 7. GAMCO Specialty Accessories; a division of Bobrick.
 - 8. Saniflow Hand Dryer Corporation.
 - 9. Sloan Valve Company.
 - 10. Tubular Specialties Manufacturing, Inc.
 - 11. World Dryer Corporation.

2.4 UNDERLAVATORY GUARDS

- 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. Plumberex Specialty Products, Inc.
 - 2. Truebro by IPS Corporation.

2.5 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A&J Washroom Accessories, Inc.
 2. American Specialties, Inc.; ASI Group.
 3. Bobrick Washroom Equipment, Inc.
 4. Bradley Corporation.
 5. Brey-Krause Manufacturing Co.
 6. GAMCO Specialty Accessories; a division of Bobrick.
 7. Tubular Specialties Manufacturing, Inc.
- C. Mop and Broom Holder:
1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf _.
 2. Length: 36 inches.
 3. Hooks: Four.
 4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
 - b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.6 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 41 16.13

FIRE DEPARTMENT KEYED ACCESS CONTROL SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Fire Department key storage box ("knox box").

1.3 COORDINATION

- A. Key Storage Box: Coordinate locations with Owner and local Fire Department.

1.4 ACTION SUBMITTALS

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

1.5 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

2.1 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: 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.
 - 4. Dimensions:
 - a. Outside Box: Approximately 7 inches wide by 7 inches high by 4-1/2 inches deep.
 - b. Mounting Flange for Recessed Box: Approximately 7 inches by 7 inches.
 - 5. Color: As selected by City Engineer 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.
 - 6. Product: Knox Company; Knox-Vault 4400 Series Single Lock Model (no substitutions allowed).
- 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

3.1 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.

3.2 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.

3.3 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Fire-Protection Cabinet - FPC-1: Non-security type for portable fire extinguishers; semirecessed surface-mounted.
 2. Fire-Protection Cabinet - FPC-2: Non-security type for ; .
 3. Fire-Protection Cabinet - FPC-3: Non-security type for ; .
- B. Related Requirements:
1. Section 10 44 16 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- D. 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.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 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. Fire-End & Croker Corporation.
 2. GMR International Equipment Corporation.
 3. Guardian Fire Equipment, Inc.
 4. JL Industries, Inc.; a division of the Activar Construction Products Group.
 5. Larsens Manufacturing Company.
 6. Modern Metal Products, Division of Technico Inc.
 7. Nystrom, Inc.
 8. Potter Roemer LLC.
 9. Strike First Corporation of America.
- C. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Fire-End & Croker Corporation; _.
 2. GMR International Equipment Corporation; _.
 3. Guardian Fire Equipment, Inc.; _.
 4. JL Industries, Inc.; a division of the Activar Construction Products Group; _.
 5. Larsens Manufacturing Company; _.
 6. Modern Metal Products, Division of Technico Inc.; _.
 7. Nystrom, Inc.; _.
 8. Potter Roemer LLC; _.
 9. Strike First Corporation of America; _.
- D. Cabinet Construction: Nonrated 1-hour fire rated 2-hour fire rated.
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.
- E. Cabinet Material:
1. Cold-rolled steel sheet:
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from full range of industry colors and color densities.
- F. 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).
- G. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- 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. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet glazing.
 - 2) Application Process: Silk-screened.
 - 3) Lettering Color: White.
 - 4) Orientation: Horizontal.

2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

3.3 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

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following:
 - 1. Portable, hand-carried fire extinguishers.
 - 2. Mounting brackets for fire extinguishers.
- B. Related Requirements:
 - 1. Section 10 44 13 "Fire Protection Cabinets."

1.3 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.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of 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. 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.
 2. Manufacturer's Standard Enameled-Metal Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity.
 3. Manufacturer's Standard Enameled-Metal Container: UL-rated 3-A:40-B:C, 5-lb nominal capacity.
 4. Manufacturer's Standard Enameled-Metal Container: UL-rated 3-A:40-B:C, 6-lb nominal capacity.
 5. Manufacturer's Standard Enameled-Metal Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity.
 6. Manufacturer's Standard Enameled-Metal Container: UL-rated 10-A:120-B:C, 20-lb nominal capacity.
 7. Enameled-Steel Container: UL-rated 1-A:10-B:C, 2.5-lb nominal capacity.
 8. Enameled-Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity.
 9. Enameled-Steel Container: UL-rated 3-A:40-B:C, 5-lb nominal capacity.
 10. Enameled-Steel Container: UL-rated 3-A:40-B:C, 6-lb nominal capacity.
 11. Enameled-Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity.
 12. Enameled-Steel Container: UL-rated 10-A:120-B:C, 20-lb nominal capacity.
 13. Enameled-Aluminum Container: UL-rated 1-A:10-B:C, 2.5-lb nominal capacity.
 14. Enameled-Aluminum Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity.
 15. Enameled-Aluminum Container: UL-rated 3-A:40-B:C, 5-lb nominal capacity.
 16. Enameled-Aluminum Container: UL-rated 3-A:40-B:C, 6-lb nominal capacity.
 17. Enameled-Aluminum Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity.
 18. Enameled-Aluminum Container: UL-rated 10-A:120-B:C, 20-lb nominal capacity.
 19. Chrome-Plated-Brass Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity.
 20. Chrome-Plated-Brass Container: UL-rated 3-A:40-B:C, 6-lb nominal capacity.
 21. Chrome-Plated-Brass Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity.
 22. Chrome-Plated-Brass Container: UL-rated 4-A:80-B:C, 10-lb nominal capacity.
 23. Chrome-Plated-Brass Container: UL-rated 10-A:120-B:C, 20-lb nominal capacity.

2.3 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, provide products by 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.
 - j. Potter Roemer LLC.
 - k. Strike First Corporation of America.
- 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

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. 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: 42 inches maximum above finished floor to top of fire extinguisher.

END OF SECTION 10 44 16

SECTION 10 51 13

METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Knocked-down athletic lockers.
 - 2. Welded athletic lockers.
 - 3. Knocked-down, open-front athletic lockers.
 - 4. Welded, open-front athletic lockers.
 - 5. Locker benches.

1.3 PREINSTALLATION MEETINGS

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

1.4 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. LEED2009 - Sustainable Design Submittals:
 - 1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. 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.
- D. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. 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
 - a. Same as for master and control keys.
 - 2. Locker Built-in Combination Locks Deliver to Owner by registered mail or overnight package service
 - a. Same as for master and control keys.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete masonry bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.8 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.
 - 4. Warranty Period for Welded Metal Lockers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.3 WELDED ATHLETIC LOCKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Art Metal Products.
 - 2. DeBourgh Mfg. Co.
 - 3. List Industries Inc.
 - 4. Lyon Workspace Products, LLC.
 - 5. Olympus Lockers & Storage Products, Inc.
 - 6. Penco Products, Inc.
 - 7. Republic Storage Systems Company.
- B. Expanded-Metal Doors: Fabricated from 0.090-inch nominal-thickness expanded metal; welded to 0.105-inch nominal-thickness steel angle frame; with 0.090-inch nominal-thickness, steel sheet lock panel backed by 0.060-inch nominal-thickness, steel sheet retainer welded to door frame.
- C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops and Bottoms: 0.060-inch nominal thickness, with single bend at edges.
 - 2. Backs: 0.048-inch nominal thickness.
 - 3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.
- D. Unperforated Sides: Fabricated from 0.060-inch nominal-thickness steel sheet.
- E. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet or 0.097-inch nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
 - 1. Cross Frames for Double-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- F. Reinforced Bottoms: Structural channels, formed from 0.060-inch nominal-thickness steel sheet; welded to front and rear of side-panel frames.

- G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; self-closing.
 - 1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
- H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 - 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder 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 0.120-inch nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- I. Coat Rods: Manufacturer's standard.
- J. Legs: 6 inches high; formed by extending vertical frame members, or fabricated from 0.075-inch nominal-thickness steel sheet; welded to bottom of locker.
 - 1. Closed Front and End Bases: Fabricated from 0.048-inch nominal-thickness steel sheet.
- K. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
- L. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- M. Boxed End Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.
- N. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- O. Finish: Baked enamel or powder coat.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 LOCKER BENCHES

- A. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
 - 1. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.
- B. Materials:
 - 1. LEED2009 - Composite Wood Products: Products shall be made without urea formaldehyde.
 - 2. LEED2009 - Composite Wood Products: Products 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."

2.5 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
 - 2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
 - 3. Triple-Tier Units: One double-prong ceiling hook.
 - 4. Coat Rods: As indicated on Drawings.

5. Open-Front Athletic Lockers: Two single-prong wall hooks bolted to locker back and coat rod.
- D. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.
- E. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- F. 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.
- G. 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.
- H. 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.
- I. 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.
- J. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.
- K. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- L. 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.
- M. 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.
- N. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.6 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches 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. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
 - D. Equipment:
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
 - E. 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.
- 3.3 ADJUSTING
- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- 3.4 PROTECTION
- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
 - B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13

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.

