1.0 - GENERAL

1.1 Description - Micro-Top includes:
Applications:

A. Interior and exterior renovation projects requiring resurfacing of damaged concrete.

B. New construction surfaces where elaborate design and color choices require costly multiple forming and pouring phases.

1. Materials: Micro-Top Liquid and Micro-Top Powder
2. Concrete placement and finish
3. Sealer application

1.2 Reference Standards
The licensed Bomanite Contractor is normally a Subcontractor and the Bomanite Micro-Top process is called out in a separate section from the balance of regular concrete work in Division 9. Depending on the project, the Micro Top may also be included in Divisions 2 and/or 3.

1.3 Definitions
Micro-Top by Bomanite is a system that employs the use of a troweled on cementitious topping to resurface vertical and horizontal surfaces on both indoor and outdoor applications. Micro-Top is approximately 20 mils thick (about the thickness of a postcard) and utilizes a full spectrum of color choices that can incorporate simple or elaborate graphic design. The work is performed on the job site by trained and experienced technicians.

1.4 Scope
The work designated in this section shall be specified Micro-Top by Bomanite. The work shall include all labor, material, equipment and transportation required to install the Micro-Top. The Contractor for this work shall be licensed, tooled and trained by Bomanite Corporation to use the materials and processes specified as Micro-Top. The Contractor shall be required to provide a foreman or supervisor who has done at least three Micro-Top projects.

1.5. Quality Assurance

A. All work shall be installed by a licensed Bomanite Contractor who shall provide a foreman or supervisor who has experience with and knowledge of special processes used to install Micro-Top. Evidence that the Bomanite Contractor is qualified to complete the project as specified herein shall be submitted to, and subject to the approval of, the Architect/Designer.

B. The licensed Bomanite Contractor shall provide a job site sample (100 square feet or 9.3 square meters minimum) to be approved by the Architect prior to the start of the construction. Said sample shall be the standard for the balance of the work installed, and shall be protected against damage until final approval from the Architect. The cost for the construction and protection of the reference sample shall be borne by the General Contractor.

2.0 - PRODUCTS

2.1 Concrete Mix Design (Optional)
For new construction, the concrete shall have a minimum compressive strength of 3,000 psi in non-freeze areas; 3,500 psi in moderate freeze-thaw areas; and 4,000 psi in severe freeze-thaw areas. Portland cement shall conform to ASTM C 150 Type I, II, or V,

depending on soil conditions. Aggregates shall conform to ASTM C 33. Mixing water shall be fresh, clean and potable. In freeze-thaw areas only, an air-entraining agent complying with ASTM C 260 shall be used to achieve an entrained air content for the particular mix used that is in accordance with the published recommendations of the Portland Cement Association and the American Concrete Institute. No admixtures containing calcium chloride shall be permitted.

2.2 Coloring, Application and Sealing Materials

A. (Optional) Reinforcement for new construction:
All imprinted slabs shall conform to the guidelines and recommendations of the American Concrete Institute for reinforcement of cast-in-place concrete slabs.

B. (Optional) Curing for new construction:
All concrete slabs shall be cured with Bomanite Cure and Seal or approved equal.

C. A semi-rigid elastomeric crack filler recommended by manufactured by shall be used to fill "working" cracks and construction joints.

D. Micro-Top Color: The surface shall be colored with the following Micro-Top color(s):
Provide all Sherwin Williams Paint Colors.

E. Sealer: All Micro-Top surfaces shall be sealed in accordance with the manufacturer's recommendations.

3.0 - EXECUTION

3.1 Installation Procedures

A. (Optional) for new construction:
Concrete shall be installed in accordance with the standards and specifications of the American Concrete Institute.

B. The substrate shall be clean of loose dirt and debris. Any surface irregularities, such as concrete spillage or other built up foreign materials, shall be removed by sanding, grinding or scraping so that approximately 20 mils of Micro-Top can be applied.

C. Surface shall be dry and free of grease, all stains or any unstable foreign material.

D. When topping a concrete substrate, a minimum surface temperature should be 451 F. If excessive moisture is encountered at exterior surfaces on grade, a moisture barrier is recommended. Apply according to manufacturer's recommendations.

E. Repair and fill all "working" cracks and construction joints with a semi-rigid elastomeric material in accordance with manufacturer's recommendations.

F. A single squeegee coat of Micro-Top shall be applied in accordance with the manufacturer's recommendations.

G. After the squeegee coat is dry to the touch, the top coat shall be applied in accordance with the manufacturer's recommendations.

H. After the initial curing (10 to 12 hours), a protective acrylic sealer shall be applied to the surface.

l. On exterior horizontal walking surfaces, a nonskid additive shall be applied to the acrylic sealer.

3.2 Protection and Maintenance

Newly completed surfaces should be protected from water until sealed by the Bomanite Contractor. Water left on the surface before sealing could result in a white film. This will not affect the adhesion or durability and can be cleaned prior to sealing. Acids or solvent materials should not be used over the finished Micro-Top.

Regular cleaning and maintenance of interior floors shall be done in accordance with job requirements. This will vary depending on a number of factors including volume and intensity of traffic, UV exposure, geographical location and weather conditions. For instance, interior applications will require a different routine maintenance program than exterior products. Residential applications typically require less cleaning and maintenance than commercial and municipal projects. In large commercial applications, a qualified floor maintenance contractor is recommended for routine cleaning.

All Micro-Top installations should be professionally cleaned and resealed periodically by your local Bomanite Contractor or a qualified floor maintenance contractor in order to maintain a top quality appearance. In general, expect the need for professional maintenance to occur every 12-24 months. Protective maintenance coats of sealer shall be applied periodically to assure the base acrylic is protected and the desired level of gloss is maintained. Exterior Micro-Top surfaces should be resealed annually depending on traffic, especially in freeze-thaw locations.

Contact your local Bomanite Contractor for the proper maintenance program in your area.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Footings.
2. Foundation walls
3. Slabs-on-grade.
4. Concrete toppings

B. Related Sections include the following:
1. Section 02751 for concrete pavement and walks.
2. COLOR STAINED CONCRETE - RESURFACING - SECTION 03032
3. Division 5 for metals.