1.1 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
1. 2161 Compressor, air, receiver mounted, 10 HP duplex (Ref. Part 2.1)
 2. 2229 Dryer, air, refrigerated, 150 CFM (Ref. Part 2.2)
 3. 7240 Fluid management system (Ref. Part 2.3)
 4. 7520 Pump, air piston, 10:1 ratio (EO1, EO2, EO3, GO, HO, ATF) (Ref. Part 2.4)
 5. 7531 Pump, diaphragm, non-mixing (EC, WWF) (Ref. Part 2.4)
 6. 7540 Pump, diaphragm, used fluid evacuation (UO) (Ref. Part 2.6)
 7. 7541 Pump, diaphragm, used fluid evacuation (UC) (Ref. Part 2.7)
 8. 7700 Reel banks, general (Ref. Part 2.8)
 9. 7780 Reel bank (ATF, CG, EC, EO1, EO2, EO3, HO, WWF) (Ref. Part 2.9)
 11. 7781 Reel bank (ATF, CG, EC, EO2, EO3, GO, HO, WWF) (Ref. Part 2.10)
- B. Roughing-in installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

1.2 REFERENCES

- A. ASME Code for Unfired Pressure Vessels

1.3 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.

1.4 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 regulations. Additional, more specific compliance requirements under individual equipment headings.

1.5 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.
 7. List of original manufacturer's parts, including supplier's part numbers and cuts, recommended spare parts stockage, quantity, local parts and service source.
- C. Shop Drawings: Submit Shop Drawings in accordance with of Division 1 - General Requirements of these specifications.
1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, mounting details, method of field assembly, components, location and size of each connection.
 2. Include diagrams for power, signal and control wiring.
- D. Include certified data for each unit and accessory system indicating the following:
1. Air compressor performance curves at summer design condition
 2. Intercooler performance at summer design condition
 3. Air dryer performance at 38 degrees F, dew point at 175 PSIG
 4. 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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.

1.10 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.
 - 2. Motor Controllers: Full-voltage, combination-magnetic type with undervoltage release feature and motor-circuit-protector-type disconnecting means and short-circuit protective device.
 - 3. Control Voltage: 120-V ac or less, using integral control power transformer.
 - 4. Motor Overload Protection: Overload relay in each phase.
 - 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. 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.
 - 3. Exterior Finish: Epoxy coating.
 - 4. Accessories: Include safety valve, pressure gauge, automatic drain, and pressure regulator.

PART 2 - PRODUCTS

2.1 COMPRESSOR, AIR, RECEIVER MOUNTED, 10 HP DUPLEX
Equipment Identifier: 2161

- 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. Princeton, IL (866) 276-3440
c. Model No.: HR10D-25 with accessories, advantage product
 - 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 duplex compressor unit consisting of air-cooled motor compressors (10 HP), air receiver, after cooler, pressure reducing station, spring isolators, and operating controls.
- C. Capacities/Dimensions:
 - 1. Overall dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	88	33	62

2. Receiver: 250 gallons
 3. Speed: 740 RPM @ 175 psi; 810 RPM @ 125 psi
 4. Displacement: 43.1 CFM each @ 175 psi; 47.3 CFM each @ 125 psi
 5. Bore diameters: 4-5/8 and 2-1/2 inches
 6. Stroke: 3 inches
 7. Number of cylinders: 4
 8. Output valve: 3/4 inch NPT(F)
 9. Bolt-down dimensions:
 - a. Length: 55 inches
 - b. Width: 27-1/2 inches
 10. Weight (approximate): 1,725 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 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. After cooler (Champion No. ACAC), one each:
 - a. Provide air compressor with air after cooler suitable for operation under 135 PSIG working pressure.
 - b. Provide a belt guard style after cooler mounted on the compressor belt guard, with automatic condensate trap and automatic float drain.
 - c. After cooler capacity to cool discharge air to within 25 degrees Fahrenheit of ambient air temperature with compressors operating at specified capacity.
 3. Air receiver:
 - a. Provide a horizontal receiver stamped ASME rated for working pressure of 200 PSIG. Flange or screw inlet and outlet connections, welded steel construction.
 - b. Fittings to include adjustable pressure regulator, safety valve, pressure gauge, drain cock, and automatic pneumatic tank drain (Champion No. ATD-P, one each).
 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. Valve capacity suitable to reduce compressor pressure from 50 PSI to 180 PSI. Pressure reducing valve to be adjustable upward from reduced pressure.
 - d. Provide valves with bronze or semi-steel bodies with stainless steel springs, stems, and seats.
 5. Provide condensate filter (Champion No. CFL100A).
 6. Provide vibration isolators (Champion No. VI) one each.
 7. Provide low level oil monitor (Champion No. LOLM) two each.
- E. Controls:

1. Pressure switch to cutout at 165 PSI with minimum differential of 20 PSI.

F. Utility Requirements:

1. Electrical:											
a.	<table border="1"> <thead> <tr> <th>Connection Requirements</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>460</td> </tr> <tr> <td>Phase</td> <td>3</td> </tr> <tr> <td>HP</td> <td>20</td> </tr> <tr> <td>Amps</td> <td>20</td> </tr> </tbody> </table>	Connection Requirements	Unit	Voltage	460	Phase	3	HP	20	Amps	20
Connection Requirements	Unit										
Voltage	460										
Phase	3										
HP	20										
Amps	20										
b.	<table border="1"> <tr> <td>Connection Type</td> <td>Provide single fusible disconnect (one per motor)</td> </tr> </table>	Connection Type	Provide single fusible disconnect (one per motor)								
Connection Type	Provide single fusible disconnect (one per motor)										

- G. Finish: Durable enamel in manufacturer’s standard color

2.2 DRYER, AIR, REFRIGERATED, 150 CFM
Equipment Identifier: 2229

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.	Quincey, IL (866) 276-3440
c.	Model No.: CRN 150 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) 896-4000
b.	Quincy Compressors, Quincy, IL (217) 222-7700

B. Capacities/Dimensions:

1. Overall dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	22	26	34

2. Capacity:

- a. 38 degrees F: 150 CFM
- b. 50 degrees F: 195 CFM

3. Drain connection: 1 inch NPT(F)
4. Air connection: 1 inch NPT(M)
5. Maximum working pressure: 232 PSIG (Level 2 controller standard)
6. Weight: 279 pounds

C. Features/Performance/Construction:

1. Provide refrigerated air dryer shall be a 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 shall be provided at same level and factory insulated.
3. Heat exchangers shall 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 shall operate continuously to maintain specified 38 degree F dew point. House unit in steel cabinet provided with access door and panel for maintenance and inspection.
5. Panel mounted gauges: Provide air inlet temperature gauge, air outlet pressure gauge, refrigerant suction pressure, and refrigerant head pressure.
6. Provide high temperature alarm with dry contacts.
7. Coalescing oil filter: Provide Grade E cold coalescing oil removal filter (Champion No. CFL170EAG): Oil filter shall extract oils and aerosols from supply air stream down to 0.008 PPM and solids down to 0.01 micros. Dedicated drain trap shall be provided. Unit shall include internal automatic drain.
8. Particulate filter (Champion No. CFL170C17A): Provide air line filter capable of filtering particles down to 1 micron and 1 PPM. Unit shall include internal automatic drain.
9. Provide maintenance kit (Champion No. CRNMK15): with separator element, drain, drain tube, hose fastener, wave spring, head O-ring, lube packet, and service reminder detail.
10. Provide coalescing maintenance kit (Champion No. CRNMK14): with filter elements, electric drain rebuild kit, drain tube, hose fastener, head O-rings, lube packet, and service reminder decal.
11. 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:

1. Electrical:											
a.	<table border="1"> <thead> <tr> <th>Connection Requirements</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>120</td> </tr> <tr> <td>Phase</td> <td>1</td> </tr> <tr> <td>HP</td> <td>3/4</td> </tr> <tr> <td>Amps</td> <td>13</td> </tr> </tbody> </table>	Connection Requirements	Unit	Voltage	120	Phase	1	HP	3/4	Amps	13
Connection Requirements	Unit										
Voltage	120										
Phase	1										
HP	3/4										
Amps	13										
b.	<table border="1"> <tr> <td>Connection Type</td> <td>Provide standard grounded receptacle</td> </tr> </table>	Connection Type	Provide standard grounded receptacle								
Connection Type	Provide standard grounded receptacle										

F. Finish: Durable enamel in manufacturer's standard color

2.3 FLUID MANAGEMENT SYSTEM, WIRELESS

Equipment Identifier: 7240

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
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B. General Description

1. The Pulse Total Fluid Management System shall be designed to manage and control lubricating oils, engine coolant, and windshield washer fluid 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), 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), and Pulse software. The Contractor shall supply all operator computer or server equipment, including monitor.
3. Products: Automatic transmission fluid, engine oil, engine coolant, gear oil, hydraulic oil, windshield washer fluid.

C. Features/Performance/Construction:

1. Meters:
 - a. Provide meters throughout the facility to accommodate all dispensing locations for the following: ATF, EC, EO, 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, EO3): 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) 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, EO1, EO2, EO3, 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. 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, 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).
 - 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) 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).
 - 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, EO1, EO2, EO3, GO, HO, WWF.
 - 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:				
a.	Connection Requirements	Hub	Pump Air Control	Extender /Remote Extender
	Voltage	120	120	120
	Phase	1	1	1
	HP	---	---	---
	Amps	3	0.6	3
b.	Connection Type	Provide standard grounded receptacle		

2.4 PUMP, AIR PISTON 10:1 RATIO (EO1, EO2, EO3, GO, HO, ATF)
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:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	8 dia.	---	28-1/2

2. Products: Automatic transmission fluid (ATF), engine oil (EO), 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:

1. Plumbing:	
a. Compressed Air:	
Connection (inches)	1/2 NPT(F)
Volume (CFM)	25
Capacity (PSI)	100

2.5 PUMP, DIAPHRAGM, NON-MIXING (EC, WWF)
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: Engine Coolant (EC), windshield washer fluid (WWF)
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)	1/2
Volume (CFM)	67
Capacity (PSI)	100

2.6 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

-
2. d. Reference Equipment Drawings: Service Equipment Layout Plan
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 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, 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)
3. Materials: Compatible with product being delivered.
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. 007-575 with 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.	<table border="1"> <tr> <td>Connection Requirements</td> <td>Strobe Unit</td> </tr> <tr> <td>Voltage</td> <td>120</td> </tr> <tr> <td>Phase</td> <td>1</td> </tr> <tr> <td>Amps</td> <td>2</td> </tr> </table>	Connection Requirements	Strobe Unit	Voltage	120	Phase	1	Amps	2
Connection Requirements	Strobe Unit								
Voltage	120								
Phase	1								
Amps	2								
b.	Connection Type Provide standard grounded receptacle								
2. Plumbing:									
a.	<table border="1"> <tr> <td colspan="2">Compressed Air:</td> </tr> <tr> <td>Connection (inches)</td> <td>1/2</td> </tr> <tr> <td>Volume (CFM)</td> <td>64</td> </tr> <tr> <td>Capacity (PSI)</td> <td>100</td> </tr> </table>	Compressed Air:		Connection (inches)	1/2	Volume (CFM)	64	Capacity (PSI)	100
Compressed Air:									
Connection (inches)	1/2								
Volume (CFM)	64								
Capacity (PSI)	100								

2.7 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, 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 COOLANT" on pump to identify product (minimum 1 inch lettering)
- 3. Materials: Compatible with product being delivered.
- 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. 007-575 with 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.	<table border="1"> <tr> <td>Connection Requirements</td> <td>Strobe Unit</td> </tr> <tr> <td>Voltage</td> <td>120</td> </tr> <tr> <td>Phase</td> <td>1</td> </tr> <tr> <td>Amps</td> <td>2</td> </tr> </table>	Connection Requirements	Strobe Unit	Voltage	120	Phase	1	Amps	2
Connection Requirements	Strobe Unit								
Voltage	120								
Phase	1								
Amps	2								
b.	Connection Type Provide standard grounded receptacle								
2. Plumbing:									
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Compressed Air:									
Connection (inches)	1/2								
Volume (CFM)	64								
Capacity (PSI)	100								

2.8 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. Engine coolant (EC): Graco No. HSL65B
5. Engine oil (EO): Graco No. HSM65B
6. Gear oil (GO): Graco No. HSM65B
7. Hydraulic oil (HO): Graco No. HSM65B
8. Windshield washer fluid (WWF): Graco No. HSL56B

C. Capacities/Dimensions:

1. Overall reel dimensions, XD20 series (ATF, CA, CG, EC, EO1, EO2, EO3, GO, HO, W, WWF) nominal:
 - a. Length: 20 inches
 - b. Width: 7-1/2 inches
 - c. Height: 25-1/2 inches
2. Reel fluid inlet:
 - a. CA, WWF: 1/2 inch NPSM (M)
 - b. CG: 1/2 inch NPT(M)
 - c. ATF, EC, EO1, EO2, EO3, GO, HO: 1/2 inch NPSM(M)
3. 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. GO:
 - 1) Length: 50 feet
 - 2) Inside diameter: 1/2 inch
 - 3) Working pressure: 2,000 PSI

- d. ATF, EO1, EO2, EO3, 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, EO, HO, GO]
 - 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. GO: Electronic in-line style english metered totalizing dispenser set to dispense (up to 5 GPM) in pints to 0.01 increments, Graco No. 255352
 - 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, EO1, EO2, EO3, HO: 1/2 inch ID by 24 inches, medium pressure hose and fittings, rated for 2,000 PSI, Graco No. 218549, (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. EC: Similar to Graco No. 218677
 - e. EO1, EO2, EO3: Similar to Graco No. 218670

- f. HO: Graco No. 218674
 - g. GO: Similar to Graco No. 218672
 - h. 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

2.9 REEL BANK (ATF, CG, EC, EO1, EO2, EO3, HO, WWF)
Equipment Identifier: 7780

- A. Reel bank shall consist of one each (ATF) reel, one each (CG) reel, one each (EC) reel, one each (EO1) reel, one each (EO2) reel, one each (EO3) reel, one each (HO) reel, and one each (WWF) reel as delineated in part 2.8 REEL BANKS, GENERAL of this specification section.
- B. Reference Equipment Drawings for Details.

2.10 REEL BANK (ATF, CG, EC, EO2, EO3, GO, HO, WWF)
Equipment Identifier: 7781

- A. Reel bank shall consist of one each (ATF) reel, one each (CG) reel, one each (EC) reel, one each (EO2) reel, one each (EO3) reel, one each (GO) reel, one each (HO) reel, and one each (WWF) reel as delineated in part 2.8 REEL BANKS, GENERAL of this specification section.
- B. Reference Equipment Drawings for Details.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 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).

3.5 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. 2161 Compressor, air, receiver mounted, 10 HP duplex; 1 hours (minimum)
 - 2. 2229 Dryer, air, refrigerated, 150 CFM; 1 hours (minimum)
 - 3. 7520 Pump, air piston, 10:1 ratio (EO1, EO2, EO3, GO, HO, ATF); 1 hours (minimum)
 - 4. 7531 Pump, diaphragm, non-mixing (EC, WWF); 1 hours (minimum)
 - 5. 7540 Pump, diaphragm, used fluid evacuation (UO); 1 hours (minimum)
 - 6. 7541 Pump, diaphragm, used fluid evacuation (UC); 1 hours (minimum)

Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION

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.

1.1 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 3720 Washer, high pressure, hot water, NG, 8 GPM (Ref. Part 2.1)
 - 2. 3783 Parts washer, automatic, front load (Ref. Part 2.2)
 - 3. 6670 Shaker, paint, industrial, bench mounted (Ref. Part 2.3)
- 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.

1.2 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.

1.3 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 of Division 1 - General Requirements of these specifications.
 - 2. Submit site specific installation drawings and procedures.

1.4 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.

1.5 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.

1.6 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.

1.7 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

**2.1 WASHER, HIGH PRESSURE, HOT WATER, NG, 8 GPM
Equipment Identifier: 3720**

- 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.: 5735SS 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. Landa, Inc., Camas, WA (877) 526.3235
b. Alkota Cleaning Systems, Inc., Alcester, SD (800) 255-6823

- B. Capacities/Dimensions:
 - 1. Overall dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	51	31	63-1/2

2. Weight: 1,471 pounds
3. Operating pressure: 3,000 PSI
4. Maximum discharge capacity: 8 GPM

C. Features/Performance/Construction:

1. Burner: NG fired, 725,000 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; one inch outside diameter, hydrostatic-pressure tested; 14,900 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. Supplier shall provide 1/2 inch outside diameter 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. Programmable smart relay feature shall control over run time, auto start/stop and shut down functionality.

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:

1.	Trigger gun: Hotsy No. 87512350 (one each per trigger gun location)
2.	36 inch wand: Hotsy No. 87253890 (one each per trigger gun location)
3.	Nozzle: Hotsy No. 87087020 (one each per trigger gun location)
4.	Quick coupler: Hotsy No. 87071020 (one each per trigger gun location)
5.	Soap solenoid and switch: Hotsy No. 89169880 (one each per trigger gun location)
6.	Remote starter: Hotsy No. 89169890 (one each per trigger gun location)
7.	Replacement nozzle: Hotsy No. 87087140 (one pack per trigger gun, pack of four, 4-1/2 millimeter with quick disconnect)
8.	Draft diverter: Hotsy No. 87177300, 12 inches, (one each)
9.	Breakthrough© detergent: Hotsy No. 89053900, (one each/55 gallon container)
10.	Powershine Super concentrate kit, self-mixing 55 gallon drum: Hotsy No. 98460080 (one each)
11.	Reel: Hotsy No. 87504780, (one each per trigger gun location/six inch hose with 360 degree range)
12.	50 foot hose assembly: Hotsy No. 87391210 (one each per trigger gun location)
13.	Scabbard: Doltmeier No. NP7225 (one each)
14.	Replacement nozzle holder: Contractor supplied, wall mounted, fabricated (one per each trigger gun location)
15.	Ceiling Mount Boom: 66.089-360 degrees, Mostmatic No. BOM66089 (one each/10 feet, 4 inch)

F. Utility Requirements:

1. Electrical:	
a. Connection Requirements	Unit
Voltage	460
Phase	3
HP	20
Amps	21
b. Connection Type	Provide disconnect
2. Plumbing:	
a. Domestic Water:	
Connection (inches)	1
Flow Rate (GPM)	8
Capacity (PSI)	40 to 60
b. Natural Gas:	
Connection (I.D. inches)	3/4
Capacity (BTU/Hr)	725000
Gas Pressure (W.C.I.)	9 to 14
c. Compressed Air:	
3. Mechanical:	
a. Venting:	
Connection (inches)	12
Stack Type	Exhaust

G. Finish: Durable enamel in manufacturer's standard color

2.2 PARTS, WASHER, AUTOMATIC, FRONT LOAD
Equipment Identifier: 3783

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.