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. Shop Drawings, General:

1. Submit all shop drawings on one reproducible print and two copies only. The reproducible print will be returned. All other reproductions required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
2. The contractor shall fill out the Concrete Submittal Checklist and include it as part of his mix design and/or shop drawing submittal package(s). Submittals without the checklist will be returned unchecked as an incomplete submittal. The checklist sheet is located at the end of this specification section.
   a. If there are questions, clarifications, modifications, or other items where information, a response, or approval is requested, such items must be written on the checklist. Only indicating such items on the shop drawings or within the calculations is not sufficient. Where items are not specifically listed on the checklist and subsequently not explicitly approved by the Structural Engineer of Record, such items are not to be considered approved or considered.
3. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.

4. Contract documents shall not be used for shop drawing, including erection plans or details.

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

C. Design Mixtures: Prepare design mixes for each type and strength of concrete by either laboratory trial mixtures or field experience methods as specified in ACI 318-05 Section 5.3. If trial mixtures method used, the contractor is to provide and use an independent testing facility for preparing and reporting proposed mix designs.

1. All concrete mix designs shall include the following information:
   a. Proportions of cement, fine and coarse aggregate and water.
   b. Water/cement ratio, design strength, slump and air content.
   c. Type of cement and aggregates.
   d. Type and dosage of all admixtures.
   e. Type, color and dosage of integral coloring compounds, where applicable.
   f. Special requirements for pumping.
   g. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified.
   h. Dated test data for the laboratory trial mixture or filed experience method.
   i. Material certifications (materials shall meet the requirements of section 2.5 below)
      1) Cementitious materials.
      2) Admixtures.
      3) Aggregates

2. Submit written reports to Architect and Structural Engineer of Record of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed and approved by Architect and Structural Engineer of Record.

D. Contract documents shall not be used for shop drawing, including erection plans or details.

E. 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, wall elevations, and supports for concrete reinforcement.

F. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
1. Shop drawings for formwork, prepared for fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joint or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.
   a. Architect's review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.

G. Samples: Submit samples of materials as requested by Architect, including names, sources, and descriptions for waterstops, vapor retarder and other products indicated by Architect.

H. Qualification Data: For Installer, manufacturer and testing agency.

I. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

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

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

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

K. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

L. Field quality-control test and inspection reports.

M. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

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

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

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

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. The Owner shall employ an approved Testing Agency to perform concrete and concrete related tests and inspections (that are not specifically noted as the contractor's responsibility) as

required by the Building Code, Project Documents, the Architect, and the Structural Engineer of Record.

E. The contractor shall employ at his expense an approved Testing Agency as defined above to perform the following:
   1. Evaluation of trial mixtures and/or concrete testing for mix design submission.
   2. Qualification of proposed materials and establishment of concrete mixtures.
   3. Other testing services needed or required by the contractor.

F. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

G. Testing Responsibilities of the Contactor:
   1. Submit data on qualifications of Contractor's proposed testing agency. Use of testing services will not relive the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.
   2. Furnish any labor necessary to assist Owner's testing agency in obtaining and handling samples at the project site or at the source of materials.
   3. Advise Owners Testing Agency at least 24 hours in advance of operations to allow for completion of quality tests and assignment of personnel.
   4. At the Contractor's expense, provide and maintain for the sole use of the Owner's Testing agency adequate facilities for the safe storage and proper curing of concrete test specimens on the project site for initial curing as required by ASTM C31.

H. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

I. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

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

   1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
   3. ACI 302 "Guide for Concrete Floor and Slab Construction".
   4. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
   5. ACI 305 "Hot Weather Concreting".
   6. ACI 306 "Cold Weather Concreting".
   7. ACI 309 "Guide for Consolidation of Concrete".
   8. ACI 347 "Recommended Practice for Concrete Formwork".
   9. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."

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

L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.
b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

c. Structural 1, B-B or better; mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

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

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

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

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A 82, as drawn.

C. Deformed-Steel Wire: ASTM A 496.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

A. 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 slabs on grade, use chairs with sand plates or prefabricated plastic supports with wide base to prevent chairs from getting pushed into subbase during concrete pour.

2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, gray or white. Supplement with the following:

   a. Fly Ash: ASTM C 618, Class C or F.
      1) Limit use of fly ash to not exceed 25 percent of cementitious content by weight.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
      1) Limit use of Ground Granulated Blast-Furnace Slag to not exceed 50 percent of cementitious content by weight.

2. Blended Hydraulic Cement: ASTM C 595, Type [IS, portland blast-furnace slag] [IP, portland-pozzolan] [I (PM), pozzolan-modified portland] [I (SM), slag-modified portland] cement.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. Use of admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.

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

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

ASTM C 494/C 494M, Type C. Set-Accelerating Corrosion-Inhibiting Admixtures must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.

1. Available Products:

    a. Boral Material Technologies, Inc.; Boral BCN.
    b. Euclid Chemical Company (The); Eucon CIA.
    c. Grace Construction Products, W. R. Grace & Co.; DCI.
    d. Master Builders, Inc.; Rheocrete CNI.
    e. Sika Corporation; Sika CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Non-Set-Accelerating Corrosion-Inhibiting Admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.

1. Available Products:

    a. Axim Concrete Technologies; Catexol 1000CI.
    b. Boral Material Technologies, Inc.; Boral BCN2.
    c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
    d. Master Builders, Inc.; Rheocrete 222+.
    e. Sika Corporation; FerroGard-901.

E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis. See architectural drawings and site plan for concrete requiring color pigment.

1. Available Manufacturers:

    a. Bayer Corporation.
    b. ChemMasters.
    c. Conspec Marketing & Manufacturing Co., Inc.; a Dayton Superior Company.
    d. Davis Colors.
    e. Elementis Pigments, Inc.
    f. Hoover Color Corporation.
    g. Lambert Corporation.
    h. Scofield, L. M. Company.
    i. Solomon Colors.

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

2.7 WATERSTOPS

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

1. Available Manufacturers:

    a. Bometals, Inc.
    b. Greenstreak.

c. Meadows, W. R., Inc.
d. Tamms Industries, Inc.
e. Vinylex Corp.