<ol style="list-style-type: none"> a. Better Engineering b. Baltimore, MD (410) 931-0000 c. Model No.: F-3000-P 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. Cuda Cleaning Sytems, Denver, CO (303) 738-2400
b. Landa Inc., Denver, CO (800) 444-7654

B. Capacities/Dimensions:

1. Overall dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	45	62	69

2. Interior working dimensions:

- a. Turntable diameter: 30 inches
- b. Turntable area: 710 square inches
- c. Working height: 36 inches

- 3. Load capacity: 750 pounds
- 4. Pump performance: Total output of 75 GPM at 60 PSI
- 5. Sump capacity: 95 gallons
- 6. Nozzles: 18 stainless steel

C. Features/Performance/Construction:

1. Cabinet construction: the cabinet shall be constructed of mild steel - structural and sheet metal. The thickness of the sheet metal shall be 1/8 to 3/16 inch.

2. The Purifier Filtration System:

- a. Removable stainless steel chip basket that is above the tank solution level; the chip basket filters the solution before it returns to the holding tank.
- b. A deflector plate beneath the chip basket that directs the return solution flow to the sediment trap area of the holding tank.
- c. A 5 inch pitch on the tank floor which forces sediment to the rear of the unit.
- d. A 2 inch deep by 10 inch wide canal which runs the width of the machine to trap sediment. Removable tank cover plates provide access to this sediment trap.
- e. A motorized oil skimmer
 - 1) Wheel diameter: 12 to 16 inches
 - 2) NEMA 12 drive motor coupled to a slip clutch.
 - 3) Automatically controlled with a 24-hour/seven-day timer.

3. Turntable/parts basket/drive system:

- a. ZXX-11 upper "ZXX" level turntable for two tiers:
 - 1) This model has a removable upper parts basket which doubles the cleaning capacity for smaller parts.
 - 2) Both levels shall have "C-shaped" spray manifolds for full coverage.
- b. Turntable rim and spokes have minimal thickness of 3/16 inch.
- c. Friction drive system foam filled tire spring loaded against turntable rim.
- d. TEFC drive motor.
- e. Removable parts basket 6 inch high sidewall/1 inch open mesh.

4. Pumps:

- a. Vertically mounted/pump end submerged no seals.
- b. TEFC motor extended motor shaft (no couplings) connects directly to impeller.

5. Provide two tank drainage ports on rear wall (one left/one right/use either).
6. Provide one tank overflow port above normal solution level.
7. Machine supported off the ground with 4 inch high forklift channels.
8. Removable cover plates in front and rear of tank.
9. Heating system/holding tank:
 - a. Standard heating system is electric
 - b. Heating system is automatically turned on and off with a 24-hour/seven-day timer
10. Spray manifolds:
 - a. Stainless steel, "V" jet spray nozzles
 - b. Manifolds positioned above, below, and on the outside of the turntable
 - c. On top loading models, overhead manifolds retract with the lid
11. Fresh rinse system, Better Engineering Model No. ARC-11:
 - a. Automatically follows the wash stage
 - b. Duration controlled by an adjustable timer inside the control box
 - c. Parts sprayed with fresh water (4 GPM)
 - d. Rinse water is automatically diverted to drain (not allowed to enter and overflow wash tank)
 - e. Delay stage in between wash and rinse cycles prevents cross contamination
12. Re-circulated rinse stage, Better Engineering Model No. ARC-22:
 - a. Works the same as ARC-11 (see above) except water is re-circulated from auxiliary tank
 - b. 50 gallon, stainless steel tank for "rinse" water
 - c. 2.0 HP vertical (seal-less) mild steel pump
 - d. Rinse tank has auto water level control
 - e. Rinse tank thermostat controls and heaters (9 kW) are separate from wash tank
13. Air drying system, Better Engineering Model No. RGB-11:
 - a. Drying stage automatically follows last wash or rinse stage
 - b. Time of dry stage controlled by an adjustable timer inside the control box
 - c. Regenerative blower is mounted to the machine to supply high velocity airflow
 - d. Air knives are positioned inside the cleaning chamber as specified by the customer
 - e. A silencer/filter is attached to the intake of the regenerative blower
 - f. Air manifolds are purged after wash cycle
14. Automatic steam exhaust, Better Engineering No. ASX-11:
 - a. Cast aluminum direct driven fan evacuates steam from the cleaning chamber
 - b. 425 CFM at 1/4 inch static pressure
 - c. Three mode selector switch on control panel:
 - 1) On: Steam exhaust fan runs continually (when machine is powered up)
 - 2) Auto: Steam exhaust fan runs during cleaning cycle until door is opened
 - 3) Off: Steam exhaust fan is off
 - d. Condensate return line feeds condensed water back to the wash holding tank, preventing the accumulation of water in the fan housing
15. Air heating system, Better Engineering No. AHS-11:
 - a. Air from the regenerative blower is run through an electric air heater to raise the air temperature to 250 degrees F or higher (consult dealer for recommended kW and air temperature)
 - b. Features/performance/construction:
 - 1) Low watt density, industrial, "Fire bar" style heating element
 - 2) Insulated heating chamber
 - 3) System is controlled with a special "PID" (Proportional Integral Derivative) thermostat that shall modulate the air temperature close to the set point

- 4) An "SSR" (Solid State Relay) shall be used in lieu of a conventional contactor
 - 5) A secondary "High Limit" thermostat shall shut down the system if the surface temperature of the air heaters ever gets too high
16. In line strainers, Better Engineering No. ILS-11-100:
- a. Installed between pump and spray manifolds to prevent clogged nozzles
 - b. Removable screen with 1/32 inch perforations
 - c. Hayward brand 100 GPM rating
 - d. Pressure gauge indicates when filter must be cleaned
17. Micron filters, Better Engineering No. ILF-22-100:
- a. Filter housing with micron rated bag installed between pump and spray manifolds
 - b. Prevents redeposition of fine particles
 - c. Rosedale brand with hinged top and eye bolts (not band clamp style)
 - d. 100 GPM rating and micron size of bag
 - e. Pressure gauge indicates when filter has to be changed
18. Low water shutdown and fill, Better Engineering No. LWS-F1:
- a. Includes the LWS-11 control plus an automatic water fill system
 - b. Whenever the float sensor is not in its' high position, a solenoid valve opens to fill the tank
 - c. Fill solenoid is deactivated during the cleaning cycle and for 30 seconds after the completion of the cleaning cycle to prevent a false "fill" signal
 - d. Water is added in small increments (when the water level drops as little as 1/16 inch) preventing a big drop in tank temperature that would otherwise occur if a lot of cold water was added at once
19. Beacon light, Better Engineering No. EBL-11:
- a. Flashes at end of cycle
 - b. Mounted for visibility from all directions
 - c. Light is 3 inches round by 4 inches high
20. Basket coatings:
- a. Removable parts baskets vinyl coated to prevent scratching of parts
 - b. Basket diameter: Same diameter as turntable with 1 inch high rim. Made of smooth welded wire, 1 by 1 inch opening.
21. Hand cleaning tray, Better Engineering No. SST-11:
- a. 24 by 18 by 4 inches stainless steel tray mounted on the side of the washer
 - b. Exact location dependent on other options (consult dealer)
 - c. Stainless pump (controlled with on/off switch) directs cleaning fluid through a hand brush
 - d. Fluid is recirculated from the Purifier's holding tank
 - e. Can be used at any time, regardless if Purifier is "in cycle"
22. Small parts baskets, Better Engineering No. SPB-11 and SPB-22:
- a. Rectangular basket with handles and a hinged lid, 1/16 inch perforations
 - b. Recommended for small parts that could otherwise get blown out of the standard parts basket
 - c. SPB-11 measures 12 by 6 by 6 inches
 - d. SPB-22 measures 15 by 9 by 6 inches
- D. Controls:
- 1. NEMA 12 control panel and junction boxes
 - 2. 110 volt controls
 - 3. Motorized, 30 minute wash
 - 4. Two channel 24-hour/seven-day timer to automatically control heating system and oil skimmer

5. Panel mounted thermostat with digital read-out
6. "Jog" button for turntable
7. "Wash" and "heat" indicator lights
8. Door/lid limit switch
9. All control circuits are individually fused

E. Accessories:

1.	Hydro-all rinse gun for manual rinsing: Better Engineering No. HAR-11
2.	Bag filters for ILF-22-100 (specify micron rating): Better Engineering No. RFB-22-100

F. Utility Requirements:

1. Backflow device

1. Electrical:											
a.	<table border="1"> <thead> <tr> <th>Connection Requirements</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>460</td> </tr> <tr> <td>Phase</td> <td>3</td> </tr> <tr> <td>HP</td> <td>5</td> </tr> <tr> <td>Amps</td> <td>43</td> </tr> </tbody> </table>	Connection Requirements	Unit	Voltage	460	Phase	3	HP	5	Amps	43
Connection Requirements	Unit										
Voltage	460										
Phase	3										
HP	5										
Amps	43										
b.	Connection Type Provide disconnect										
2. Plumbing:											
a.	<table border="1"> <thead> <tr> <th colspan="2">Domestic Water:</th> </tr> </thead> <tbody> <tr> <td>Connection (inches)</td> <td>1/2</td> </tr> <tr> <td>Flow Rate (GPM)</td> <td>10 to 12</td> </tr> <tr> <td>Capacity (PSI)</td> <td>50 to 150</td> </tr> </tbody> </table>	Domestic Water:		Connection (inches)	1/2	Flow Rate (GPM)	10 to 12	Capacity (PSI)	50 to 150		
Domestic Water:											
Connection (inches)	1/2										
Flow Rate (GPM)	10 to 12										
Capacity (PSI)	50 to 150										
3. Mechanical:											
a.	<table border="1"> <thead> <tr> <th colspan="2">Venting:</th> </tr> </thead> <tbody> <tr> <td>Connection (inches)</td> <td>4</td> </tr> </tbody> </table>	Venting:		Connection (inches)	4						
Venting:											
Connection (inches)	4										

- G. Finish: Prime washer with epoxy compatible primer and finish with epoxy enamel in manufacturer's standard color

2.3 SHAKER, PAINT, INDUSTRIAL, BENCH MOUNTED
Equipment Identifier: 6670

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.	Midwest Mixing
b.	Chicago Ridge, IL (800) 879-8971
c.	Model No.: 6A

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. Miracle Paint, Inver Grove Heights, MN (888) 236-1143
b. Fluid Management, Wheeling, IL (847) 537-0880

B. Capacities/Dimensions:

1. Overall dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	19	31	30

2. Approximate weight: 220 pounds
3. Max motor power: 1-1/2 HP
4. Mixing capacity: One 5-gallon can separately or four 1-gallon cans simultaneously
5. Max CFM draw: 70
6. Max operating pressure: 100

C. Features/Performance/Construction:

1. Can holder shall rotate 360 degrees and lock in any position for shaking operation.
2. Bottom end clamp shall be recessed to prevent slippage.
3. Ball bearings shall be used throughout, pre-lubricated, and double sealed.

D. Utility Requirements:

1. Plumbing:	
a. Compressed Air:	
Connection (inches)	1/4
Volume (CFM)	70
Capacity (PSI)	100

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 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).

END OF SECTION 11 11 29

SECTION 11 11 40

RELOCATION OF EXISTING EQUIPMENT DIRECTIVES

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 Owner-supplied equipment that shall be relocated and installed by the Contractor as specified herein.

1.1 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.

1.2 QUALITY ASSURANCE AND CONDITION DOCUMENTATION

- A. Existing Equipment shall be tested and certified as operational and safe by the Owner prior to removal by the contractor or his agents.
- B. Owner'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 Owner.
- D. Contractor to coordinate directly with the Owner or Owner's Representative 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 Owner's current operation.

1.3 SUBMITTALS

- A. Contractor shall submit a schedule for equipment relocation no less than two months before any relocation is required. Owner must approve relocation and installation schedule.
- B. Drawings for existing equipment shall be required where re-installation is provided by the original equipment manufacturer.

1.4 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.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. A relocation and transport plan listing each item in Part 2.0 requiring re-installation by the contractor must be submitted to the Owner'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

2.1 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. 2630 Receiver, vertical mounted, 400 gallon
 2. 3610 Vacuum, canister, stainless steel
 3. 7958 Tank, double wall, cube, 240 gallon (ATF, EO1, EO2, EO3, GO, HO, WWF)
 4. 7970 Tank, double wall, cube, 500 gallon (EC, UC, UO)
 5. 9510 Harness, safety, I-beam, trolley, self-retracting
 6. 21611 Compressor, air, receiver mounted, 10 HP duplex
 7. 21612 Compressor, air, receiver mounted, 15 HP duplex
 8. 24401 Changer, tire, auto
 9. 57091 Lift, surface mounted, twin-post, 9,000 pound
 10. 57092 Lift, surface mounted, twin-post, 9,000 pound
 11. 57093 Lift, surface mounted, twin-post, 9,000 pound
 12. 57141 Lift, surface mounted, twin-post, 15,000 pound
 13. 57142 Lift, surface mounted, twin-post, 15,000 pound
 14. 75101 Pump, air piston (CG), with hoist
- 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.

2.2 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 Owner's move-in is imminent, unless approved by Owner's Representative.

PART 3 - EXECUTION

3.1 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 [Owner]'s Representative to resolve any differences to this list prior to re-installation and again upon completion of re-installation for each item.

3.2 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.

3.3 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 [Owner]'s Representative, the Architect or designated representative. Where available, the test should be conducted using acceptance procedures provided by the manufacturer.

3.4 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 Owner'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.

1.1 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 3460 Reel, vehicle exhaust, motor operated, individual fan, 6 inch hose (Ref. Part 2.1)
 - 2. 3465 Rail system, vehicle exhaust, 6 inch hose (Ref. Part 2.2)
 - 3. 3466 Reel, vehicle exhaust, motor operated, central fan, 4 inch hose, with VFD (Ref. Part 2.3)
- 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.

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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

2.1 REEL, VEHICLE EXHAUST, MOTOR OPERATED, INDIVIDUAL FAN, 6 INCH HOSE
Equipment Identifier: 3460

- 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. Thomasville, NC (800) 533-5286 c. Model No.: 865 with accessories
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- 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) 305-3500 b. Monoxivent, Rock Island, IL (309) 794-1000
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- B. Capacities/Dimensions:

- 1. Overall dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	58	31	33

2. Outlet duct length: 12 inches
 3. Exhaust hose:
 - a. Diameter: 6 inches
 - b. Length: 33 feet
 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 No. 20802865 shall consist of a heavy steel coated with an aluminum zinc alloy to resist corrosion.
 - 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 revolution of the drum.
 - d. The drum shall be motorized and shall be capable of lifting 65 pounds of hose.
 - e. The hose reel without the hole shall not exceed 70 pounds.
 - f. The connecting tube of aluminum, flexible, diameter 6-1/4 inches, length 12 inches, 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 directly to the drum. The exhaust fan shall be Nederman series N27, No. 14514322
 - b. Exhaust fan shall be radial blade type fan constructed of powder coated steel.
 - c. The exhaust fan shall be to the exhaust reel utilizing a fan mounting bracket, Nederman No. 20373556
 3. Exhaust hose:
 - a. The hose Nederman series NFC 4.2 No. 86900692 shall be constructed of high temperature fabric with an external steel helix. The Nederman series 6.5 No. 86900811 shall be constructed of a coated high temperature rated fabric with a stainless steel helix. The steel helix shall have a plastic coating that will prevent it from scratching vehicles.
 - b. The exhaust hose consists of a 24 foot hose rated at 800 degrees F or greater and 9 feet of hose rated at 1,200 degrees F or greater.
- D. Controls:
1. Remote control shall contain switches for hose up, hose down. Fan ON/OFF shall be controlled by pendant switch Nederman No. 20373712.
 2. Limit switches:
 - a. Limit switch shall stop drum rotation during hose coil/recoil and prevent damages to the hose.
 - b. Lower limit switch shall stop drum rotation when hose has uncoiled from drum to prevent recoil.
 - c. Upper limit switch shall override the remote switch and disengage supply current to the motor and override the remote switch when the hose is totally coiled.
 3. Electrical control box with fan contractor and 24V transformer to start/top fan, Nederman No. 89115570.
- E. Accessories:
1. Exhaust extraction nozzle with clamp:
 - a. A 6 inch aluminum exhaust extraction nozzle with cane, Nederman No. 89298067 (one each per reel)
 - b. Nozzle shall be capable of withstanding temperatures of up to 660 degrees F.

- c. A fully adjustable locking clamp shall be used to secure the nozzle to the vehicle exhaust pipe.
 - d. A steel mesh inlet guard shall be used to prevent passage of debris to hose.
2. Cane nozzle for stack exhausts:
- a. A galvanized steel nozzle for stack pipes, Nederman No. 20374287, shall be provided for every three exhaust reels.