2. Profile: As indicated.
3. Dimensions: As indicated; nontapered.

2.8 VAPOR RETARDERS

A. Underslab Vapor Barrier 1: 15 mil minimum thickness, Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced, high density polyethylene, or polyolefin equivalent, complying with ASTM E 1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
2. Basis of Design Product:
   a. STEGO INDUSTRIES LLC Product Stego Wrap (15-mil) Vapor Barrier ; www.stegoindustries.com
3. Other Acceptable products
   a. Fortifiber Building Systems Group Product Moistop Ultra® 15; www.fortifiber.com.
   b. Reef Industries Product Griffolyn 15 Mil ; www.reefindustries.com.
   c. W.R. Meadows Inc. Product PERMINATOR 15 ; www.wrmeadows.com.
   d. Substitutions: See Section 01 6000 - Product Requirements.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 FLOOR AND SLAB TREATMENTS

A. General: The contractor shall coordinate and insure that all floor and slab treatments, curing materials and compounds, finish floor materials, related materials, paints, and repair compounds are compatible.

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces. To be applied where concrete indicated to be sealed in Architectural Drawings.

1. Available Products:

   a. Burke by Edoco; Titan Hard.
   b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.
   c. Dayton Superior Corporation; Day-Chem Sure Hard.
   d. Euclid Chemical Company (The); Euco Diamond Hard.
   e. L&M Construction Chemicals, Inc.; Seal Hard.

f. Meadows, W. R., Inc.; Liqui-Hard.
g. Nox-Crete Products Group, Kinsman Corporation; Duranox.

C. For additional information on color stained concrete see 03032 Color Stained concrete specifications.

2.10 CURING MATERIALS

A. General: The contractor shall coordinate and insure that all floor and slab treatments, curing materials and compounds, finish floor materials, related materials, paints, and repair compounds are compatible. Evaporation retarder shall not be used where epoxy floor covering is to be placed; slab shall be wet cured with Absorptive Cover or Moisture-Retaining Cover as indicated below.

1. The contractor shall verify and be responsible for insuring the VOC emission limits of authorities having jurisdiction are not exceeded during the project.

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

1. Available Products:
a. Burke by Edoco; BurkeFilm.
b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
c. Dayton Superior Corporation; Sure Film.
d. Euclid Chemical Company (The); Eucobar.
e. L&M Construction Chemicals, Inc.; E-Con.
f. Meadows, W. R., Inc.; Sealtight Evapre.
g. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
h. Sika Corporation, Inc.; SikaFilm.

C. 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.

D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet or natural fiber matting attached to plastic sheet backing. Acceptable product is Aquacure by DRC, exclusive distributor - Greenstreak Group, Inc. 800-325-9504, or equal.

E. Water: Potable.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. Review curing compounds with manufacturer and waterproofing manufacturer to make sure curing compound does not inhibit adhesion.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoco; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.

h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
m. Tamms Industries, Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. US Mix Products Company; US Spec Maxcure Resin Clear.
p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

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

1. Available Products:

a. Anti-Hydro International, Inc.; AH Clear Cure WB.
b. Burke by Edoco; Spartan Cote WB II.
c. ChemMasters; Safe-Cure & Seal 20.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
f. Euclid Chemical Company (The); Aqua Cure VOX.
g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
h. Lambert Corporation; Glazecote Sealer-20.
i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
j. Meadows, W. R., Inc.; Vocomp-20.
k. Metalcrete Industries; Metcure.
l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
n. Tamms Industries, Inc.; Clearseal WB 150.
o. Unitex; Hydro Seal.
p. US Mix Products Company; US Spec Hydrasheen 15 percent
q. Vexcon Chemicals, Inc.; Starseal 309.

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

1. Available Products:

a. Burke by Edoco; Spartan Cote WB II 20 Percent.
b. ChemMasters; Safe-Cure Clear.
c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; High Seal.
d. Dayton Superior Corporation; Safe Cure and Seal (J-19).
e. Euclid Chemical Company (The); Diamond Clear VOX.
f. Kaufman Products, Inc.; SureCure Emulsion.
g. Lambert Corporation; Glazecote Sealer-20.
h. L&M Construction Chemicals, Inc.; Dress & Seal WB.
i. MBT Protection and Repair, Div. of ChemRex; MasterKure-N-Seal VOC.
j. Meadows, W. R., Inc.; Vocomp-20.
k. Metalcrete Industries; Metcure 0800.
l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 200E.
m. Sonneborn, Div. of ChemRex; Kure-N-Seal.
n. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.

o. Tamms Industries, Inc.; Clearseal WB STD.
p. Unitex; Hydro Seal 18.
q. US Mix Products Company; US Spec Radiance UV-25
r. Vexcon Chemicals, Inc.; Starseal 0800.

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

1. Available Products:

a. Burke by Edoco; Cureseal 1315.
b. ChemMasters; Spray-Cure & Seal Plus.
c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Sealcure 1315.
d. Dayton Superior Corporation; Day-Chem Cure and Seal (J-22UV).
e. Euclid Chemical Company (The); Super Diamond Clear.
f. Kaufman Products, Inc.; Sure Cure 25.
g. Lambert Corporation; UV Super Seal.
h. L&M Construction Chemicals, Inc.; Lumiseal Plus.
i. Meadows, W. R., Inc.; CS-309/30.
j. Metalcrete Industries; Seal N Kure 0.
k. Sonneborn, Div. of ChemRex; Kure-N-Seal 5.
l. Tamms Industries, Inc.; LusterSeal 300.
m. Unitex; Solvent Seal 1315.
n. US Mix Products Company; US Spec CS-25
o. Vexcon Chemicals, Inc.; Certi-Vex AC 1315

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

1. Available Products:

a. Burke by Edoco; Cureseal 1315 WB.
b. ChemMasters; Polyseal WB.
c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Sealcure 1315 WB.
d. Euclid Chemical Company (The); Super Diamond Clear VOX.
e. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
f. Lambert Corporation; UV Safe Seal.
g. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
h. Meadows, W. R., Inc.; Vocomp-30.
i. Metalcrete Industries; Metcure 30.
j. Symons Corporation, a Dayton Superior Company; Cure & Seal 31 Percent E.
k. Tamms Industries, Inc.; LusterSeal WB 300.
l. Unitex; Hydro Seal 25.
m. US Mix Products Company; US Spec Radiance UV-25.
n. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

K. For additional information on finishing and sealing floor surfaces to receive color stained concrete see COLOR STAINED CONCRETE - RESURFACING - SECTION 03032

2.11 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, epoxy resin with a Type A shore durometer hardness of 80 typically unless noted or aromatic polyurea at traffic areas with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

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

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

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

E. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: 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 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.

2.13 CONCRETE MIXTURES, GENERAL

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

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

B. Concrete type, slump, air content, and maximum water to cementitious content shall be as shown on the Structural Drawings.

C. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

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

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

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

1. Use of admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal
2. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
3. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
4. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
5. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

F. Slump Limits: Proportion and design mixes to result in slump at point of placement as shown on the drawings.
1. When use of a Type I or II plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C494 is permitted, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.

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

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Building Members: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated in drawings.

2. Maximum Water-Cementitious Materials Ratio: As indicated in drawings.
3. Slump Limit: As indicated in drawings. 8 inches (200 mm), plus or minus 1 inch (25 mm), for concrete with verified slump indicated in drawings before adding high-range water-reducing admixture or plasticizing admixture].
4. Air Content: As indicated in drawings, at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

2.15 FABRICATING REINFORCEMENT

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

2.16 CONCRETE MIXING

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

1. Mixing and delivery time shall not exceed 90 minutes.
2. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.

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

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

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

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

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

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

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

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
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.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Plastic Vapor Retarders: Convene preconstruction meeting prior to starting work. Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

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

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" and Structural Drawings for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

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

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

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

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

3.6 JOINTS

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

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

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls no further than 90' on center. Locate joints midway between piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

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

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
3. Slab reinforcement shall not cross contraction joints.

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

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 WATERSTOPS

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

3.8 CONCRETE PLACEMENT

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

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

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

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

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with the recommendations and intent of 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. Deliver concrete to meet the following minimum temperatures immediately after placement:
   a. 55 deg F for sections less than 12in. in the least dimension.
   b. 50 deg F for sections 12in. to 36in. in the least dimension.
   c. 45 deg F for sections 36in. to 72in. in the least dimension.
   d. 40 deg F for sections greater than 72in. in the least dimension.
   e. The temperature of concrete as placed shall not exceed these values by more than 20 deg F.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 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.

3.9 FINISHING FORMED SURFACES

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

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

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

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

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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

3.10 FINISHING FLOORS AND SLABS

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

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.

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

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

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

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated by Architect, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F(F) 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.

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

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

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

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

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

1. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate or aluminum granules over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate or aluminum granules.

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

1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

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

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

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

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after

loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions to concrete floors indicated in Architectural Drawings to be troweled and sealed.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Do not apply to concrete that is less than seven days' old unless otherwise required by manufacturer.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

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

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

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

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

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

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

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Also see specification 01410 Structural Tests and Special inspections for additional information.

B. Inspections:

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

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

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days. Compression test specimens for days not specified shall be at the contractors expense.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Structural Engineer of Record but will not be used as sole basis for approval or rejection of concrete.

13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete at the Contractor's expense when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Structural Engineer of Record. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

CONCRETE SUBMITTAL CHECKLIST

This submittal checklist must be provided with all concrete and reinforcing steel packages that are to be submitted to Structural Design Group. Absence of a properly completed checklist may result in the return of the submittal unchecked or as revise and resubmit.

MIX DESIGN		
Included?	**Description**	**Location in project documentation where this requirement is located.**
☐	Field data or trial mixture strength data	Spec Section 03300, Part I, Subsection 1.4
☐	Verify Mix Design Constraints Limit Fly Ash to 25% Limit Proportions per Spec Section 03300, Part II, Subsection 2.5 W/C ratio, Air, Slump per General Notes	Spec Section 03300, Part II, Subsection 2.5 General Notes – Section 4.0
☐	Mix Design Data: 1. Proportions of cement, fine and coarse aggregate and water. 2. Water/cement ratio, design strength, slump and air content. 3. Type of cement and aggregates. 4. Type and dosage of all admixtures. 5. Type, color and dosage of integral coloring compounds, where applicable. 6. Special requirements for pumping. 7. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified. 8. Material certifications 1) Cementitious materials. 2) Admixtures. 3) Aggregates .	Spec Section 03300, Part I, Subsection 1.4 Spec Section 03300, Part I, Subsection 2.5, 2.6

REBAR SHOP DRAWINGS		
Included?	**Description**	**Location in project documentation where this requirement is located.**
☐	Submit all shop drawings on one reproducible print and two reproductions only.	General Notes - Section 2.0 Spec Section 03300, Part I, Subsection 1.4
☐	Contract documents not used for shop drawing.	Spec Section 03300, Part I, Subsection 1.4
☐	Resubmitted shop drawings have all revised items clouded or identified.	Spec Section 03300, Part I, Subsection 1.4
☐	Any requested information, clarifications, requests for approvals, modifications, etc. as listed in Spec Section 03300, Part I, Subsection 1.4 are included by the contractor below.	Spec Section 03300, Part I, Subsection 1.4

FORMWORK, RE-SHORE, OTHER SHOP DRAWINGS		
Included?	**Description**	**Location in project documentation where this requirement is located.**
☐	Submit all shop drawings on one reproducible print and two reproductions only.	General Notes - Section 2.0 Spec Section 03300, Part I, Subsection 1.4
☐	Contract documents not used for shop drawing, including erection plans or details	Spec Section 03300, Part I, Subsection 1.4
☐	Resubmitted shop drawings have all revised items clouded or identified.	Spec Section 03300, Part I, Subsection 1.4
☐	Any requested information, clarifications, requests for approvals, modifications, etc. as listed in Spec Section 03300, Part I, Subsection 1.4 are included by the contractor below.	Spec Section 03300, Part I, Subsection 1.4
☐	Calculations stamped by an Engineer registered in the state where the project is located.	Spec Section 03300, Part I, Subsection 1.4
QUESTIONS, ETC. PER SECTION 03300, PART I, SUBSECTION 1.4		

END OF SECTION 03300

1.0 - GENERAL

1.1 Scope

A. Furnish and install all Architectural Precast Concrete as indicated on the drawings and herein specified.

1.2 Submittals

A. Submit shop drawings for approval.

B. Shop drawings shall show fabrication details, layout plan, connection and anchorage details not indicated on the architect's drawings, and member identification marks. The identification marks shall appear on manufactured units to facilitate correct field placement.

1.3 Qualifications

A. The concrete products covered by this specification and shown on the drawings shall be equal quality, strength, appearance, texture, design, shape and dimensions of that manufactured by Miller Precast Company, or pre-approved equal.