F. Utility Requirements:

1. Electrical:		
a. Connection Requirements	Fan	Hose Reel
Voltage	460	120
Phase	3	1
HP	2	1/3
Amps		3
b. Connection Type	Provide disconnect	
2. Mechanical:		
a. Venting:		
Connection (inches)	6-1/4	
Volume (CFM)	675	
Stack Type	---	

2.2 RAIL SYSTEM, VEHICLE EXHAUST, SIX INCH HOSE
Equipment Identifier: 3465

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. Thomasville, NC (800) 533-5286
c. Model No.: 20917020 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. Rail length: 90 feet
- 2. Exit duct: 6 inches
- 3. Exhaust hose:
 - a. Dimensions
 - 1) Diameter: 6 inches

- 2) Length: 24 feet
 - b. Quantity per rail: Two
 4. Exhaust fan:
 - a. Air volume: 1,400 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 use to prevent passage of debris to hose.
 - e. Provide one each per hose
 - 2. Extraction nozzle with internal grips:
 - a. 4 inch EPDM exhaust extraction nozzle with internal grip in two length positions. Nozzle shall accept a single 2-1/2 inch exhaust or two 2-1/2 inch exhausts, Nederman No. 20867261.
 - b. Nozzles shall be capable of withstanding temperatures up to 365 degrees F
 - c. Adjustable internal grip shall be used to secure the nozzle to the vehicle exhaust pipe(s).
 - d. Non-scratching rubber hood.
 - e. Provide one per hose.
 - 3. 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 300 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. 89115569.
 - 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								
<table border="1"> <tr> <td>Voltage</td> <td>460</td> </tr> <tr> <td>Phase</td> <td>3</td> </tr> <tr> <td>HP</td> <td>3</td> </tr> <tr> <td>Amps</td> <td>4.6</td> </tr> </table>		Voltage	460	Phase	3	HP	3	Amps	4.6
Voltage	460								
Phase	3								
HP	3								
Amps	4.6								
b. Connection Type	Provide disconnect								
2. Mechanical:									
a. Venting:									
<table border="1"> <tr> <td>Connection (inches)</td> <td>6</td> </tr> <tr> <td>Volume (CFM)</td> <td>1400</td> </tr> <tr> <td>Stack Type</td> <td>No loss stack</td> </tr> </table>		Connection (inches)	6	Volume (CFM)	1400	Stack Type	No loss stack		
Connection (inches)	6								
Volume (CFM)	1400								
Stack Type	No loss stack								

2.3 REEL, VEHICLE EXHAUST, MOTOR OPERATED, CENTRAL FAN, FOUR INCH HOSE
 Equipment Identifier: 3466

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. Livonia, MI (734) 729-3344
c. Model No.: 865M exhaust hose reel with motor - 20802665

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 dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	45-1/2	25	29-1/2

2. Drum storage capacity hose length: 39 feet
3. Exit duct: 12 inches
4. Exhaust hose:
 - a. Diameter: 4 inches

- b. Length: 33 feet
- C. Features/Performance/Construction:
 - 1. Exhaust hose drum:
 - a. The exhaust hose drum, Nederman Model No. 20802665 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 revolution of the drum.
 - d. The connecting tube of aluminum, flexible, diameter 6-1/4 inches, length 12 inches, shall be used in a straight position when bends are needed in the duct system.
 - 2. Exhaust hose:
 - a. The hose Nederman series NFC1.5 No. 87800002 shall be constructed of neoprene based 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 350 degrees F continuously.
- D. Accessories:
 - 1. Exhaust extraction nozzle with clamp:
 - a. A 4 inch EPDM exhaust extraction nozzle with clamp. Nozzle shall accept a 3 inch exhaust, No. 20804061 or two 2 inch exhaust port, Nederman No. 20804161.
 - b. Nozzles shall be capable of withstanding temperatures up to 350 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 reel
 - 2. Extraction nozzle with clamp: A 4 inch EPDM exhaust extraction nozzle with internal grip in two length positions. Nozzle shall accept a single 2-1/2 inch exhaust or two 2-1/2 inch exhausts, Nederman No. 20867861.
 - 3. 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 350 degrees F.
- E. Controls:
 - 1. Remote control shall contain switches for hose up, hose down. Fan ON/OFF shall be controlled by pendant switch Nederman No. 20373712.
 - 2. Limit switches:
 - a. A limit switch (Nederman No. 20373557) shall stop drum rotation during hose coil/recoil and prevent damages to the hose.
 - b. Lower limit switch shall stop drum rotation when hose has uncoiled from drum to prevent recoil.
 - c. Upper limit switch shall override the remote switch and disengage supply current to the motor and override the remote switch when the hose is totally coiled.

F. Utility Requirements:

1. Electrical:	
a. Connection Requirements	Hose Reel
Voltage	120
Phase	1
HP	1/5
Amps	1.4
b. Connection Type	Provide disconnect

A. Utility Requirements:

1. Electrical:	
a. Connection Requirements	Motor
Voltage	120
Phase	1
HP	4.8
Amps	30
b. Connection Type	Provide j-box

B. Finish: Stainless steel

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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).

3.4 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.

END OF SECTION 11 24 19

SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manually operated roller shades with single rollers.
 - 2. Manually operated roller shades with double rollers.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.3 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 Initial Selection: For each type and color of shadeband material.
 - 1. Include Samples of accessories involving color selection.
- D. Samples for Verification: For each type of roller shade.
 - 1. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
- E. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.6 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.

1.7 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

2.1 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade or comparable product by one of the following:
1. BTX Window Automation, Inc.
 2. DFB Sales.
 3. Draper Inc.
 4. Hunter Douglas Contract.
 5. Lutron Electronics Co., Inc.
 6. Nysan Solar Control Inc.; Hunter Douglas Company.
 7. OEM Shades Inc.
 8. Shade Techniques, LLC.
 9. Silent Gliss USA, Inc.
 10. SM Automatic, 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: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip, jamb mount.
 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
 - 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. 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 Orientation on Shadeband: Up the bolt.
 2. Material: .
 - a. Visually Transparent Sing-Fabric Shadecloth: MechoShade Systems, Inc., Euroveil 5300 Series.
 - 1) Type: 0.010 diameter non-raveling Vinyl/Polyester yarn.
 - 2) Weave: Basket Weave.
 - 3) Thickness: 0.025.
 - 4) Openness Factor: 5 percent.
 - 5) Color: As selected by Architect from manufacturer's full range.
 3. 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. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Mechoshade S or comparable product by one of the following:
 - 1. BTX Window Automation, Inc.
 - 2. DFB Sales.
 - 3. Draper Inc.
 - 4. Hunter Douglas Contract.
 - 5. Lutron Electronics Co., Inc.
 - 6. Nysan Solar Control Inc.; Hunter Douglas Company.
 - 7. OEM Shades Inc.
 - 8. Shade Techniques, LLC.
 - 9. Silent Gliss USA, Inc.
 - 10. SM Automatic, 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: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip, jamb mount.
 - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
 - 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. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
 - 2. Inside Roller:
 - a. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Outside Roller:
 - a. Direction of Shadeband Roll: Regular, from back of roller.
 - 4. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- D. 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.
- E. Shadebands:
 - 1. Material Orientation on Shadeband: As indicated on Drawings.
 - 2. Inside (Roomside) Material: As indicated on Drawings Finish Schedule.
 - 3. Outside (Windowside) Material: As indicated on Drawings Finish Schedule.
 - 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.

2.4 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. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
2. 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.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 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

SECTION 12 93 00 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bicycle racks.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for installing pipe sleeves cast in concrete footings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED2009 - Sustainable Design Submittals:
- C. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.

PART 2 - PRODUCTS

2.1 BICYCLE RACKS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product by Madrax; Graber ManufacturingCo or comparable product by one of the following:
 - 1. Dero Bike Rack Co.(www.dero.com): Campus Rack
 - 2. Bike Fixation by Saris (www.bikefixation.com): City Rack
 - 3. Madrax; Graber Manufacturing Co. (www.madrax.com): Spartan Rack
- B. Bicycle Rack Construction:
 - 1. Frame: Steel.
 - 2. Frame: Not less than 2-3/8" OD, 7 gauge steel tube
 - 3. Hangers:: 1-1/2" x 1", 11 gauge square tube
 - 4. Capacity: 4 bikes; single sided.
 - 5. Style: As indicated.
 - a. Overall Height: As indicated.
 - b. Overall Width: As indicated
 - c. Overall Depth: As indicated.
 - 6. Security: Designed to lock .
 - 7. Accessories: Base covers for each pipe and tubing anchored end.
 - 8. Installation Method: Cast in concrete.
- C. Steel Finish: Color coated.
 - 1. Color: As selected by Architect from manufacturer's full range.
- D. Stainless-Steel Finish: No. 4.
- E. Wood Finish: Manufacturer's standard finish.

2.2 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWWA M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.3 GENERAL FINISH REQUIREMENTS

- A. 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.

2.4 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with , mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with , mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION 12 93 00

SECTION 14 45 00

VEHICLE LIFTS

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.

1.1 WORK INCLUDED

- A. Equipment items as listed below by Equipment Identifier:
 - 1. 5645 Lift, axle, two-post, 70,000 pound, shallow design (Ref. Part 2.1)
 - 2. 5712 Lift, surface mounted, twin post, 12,000 pound (Ref. Part 2.2)
 - 3. 5716 Lift, surface mounted, twin-post, 18,000 pound (Ref. Part 2.3)
 - 4. 5779 Lift, parallelogram, 100,000 pound, 42 feet (Ref. Part 2.4)
- 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.

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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

2.1 LIFT, AXLE, TWO-POST, 70,000 POUND, SHALLOW DESIGN

Equipment Identifier: 5645

- 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
b.	Madison, IN (812) 273-1622
c.	Model No.: MOD 35M-21

- 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.	No other manufacturers have been identified with a product that can potentially meet specifications.