B. Architectural Precast Concrete shall be reinforced, capable of supporting tensile loads and be manufactured according to standards of wet cast process. **Dry cast products (such as Cast Stone) shall not be acceptable.**

C. The latest edition of the following specifications, standards and codes shall govern with modifications as specified herein:

1. American Concrete Institute:
   ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures.
   ACI 318 - Building Code Requirements for Reinforced Concrete.
   ACI 347 - Recommended practice for Concrete Formwork.

2. American Welding Society:
   AWS D1.0 - Code for Welding in Building Construction.
   AWS D3.0 - Standard Qualification Procedure.
   AWS D12.1 - Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

3. Industrial Fasteners Institute:
   Handbook on Fastener Standards.

2.0 - PRODUCTS

2.1 Materials

Materials shall be as outlined in ACI 318 - Building Code Requirements for Reinforced Concrete and the AISC Manual of Steel Construction.

2.2 Design

A. All concrete products shall be designed to support the dead and live loads in accordance with the International Building Code.

B. Proposed design shall be supported by complete calculations and drawings, and shall have the architect's approval.

C. All reinforcing, connection, bearing and fitting details shown on the drawings indicate the intent. The concrete manufacturer shall be responsible for all detail connections and design thereof. Provide all materials required.

2.3 Finish

A. Surface textures shall be with scored markings as selected by the Architect.

B. All standard shaped concrete products shall be cast in steel, fiberglass, or concrete molds. Special shaped products may be cast in accurately constructed forms with smooth interior surfaces of plastic coated wood, Masonite or similar materials.

C. Formed surfaces of concrete products shall be plant finish with an Architectural Grade a Finish. All air pockets and holes larger than 1/4" shall be filled with a sand-cement paste. All form offsets or fins shall be ground smooth.

D. All surfaces of concrete shall be clean and uniform for acceptable exposed finish.

2.4 Fasteners

A. The concrete manufacturer shall cast in structural inserts, bolts and plates as detailed on the contract drawings or required.

B. Hand drilled, power drilled, and power driven inserts and studs may be placed in concrete members. Power driven inserts and studs shall be located a minimum of 4" from concrete edges to eliminate spalling.

3.0 - EXECUTION

3.1 Installation

A. Concrete members shall be lifted and supported during manufacturing operations, stockpiling, transporting, and erection, only at the lifting and/or support points shown on the shop drawings.

B. All concrete members shall be erected into final position in the structure by the concrete manufacturer or by other competent erection personnel.

C. Erection shall be done with equipment, methods and personnel acceptable to the architect and manufacturer.

D. Erection shall be defined as including placing and leveling the members in final position in the structure on bearing surfaces prepared true to the line and grade under other items of the general contract.

E. Removal of lifting hook, if required.

END OF SECTION

1.0 - GENERAL

1.1 Related Documents

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

1.2 Summary

A. This Section includes unit masonry assemblies consisting of , but not limited to the following:

1. Concrete Masonry Units
2. Brick unit masonry
3. Mortar and Grout
4. Insulation in masonry walls

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Flashing and Sheet Metal" for exposed sheet-metal flashing installed in masonry
2. Division 7 Section-07910 - "Joint Sealants" for sealing joint in mockup
3. Division 7 - 07720 - Wall flashing
4. Division 7 - Section 07180 -Dampproofing
5. Division 8 - Section 08110 -Hollow Metal Doors and Frames

C. Products installed but not furnished under this Section include the following:

1. Hot dip-galvanized Steel lintels for unit masonry
2. Wood nailers and blocking built into unit masonry
3. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section "Flashing and Sheet Metal."

1.3 Submittals

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Samples for initial selection of the following:

1. Unit masonry samples in full size form showing the full range of colors and textures available for each different exposed masonry unit required.

D. Samples for verification of the following:

1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.

a. Include size-variation data for Type FBS brick, verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances.
b. Weep holes/vents in color to match mortar color.

2. Accessories embedded in the masonry.

E. List of Materials Used in Construction Mockups: List generic names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.

F. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
2. Each material and grade indicated for reinforcing bars.
3. Each type and size of joint reinforcing.
4. Each type and size of anchors, ties, and metal accessories.

G. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

1. Mortar complying with property requirements of ASTM C 270.
2. Grout complying with property requirements of ASTM C 476.
3. Masonry units complying with property requirements of ASTM C90.

H. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 Quality Assurance

A. Clay Masonry Unit Test: For each clay masonry unit indicated, per ASTM C 67

B. Concrete Masonry Unit Test: For each different concrete mansory unit indicated, per ASTM C 140

C. Mortar Test: Test mortar properties per test methods of ASTM C 270

D. Evaluate mortar composition and properties per ASTM C 780

E. Grout Test: Test grout for compressive strength per ASTM C 1019

F. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

G. Single-Source Responsibility 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 one source and by a single manufacturer for each different product required.

H. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

I. Mockup: Prior to installing unit masonry, construct sample wall panel(s) to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

2. Locate mockups on site in the locations indicated or, if not indicated, as directed by Architect.
   a. Include exterior face brick wall with field and accent brick and a control joint.
   b. Seal control joint complying with Division 7 Section "Joint Sealants".

3. Build mockups for the following types of masonry full thickness, including face and back-up wythes as well as accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
   a. Typical exterior face brick wall with through wall flashing installed for a 24 inch length in corner of mockup approximately 16" down from top of mockup with a 12 inch length of flashing left exposed to view (omit masonry above half of flashing).
   b. Typical interior masonry unit wall.
   c. Clean exposed faces of mockups with masonry cleaner "Sure Klean 600" or other masonry manufacturer approved cleaner.
   d. Protect accepted mockups from the elements with weather-resistant membrane.

4. Notify Architect one week in advance of the dates and times when mockups will be constructed.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
   a. Acceptance of mockup is for color, texture and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship and other material and construction qualities specifically approved by Architect in writing.
   b. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
   c. When directed, demolish and remove mockups from Project site.
   d. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 Special Inspections

Cooperate and adhere to the requirements of 2021 International Building Code - Special Inspections. All masonry and masonry reinforcing shall be subject to special inspections and

observations, at stage intervals deemed necessary, by the Owners' third party Inspector, Engineer and/or the Architect prior to grout filling.

1.6 Special Markings

A. The contractor shall chalk-line mark the floor slab for masonry wall locations.

B. The contractor shall mark on the floor slab location of reinforcing dowels to serve grouted cells so as to be clear as to locations of vertical cell reinforcement.