- B. General Description
 - 1. Lifting Units: Lift shall consist of two individual modular lifting assemblies in line with the longitudinal axis of the vehicle, each lifting cylinder so equipped as to engage the axle and

suspension, as specified herein. Each modular lifting assembly shall be housed in a totally contained, environmentally safe containment. The movable post shall be equipped with automatic shutter-plate covers that move with the post so as to keep the trench opening covered at all times. All trench cover plates, including recess covers shall be permanently attached to the floor openings to insure their proper use. The modular lifting system shall be VEC equalized and controlled. The operation of the lift shall be electro hydraulic.

2. Only axle adjusting post-type lifts are acceptable.

C. Capacities/Dimensions:

1. Overall dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	---	---	---
b. Console	27	16-1/4	54-1/2

2. Hydraulic lift:

a. Lift capacities:

- 1) Movable post modular: 35,000 pounds
- 2) Fixed post modular: 35,000 pounds
- 3) Total: 70,000 pounds

b. Lift rise:

- 1) Movable post modular: 70 inches to point of adapter contact.
- 2) Rear: 70 inches to point of adapter contact

c. Piston diameter:

- 1) Movable post modular:
 - a) First stage: 9-1/16 inches
 - b) Second stage: 7-7/8 inches
- 2) Fixed post modular:
 - a) First stage: 9-1/16inches
 - b) Second stage: 7-7/8 inches

d. Adjustable adapters spread and retract:

- 1) Movable post modular: 57-3/4 inches (maximum) and 40-1/4 inches (minimum)
- 2) Fixed post modular: 39-3/4 inches (maximum) and 24-3/4 inches (minimum)

e. Wheel base range: 198 to 348 inches

f. Length of frame for moveable piston: 21 feet 4 inches

3. Electric-hydraulic power unit: movable post modular

- a. Motor: 5 HP, 3 phase
- b. Pump: 19.3 gallons per minute
- c. Oil capacity: 19.3 gallons

4. Electric-hydraulic power unit, fixed post modular:

- a. Motor: 5 HP, 3 phase
- b. Pump: 19.3 gallons per minute
- c. Oil capacity: 19.3 gallons

5. Control console dimensions:
 - a. Length: 27 inches
 - b. Width: 16-1/4 inches
 - c. Height: 54-1/2 inches
 6. Automatic fluid displacement system:
 - a. Fluid displacement: 4 GPM at 90 PSI
- D. Features/Performance/Construction:
1. Movable post modular:
 - a. The movable post shall be equipped with a carriage assembly with permanent lubricated bearing wheels for smooth and proper movement in the structural channel track. The casing of the movable post shall be coated with EnviroGuard coating of 1/4 inch thickness for ultimate durability and maximum protection against deterioration due to electrolysis and/or harsh contaminants.
 - b. Recessed track properly sized for movable post to provide proper engagement for vehicles ranging in wheelbases specified by fleet demand. The track shall have a pocket location to house the saddle and adapter assembly when lift is in the lowered position providing an unobstructed clear floor. The recess shall allow the superstructure and adapters to be stored completely below grade. When lowered, no part of the saddle or its adapters shall interfere with the drive thru clearance of the bay. It shall not be necessary to remove adapters to achieve full ground clearance and it shall not be required to remove or reposition the adapters in order to close the pit covers. All openings in the floor and gaps between floor and superstructure must be covered when the lift is down.
 - c. Wheelbase adjustment shall be accomplished by a 2 HP, explosion proof electric motor, and chain drive assembly. Adjustment control shall be located on control console.
 - d. Front superstructure shall be of a low profile design not to exceed 5 inches (including adapters) and shall move forward or backward without interfering with snow removal, tire chains, wheelchair lifts or other "low profile" accessories commonly found on customer's vehicles.
 - e. Lift locks: The lift lock shall be rated at same capacity as the corresponding jacking unit. The lock leg shall be a two stage telescoping type constructed of rectangular tubing. The lock leg shall be equipped with 18 locking positions on 3 inch increments. The locking latch shall be spring loaded to the lock position and shall be released at the control console. The locking latch shall be gravity activated with a spring loaded assist. Release mechanism shall be an air cylinder to minimize potential hydraulic leaks. Hydraulically operated or electrically operated safeties are not acceptable. The lift locking leg shall be attached to the saddle to prevent rotation and insure proper position of locking latches at all times for maximum rigidity.
 - f. Electro-hydraulic power unit: The movable post modular unit shall be equipped with a power unit assembly, with an explosion proof motor. (All models bio fluid compatible). The power unit system shall supply ample pressure for operation of lift system. The power unit shall be housed within the modular unit containment.
 - g. Modular containment: The modular containment shall be a steel enclosure 5 feet, 7 inches in depth, appropriately sized in length to accommodate specified wheelbase range. The containment shall be coated internally and externally with EnviroGuard coating of 1/4-inch thickness for ultimate durability and maximum protection against deterioration due to electrolysis and/or harsh contaminants. EnviroGuard shall be applied to the inside and the outside of the containment housing to create a 1/2 inch (13 millimeters) thick impermeable shell that is watertight, encapsulated against corrosion and electrolysis. The unit shall be tested against electrolysis by way of a 30,000 volt stray current test. The containment shall be designed to prevent the release of any contaminants in to the surrounding soil or infiltration by hydrostatic pressure from surrounding water tables. Parts treated with the EnviroGuard coating shall be warranted against corrosion or electrolysis for a period of 10 years. The containment shall be equipped with a Liquid Detection System that shall relay visual notification to

the lift control LCD screen upon detection of 5 inches of liquid accumulation in the containment. The containment shall be equipped with a fitting located on a floor cover plate connected to a 1-1/2-inch PVC tube routed to the bottom of the containment, which permits the removal of any liquid accumulation from the surface level.

2. Stationary post modular:

- a. The stationary post shall be of the same design construction, diameter, and rise as the movable post.
- b. Frame: The frame unit will provide integral wheel chocks at floor level in order to accurately locate vehicle axles over the lifting saddle and adapters. Wheel chocks shall be embedded below grade on both sides of the stationary module. No part of the wheel spotting system shall protrude above the floor surface and the spotting adapters shall be provided on both sides of the module to allow loading by the operator either in forward or reverse gear. The recess shall allow the superstructure and adapters to be stored completely below grade. When lowered, no part of the saddle or its adapters shall interfere with the drive thru clearance of the bay. It shall not be necessary to remove adapters to achieve full ground clearance and it shall not be required to remove or reposition the adapters in order to close the pit covers. The frame assembly shall also provide a recess beneath the floor 48 inches wide for the rear saddle and base adapters when the plunger is in the down position. The recess area shall have cover doors to close over the opening when lift is not in use.
- c. Lift locks: The lift locks shall be of the same design and construction as the movable post.
- d. Power unit: The power unit shall be of the same construction and design as the movable post.
- e. Modular containment: The modular containment shall be a steel enclosure 6 feet in depth, appropriately sized to house stationary post assembly and power unit. The containment shall be coated internally and externally with EnviroGuard coating of 1/4 inch thickness for ultimate durability and maximum protection against deterioration due to electrolysis and/or harsh contaminants. The containment shall be designed to prevent the release of any contaminants in to the surrounding soil.

3. Control console:

- a. The control console shall be equipped with a joystick type control for fore and aft movement of the piston and up and down operation of the lift. The joystick control shall be equipped with a locking ring to prevent accidental engagement of the control when not in use. The joystick shall permit fine adjustment of the lifting carriage or moveable piston to permit accurate alignment of axles, unloading of wheels, and reinstallation of drive-train components.
- b. An equalization system shall monitor all jacking assemblies in relation to each other. The equalization shall be accomplished through variable motor rotation without the use of flow metering valves.
- c. The lift control panel shall be equipped with Inbay Technology allowing (or equal) system communication through the use of an LCD screen. The LCD screen shall provide onboard: Operation training, operation manual, preventive maintenance reminders, fault codes, and site specific presets.
- d. The system shall provide the ability for the following facility required settings:
 - 1) Up to ten memorized wheel base locations as required by fleet.
 - 2) Up to four memorized height requirements as required by facility.
- e. The control system shall indicate to the operator when the lift is fully lowered to prevent damage to the vehicle, the lift and to eliminate tire damage.
- f. The control system shall indicate to the operator which lifting pistons are activated, when the moveable piston is moving fore and aft, when the moveable post is in its "home" position and when each piston is fully recessed below grade.
- g. The control system shall be compliant with the requirements of ANSI, ALI, UL201 and all other applicable NEC requirements.

4. Shutter plate continuous pit cover: The movable post shall be equipped with shutter plate covers that move with the post so as to keep the trench opening covered at all times. Shutterplates shall be zinc electroplate and all pivot points on the shutterplate cover system shall be constructed of zinc electroplate to reduce maintenance.
5. Fluid Evacuation System: each modular containment unit will be equipped with an automatic fluid evacuation system.

E. Controls:

1. All controls and electrical components shall meet applicable NEC requirements.
2. Controls shall be console mounted.
3. Reference Equipment Layout Drawings for the location of the control console.