C. The contractor shall mark the concrete sub-floor with temporary marker paint to identify location of structural CMU reinforcing dowels so as to accurately locate reinforced cells during wall erection. Markings should be transferred to CMU surfaces as installation allows.

D. Prefabricated Corner and "T" Wall Reinforcing - upon arrival to the job site and while material is in bundle state, the ends shall be spray painted in the field with permanent bright red paint for easy recognition during site inspections.

1.7 Special Sequencing

A. After the special markings have been provided and prior to the start of CMU installation, an inspection of the concrete floor slab and CMU reinforcing dowels shall be required.

B. CMU wall construction designed to receive structural reinforcement and cell grouting shall be installed in such sequencing as to consolidate the work of placing reinforcement and cell grouting to minimum concentrate intervals encompassing such significant quantities as to warrant truck delivery of ready-mixed grout.

C. The work event of placing structural reinforcement and grouting shall require continuous special observation by the Owner's third party Inspector(s) as required by the 2021 International Building Code. Grout mix samples shall be required for testing purposes. The General Contractor shall directly schedule special masonry observations at least 24 hours in advance and notify Architect accordingly. Cost associated with special sequencing shall be considered and included in base bid.

1.8 Delivery, Storage, and Handling

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store 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 avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 Project Conditions

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

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

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

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 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 mortar splatter by coverings spread 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 on 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 subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:

   a. 40 to 32 deg F: Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:

   a. 40 to 25 deg F : Cover masonry with a weather-resistant membrane for 48 hours after construction.
   b. 25 to 20 deg F: Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h.
   c. 20 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after construction.

3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above.

2.0 - PRODUCTS

2.1 Manufacturers

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Brick:
   a. Acme Brick Co.
   b. Belden Brick Co.
   c. Cherokee Sanford Group, Inc.
   d. US Brick
   e. Boren
   f. Triangle
   g. Boral
   h. Tri-State

2. Portland Cement, Mortar Cement, Masonry Cement, and Lime:
   a. Essroc Materials, Inc.
   b. Glen-Gery Corporation
   c. Lafarge Corporation

3. Joint Reinforcement, Ties, and Anchors:
   a. Dur-O-Wal, Inc.
   b. Heckman Building Products, Inc.
   c. Hohmann & Barnard, Inc.
   d. Wire-Bond

2.2 Concrete Masonry Units

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

2. Bullnose units are required for all outside corners of vertical surfaces, unless otherwise indicated.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2,000 psi.
2. Weight Classification: **NORMAL**
3. Aggregates: Do not use aggregate made from pumice, scoria or tuff.
4. Provide Type N-I moisture-controlled units
5. Size: Manufactured to the actual dimensions indicated on Drawings within tolerances specified in the applicable referenced ASTM specification. Typical unit 8" nominal, 6" nominal, 4" nominal, or 12" nominal as indicated on drawings.

C. Custom Textured and Color Concrete Masonry Split Face Units

Units shall be made with either white marble or white limestone to meet ASTM C - 90-90 Type I. Units shall be of size as indicated and/or as required and shall be laid in stack bond. Furnish all necessary halves, flush ends, and specials. Face detail shall be as indicated on drawings and details.

2.3 Brick

A. General: Provide shapes indicated and as follows for each form of brick required.

1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.

1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes and lintels.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Face Brick: ASTM C 216 and as follows:

1. Grade and Unit Compressive Strength: Provide units with grade and minimum average net-area compressive strength indicated below:
   a. Grade: SW. With color through brick to match existing school brick predominant on buildings in the school complex or as otherwise selected by the architect.
2. Type: FBS. With color through brick as selected by the architect.
3. Size: Bricks manufactured to the following actual dimensions within tolerances specified in ASTM C 216:
   a. Standard: 3-5/8 inches thick by 2-1/4 inches high by 7-5/8 inches long.
4. Application: Use where brick is exposed, unless otherwise indicated.
5. Color and Texture: As selected by the architect.

D. Brick Schedule
1. Contractor to provide an allowance (materials only) for the brick. See Section 01020 – Allowances.

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. Masonry Cement: ASTM C91

C. Hydrated Lime: ASTM C 207, Type S (for CMU) Type N (for face brick).

D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.

1. White-Mortar Aggregates: Natural white sand and or ground white stone.

F. Aggregate for Grout: ASTM C 404.

G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

H. Cold Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C; and recommended by the manufacturer for use in masonry mortar of composition indicated.

I. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

J. Water: Potable.

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

1. Cold Weather Admixture:
   a. "Accelguard 80"; Euclid Chemical Co.
   b. "Morset"; W. R. Grace & Co.

2. Mortar shall be approved equal to Lafarge as selected by Architect from full range of mortar colors available.

2.5 Ties and Anchors, General

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated. Provide ties that will extend into the brick veneer a minimum of one half of the veneer width.

B. Wire: As follows:
1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for wire ties and anchors in exterior walls.
2. Wire Diameter: 0.1875 inch.

2.6 Bent Wire Ties and Cornices

A. Individual units prefabricated from bent wire to comply with requirements indicated below:

1. Type for Masonry where Whythes are of Different Material: Adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches. Ties shall be long enough to extend through rigid wall insulation and into outer wythe a minimum of 2 inches.

B. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:

1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.
2. Ladder design with cross rods spaced not more than 16" o.c. One side rod for each face shell of concrete masonry back-up and one rod for brick wythe.
3. Wire Size: 0.1875" diameter for deformed rods; No. 9 cross rods.
Hot dipped galvanized, Class 3. H. Reinforcing:

4. Brick to block ties: 3/16" diameter adjustable double hook & eye; Hohmann & Barnard Lox-All Adjustable Eye-Wire, Dur-o-wall or equal.

2.7 Embedded Flashing Materials

A. Vinyl Flashing:

1. Thickness: 40 mil thick.
2. Application: Use where flashing is fully concealed in masonry

B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.

C. Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to the following:

1. Vinyl Flashing:
   a. Gibraltar
   b. Nervastral
   c. AFCO

2.8 Single-Wythe CMU Flashing

Single-Wythe Concrete Masonry Unit Drainage System: BlockFlash™
Install CMU cell flashing pans with built in adjoining bridge made from recycled polypropylene with chemical stabilizers that prevent UV degradation. Flashing pans have a sloped design to direct moisture to the integrated weep spout. Designed to be built into mortar bed joints to expel moisture (unimpeded by mortar droppings) to the exterior of CMU walls. Drainage Mats and Insect Guards included. Product: Subject to compliance with requirements, provide "BlockFlash™" as manufactured by Mortar Net Solutions.

2.9 Miscellaneous Masonry Accessories

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from Neoprene.

B. Preformed Metal Control-Joints: Heckman 16 oz. copper – Type 93U, designed to fit brick size and configuration as indicated.

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

D. Weep Holes: Provide the following:

1. Wicking material: Cotton sash cord in length required to produce 2 inch exposure on exterior and 18 inches in cavity between wythes.

E. Sealer for Brick: Prosoco-Siloxane-Weather Seal

F. Rebar Positioners: 3/16" diameter, hot-dipped galvanized and provided at 48" vertical centers in each reinforced cell.

2.10 Wall Reinforcement and Anchors

A. Continuous wall reinforcement at 16" o.c. for all masonry walls shall be hot-dipped galvanized and of either truss or ladder design with tabs for exterior two Wythe walls. Reinforcement shall have not less than No. 9 steel wire cross rods and No. 9 deformed side rods. Wires shall conform to ASTM A82. Reinforcement shall have

a drip when used in cavity walls, use rectangular pintle sections 16" o.c. in back-up masonry and adjustable double eyelet sections in face brick where rigid insulation is indicated or required in cavity space or where face brick and back-up masonry is not run up together. Use manufacturer's pre-formed corners and intersecting sections and splice as recommended. Basis of material selection shall be Hohmann & Barnard #270 or approved equals by Heckmann Building Products, Wire Bond and Dur-O-Wall.

2.11 Masonry Cleaners

A. Job Mixed Detergent Solution: Solution of ½ cup dry measure tetrasodium polyphosphate and 1/2 cup dry measure laundry detergent dissolved in 1 gallon of water.

B. Proprietary Detergent Solution: Manufacturer's standard strength cleaner designed for removing mortar/grout stains, efflorescence and other new construction stains from new masonry surfaces as acceptable to masonry material manufacturer. "Sure Klean" No. 600 Detergent; ProSoCo, Inc., or approved equal. Do not use acid cleaners.

2.12 Mortar and Grout Mixes

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.

1. Limit cementitious materials in mortar to portland cement-lime.

2. Use Type S or N mortar.

D. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.

E. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Grout to have minimum 2,500 psi compressive strength at 28 days when tested in accordance with ASTM C1019.

1. Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.
2. Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.

3.0 - EXECUTION

3.1 Examination

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.
2. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 General

A. Lay out all masonry work according to the dimensions shown on the drawings. No work shall be laid unless the temperature is 35° F. and rising.

B. All masonry work shall be laid straight, level, plumb, and true. Exterior walls shall be laid continuously around the entire structure and in no case racked up more than five (5) feet.

C. Build in all flashing, anchors, reinforcing, inserts, wall plugs, lintels, bearing plates, bond beams and items as required to accommodate the work of others.

D. All special details such as chases, openings, expansion joints, projections, corbels, etc., shall be built as required and/or indicated on the drawings.

E. Lay all masonry, brick and block in full bed of mortar completely filling all joints with mortar. Allow for caulking joints at all window and door frames, and at all wall intersections.

F. Joints of all exposed masonry surfaces shall be finished after the mortar has taken its initial set. Use a straight edge for horizontal joints. Vertical joints shall be in alignment from top to bottom.

G. At the end of each day or when rain or frost is imminent, the tops of masonry walls and similar surfaces shall be properly protected by covering top of wall with a strong waterproof membrane well secured in place.

H. Consult all other trades in advance and make provisions for the installation of their work to avoid cutting and patching. Do all cutting and patching of masonry required to accommodate work of others.

I. Unfinished work shall be stepped back to permit joining of new work. Masonry work may be toothed only when approved. Before connecting new work with work previously built, sweep clean, remove loose mortar and thoroughly wet the old brick.

J. As the work progresses, mortar daubs and smears shall be cleaned from masonry work.

K. Door frames shall be set before the masonry walls are built. As the masonry walls are built around these frames, the inside of the frames shall be grouted solid with mortar. NOTE: See HOLLOW METAL DOORS AND FRAMES - SECTION 08110 for requirements to coat interior of frames prior to grouting.

L. Extend all rated walls to the underside of structural deck above unless otherwise approved. Fit walls neatly with all joints filled where two levels of ceiling occur, extend walls to high level. Extend all partition walls to 8" above adjacent ceiling.

M. Weep holes: Provide weep holes in head joints 32" o.c. at thru wall flashing where air space is not open downward. Weep holes shall be below finish floor line and above finish grade.

N. MORTAR IN CONTACT WITH COPPER PIPING WILL NOT BE ACCEPTED. Coordinate with plumbing or mechanical contractor if copper is encountered without sleeving/insulation. Anticipate additional corrective work.

3.3 Installation, General

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

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

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

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

3.4 Construction Tolerances

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet , nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet) or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.5 Laying Masonry Walls

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

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry:

1. Lay CMU in running bond pattern

D. Lay concealed masonry with all units in a wythe as above. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

J. Build non load-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.6 Mortar Bedding and Jointing

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed all webs in mortar.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.
5. Fill bottom course of all CMU solid with mortar.
6. Fill all courses of CMU adjacent to fill in area of ramp and stage solid with mortar.

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

1. Lay all brick with full head and bed joints.
2. At cavity walls, bevel beds away from cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.
3. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4-to-3/8-inch joints. Three brick courses and three mortar courses in 8-inch vertical to course with CMU.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

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

3.7 Structural Bonding of Multiwythe Masonry

A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties as shown, but not less than 1 metal tie for 4 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown. Provide continuity with horizontal joint reinforcing at corners by using prefabricated "L" units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space by providing continuity with horizontal joint reinforcing at corners by using prefabricated "T" units.

3.8 Cavities

A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.

1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.
2. Tie exterior wythe to back-up with individual metal ties. Stagger alternate courses.

3.9 Anchoring Masonry to Structural Members

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Space weldable rebar couplers at horizontal bond beams as indicated, but not more than 24 inches o.c. vertically.

3.10 Cavity Wall and Masonry Cell Insulation

A. On units of plastic board insulation, place small dabs of adhesive, spaced approximately 12 inches o.c. both ways on inside face or attach to inside face with plastic fasteners designed for his purpose. Verify compatibility of adhesive and bituminous damproofing specified in Division 7. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

B. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.11 Horizontal Joint Reinforcement

A. General: Provide continuous horizontal joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, ½" elsewhere. Lap reinforcing a minimum of 6 inches.