F. Accessories:

1. Universal adapter stand: Rotary No. FD2361BK (one each)
2. Heavy duty truck adapter kit: Rotary No. AK-HTA60-2

G. Utility Requirements:

1. Electrical:	
a. Connection Requirements	Unit
Voltage	460
Phase	3
HP	10
Amps	16
b. Connection Type	Provide disconnect
2. Plumbing:	
a. Compressed Air:	
Connection (inches)	1/4
Volume (CFM)	5
Capacity (PSI)	100 - 120

**2.2 LIFT, SURFACE MOUNTED, TWIN-POST, 12,000 POUND
 Equipment Identifier: 5712**

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.: SPO12-TA

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.	BendPak, Santa Paulo, CA (805) 933-9970
b.	Mohawk, Amsterdam, NY (518) 842-1431

B. Capacities/Dimensions:

1. Overall dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	137-5/8	24	164

2. Capacity: 12,000 pounds, minimum
3. Lift rise: 72-3/4 inches, minimum
4. Distance between columns: 114-7/8 inches
5. Drive-through clearance: 102-3/8 inches
6. Floor to overhead switch bar: 159-1/8 inches
7. Floor to overhead bar: 165 inches
8. Arm reach (two-stage arms with flip-up adapter):
 - a. Front: 27-1/2 inches minimum, 59 inches maximum
 - b. Rear: 27-1/2 inches minimum, 59 inches maximum
9. Minimum adapter height: 4-3/4 inches (floor to top of adapter)
10. Lifting speed: 60 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.

- 10. A rubber guard shall be included on the columns in order to protect the vehicle doors.
- 11. A light kit shall be included with the unit to illuminate the underside of the vehicle.

D. Controls: Single point manual controls push button "UP" and lowering lever for descent mounted on lift column.

E. Accessories:

1. Air/electric utility box: Rotary No. FA5911BK (one each per unit)
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F. Utility Requirements:

1. Electrical:		
a. Connection Requirements	Unit	Air / Electrical
Voltage	460	115
Phase	3	1
HP	2	---
Amps	10	15
b. Connection Type	Provide disconnect	
2. Plumbing:		
a. Compressed Air:		
Connection (inches)	1/4	
Volume (CFM)	5	
Capacity (PSI)	90-120	

G. Finish: Durable enamel in manufacturer's standard color

2.3 LIFT, SURFACE MOUNTED, TWIN-POST, 18,000 POUND

Equipment Identifier: 5716

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
b. Madison, IN (812) 273-1622
c. Model No.: SP018 with accessories

- 2. Alternate manufacturers: *Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturer's, including the following, may be considered as equal.*

a. Stertil-Koni USA Inc., Stevensville, MD (410) 643-9001
b. Mohawk Resources LTD, Amsterdam, NY (518) 842-1431

B. Capacities/Dimensions:

1. Overall Dimensions:

Dimensions (inches)			
	Length	Width	Height
a. Equipment	155	38	197-1/4

2. Capacity: 18,000 pounds, minimum

3. Adjustable height:

- a. Minimum: 14 feet, 6 inches
- b. Maximum: 16 feet, 6 inches

4. Lift rise: 88-7/8 inches (from floor to top of fully extended adapter)

5. Distance between columns: 120-1/4 inches

6. Drive-through clearance: 105-3/4 inches

7. Arm reach:

- a. Front: 38-1/2 inches minimum, 62 inches maximum
- b. Rear: 38-1/2 inches minimum, 62 inches maximum

8. Adapter height: 5-3/4 to 7-1/2 inches (floor to top of adapter)

9. Adapter height with low extension: 10-3/4 inches (floor to top of adapter)

10. Adapter height with high extension: 15-3/4 inches (floor to top of adapter)

11. Lifting speed: 85 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 19-1/2 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 14 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, 5 inch and 10 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 16 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 down 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:

1. Electrical:			
a.	Connection Requirements	Unit	Air Electrical
	Voltage	460	115
	Phase	3	1
	HP	2	---
	Amps	10	15
b.	Connection Type	Provide disconnect	
2. Plumbing:			
a.	Compressed Air:		
	Connection (inches)	1/4	
	Volume (CFM)	5	
	Capacity (PSI)	90 - 120	

G. Finish: Durable enamel in manufacturer's standard color

**2.4 LIFT, PARALLELOGRAM, 100,000 POUND, 42 FEET
 Equipment Identifier: 5779**

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.

Prime Information:
Mohawk Resources, Ltd. Amsterdam, NY (518) 842-2006 Model No.: 100-42-F with accessories

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.*

Alternate Information:
Rotary Lifts, Madison, IN (812) 273-1622 Steril Koni, Stevensville, MD (410) 643-9001

B. Capacities/Dimensions:

1. Overall dimensions:

Dimensions (inches)			
	LENGTH	WIDTH	HEIGHT
Equipment	109-1/2	504	16

2. Lift dimensions:
 - a. Platform length: 42 feet
 - b. Platform width: 32-1/4 inch platform
 - c. Spacing between platforms: 45 inches platform
 - d. Overall width: 109-1/2 inch (flush)
 - e. Horizontal movement (from collapsed to fully raised position): 36-1/4 inch (flush)
 - f. Fully extended height: 63 inches from finished floor to top of platform (flush)
3. Minimum full lifting height of a flush mounted in a recess unit from finished floor level to bottom of tires: 63 inches, minimum. Lifting unit shall permit lifting of vehicle to any height up to its full amount with a minimum of 10 locking positions distributed throughout the lift's travel.
4. Lifting capacity: 100,000 pounds, minimum

C. Features/Performance/Construction:

1. Complete lift assembly shall consist of an electro-hydraulic lift unit, control console, and specified accessories.
2. Control console shall be connected by required lengths of stainless steel hydraulic pipe or steel reinforced hydraulic hose, nylon compressed air line, and electrical cable permitting location 10 feet (minimum) from the connections on the lift unit including standard fittings throughout. All hydraulic hoses on lifting structure shall be of steel reinforced construction and have standard fittings throughout.
3. Support leg assembly:
 - a. Base of each lifting member shall be pre-drilled to accept anchoring bolts adequately sized for the loads imposed during lift operation.
 - b. Each hydraulic cylinder shall be mounted on the underside of the lifting platform and have a flow check integrally mounted to prevent collapse in the event of a major fluid leak.
4. Platform:
 - a. Each platform shall be constructed of 0.375 inch thick plate steel supported by 0.250 inch thick steel "I" beams.
 - b. Each platform shall have two automatic swing wheel chocks mounted to the front and rear of the lift to prevent a vehicle from rolling off the platform when raised more than 12 inches. Chocks shall not reduce the effective length of lifting platforms by more than 6 inches.
 - c. There shall be no fixed obstructions between lifting platforms.
 - d. Hydraulic gear pump, driving lift, shall be capable of supplying the appropriate PSI and GPM to operate, and be capable of being lowered from any raised position by operation of manual pump and valving system.
5. Safety features:
 - a. Safety locks with a safety factor of not less than 3:1 shall be mounted one set to each lifting cylinder, engaging as the lift ascends, and shall allow the lift to be locked at a minimum of 10 different levels ensuring minimal travel due to a hydraulic fluid leak.
 - b. Safety locks shall be automatically disengaged when the lift "Lower" control is operated, and automatically re-engaged when the lift "Lower" control is released.
 - c. Lift shall have full length continuous safety bar mounted to the lower surface of the main lifting platform and coupled to the control system. Safety bar will be located on the inside and the outside of both platforms. The lift will stop and lock out the operator with a horizontal or vertical displacement of the tape switch.
 - d. Equalization mechanism shall ensure that the individual lifting platforms differ in height

by no more than two inches.

D. Controls:

1. Control console shall house an oil reservoir, suction strainer, low pressure return filter, hydraulic gear pump, manual pump, and NEMA 12 rated (minimum) electrical enclosure for system disconnect, "Raise/Lower" and "Press to Lock Lift" controls and "Power-On" and "Operator Lock-Out" pilot lamps.
2. Control system shall be operated by a Programmable Logic Control (PLC) and lock-out of all operations of lift controls if insufficient air pressure to operate the safety locks, displaced safety tape switch of uneven platform height exists. This lockout shall not be able to be reset unless the unsafe condition has been corrected.
3. Control system shall be able to be programmed to stop a lift at a specific height in order to load or unload any accessory jack.

E. Accessories:

1.	50,000 rolling jack
2.	Track lighting
3.	Tape switch, 42 foot track

1. Repair bays:

- a. Center jack: 50,000 pound capacity, should slide on inner rail, one each
- b. Wheel set: Retractable, for loading or unloading of accessory center jack, one each
- c. Platform lighting system: Individual fluorescent lamps (built in), with unitized waterproof construction and clear shatterproof tubes, eight each
- d. Finish: Durable enamel in manufacturer's standard color

F. Utility Requirements:

1. Electrical:	
CONNECTION REQUIREMENTS	Unit
Voltage	460
Phase	3
HP	20
Amps	30
Connection Type	Provide disconnect
2. Plumbing:	
COMPRESSED AIR	
Connection (inches)	1
Volume (CFM)	5
Capacity (PSI)	85 - 100

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 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).

3.5 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. 5645 Lift, axle, two-post, 70,000 pound, shallow design; 8 hours (minimum)
 2. 5712 Lift, surface mounted, twin-post, 12,000 pound; 2 hours (minimum)
 3. 5716 Lift, surface mounted, twin-post, 18,000 pound; 2 hours (minimum)
 4. 5779 Lift, parallelogram, 100,000 pound, 42 feet; 8 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 14 45 00