1. Space reinforcement not more than 16 inches vertically o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement in mortar joints 1 block course above and below wall openings and extending 12 inches beyond opening.
   a. Reinforcing above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

3.12 Control and Expansion Joints

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through

movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry by installing preformed control-joint gaskets designed to fit standard sash block.

C. Form expansion joints in brick made from clay or shale by forming an open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Maintain joint free and clear of mortar.

3.13 Lintels

A. Install steel lintels where indicated.

B. Provide pre-cast masonry lintels where shown and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.14 Flashing, Weep Holes, and Vents

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

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashing as follows:

1. At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches and through the inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches unless otherwise indicated.
2. At lintels and shelf angles extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.
3. Flashing installation is to be inspected and approved in writing by Architect before proceeding with masonry work.

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

1. Form weep holes with product specified in Part 2 of this Section.
2. Form weep holes by keeping head joints free and clear of mortar.
3. Space weep holes 24 inches o.c.

E. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

1. Install through-wall flashing and weep holes above horizontal blocking.

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

3.15 Grouting of CMU Walls

A. Contractor to notify Owner's Testing Agent prior to all grouting of steel reinforced CMU.

B. All cavities with steel reinforcing to be cleaned of all debris and broken CMU prior to filling with grout.

C. All reinforcing steel in cells to be filled with grout or concrete to be continuous with laps as required by code.

D. Grout for filled masonry cells is not to be dropped more than five (5) feet.

3.16 Repairing, Pointing and Cleaning

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, 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 application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using approved masonry cleaner.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.17 Sealing of Brick

A. Take precautions to avoid harm to building occupants, pedestrians, nearby property and all non-masonry surfaces from contact with sealer and fumes. Protect and/or divert auto and pedestrian traffic.

B. Test masonry (minimum 4 ft x 4 ft area) before overall application to assure compatibility and desired water repellent results. (Treated and cured masonry should shed water and not wet out.) Apply tests using the same equipment as for job application and allow to cure 24 to 48 hours. Test panels should remain available for inspection by Architect.

C. Surface Preparation:

1. Fill all cracks and voids to avoid penetration of fumes into the building. (Such openings may permit moisture, sealer or sealer fumes to penetrate wall.) Make sure that all caulks and sealants are in place and completely cured.
2. Clean dirt, oil and other contaminants from the surface. Use appropriate proprietary cleaners (do not use raw acids) where necessary. Rinse with pressure equipment at 500 to 1,500 psi to thoroughly remove all detergent residues. Do not apply to surfaces that are wet to the touch. Best results are obtained on dry surfaces. Internal moisture should also be dissipated.

3.18 Masonry Waste Disposal

A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the project site.

END OF SECTION

1.0 - GENERAL

1.1 Summary

A. Brick Pavers

B. Bedding and Joint Sand

1.2 References

ASTM International List of Applicable Standards:

1. C 902 Standard Specification for Pedestrian and Light Traffic Paving Brick
2. C 1272 Standard Specification for Heavy Vehicular Paving Brick
3. C 136 Method for Sieve Analysis for Fine and Coarse Aggregate
4. C 67 Method of Sampling and Testing Brick and Structural Clay Tile
5. C 33 Specification for Concrete Aggregates
6. C 144-89 Standard Specification for Aggregate for Masonry Mortar

1.3 Quality Assurance

A. Installation shall be completed by a contractor with at least one (1) year of experience in placing interlocking pavers on projects with similar scope and budget.

B. Installation contractor shall adhere to all local/state/provincial licensing and bonding requirements.

1.4 Submittals

A. Submit product drawings and data.

B. Submit samples of fired clay paving units to indicate color, size and finish selections. Color will be selected by Architect from manufacturer's available color palette.

C. Submit sieve analysis for grading of bedding and joint sand.

D. Submit test results for compliance of paving unit requirements to ASTM C 902 or ASTM C 1272 from and independent testing laboratory.

E. Submit installer qualifications: provide satisfactory evidence that the installer complies with the qualifications set out in section 1.03.

F. Submit a detailed schedule and work plan.

1.5 Mock Ups

Install a 10 ft. x 10 ft. paver area as described in section 3.02. This area will be used to determine surcharge of the bedding sand layer, joint sizes, lines, laying pattern(s), color(s), and texture of the job. This approved mock up is the standard by which appearance, workmanship, substrate preparation and material application will be judged.

1.6 Delivery, Storage And Handling

A. Deliver brick pavers to the site in plastic banded, steel banded or plastic wrapped cubes or on pallets capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.

B. Sand shall be covered with waterproof covering to prevent exposure to rainfall or removal by wind. The covering shall be secured in place.

1.7 Environmental Conditions

A. Do not install sand or pavers during heavy rain or snowfall.

B. Do not install bedding sand over frozen base materials.

C. Do not install sand when frozen.

2.0 - PRODUCTS

2.1 Brick Pavers

Brick pavers may have spacer bars or "lugs" on the sides of each unit.

A. Brick pavers shall be A Grade pavers manufactured by a member of the Brick Industry Association (BIA)

B. Paver type(s), dimensions, and edge finishes used shall be:

Paver Type	Dimensions	Edge Finish
Standard Paver	4" x 8" x 2¼"	Beveled Edge

C. Pavers shall meet the following requirements set forth in ASTM C 902 "Specification for Pedestrian and Light Traffic Paving Brick"

1. Minimum average compressive strength of 10,000 psi.

2. The average cold water absorption shall not be greater than 6% with no individual unit testing greater than 7%. Absorption test results may not be achieved through the use of sealers or other products applied to the clay paver.

3. Resistance to 50 freeze-thaw cycles, when tested in accordance with ASTM C67. In addition, the clay paver must pass CSA-A231.2 freeze thaw test in saline solution without the use of sealers or other chemical treatments. A test report must be submitted by the manufacturer if required.

4. Dimensional tolerances should meet the PX standard. The dimensional tolerances around the mean values for length, width, and depth shall be 1/16". Pavers with the Antique edge finish will meet a PX Standard for dimensional tolerances and a PA Standard for "Maximum Permissible Extent of Chippage from Edges and Corners" due to the tumbled nature of this product.

5. The pavers should be solid units without core holes or other perforations.

6. The contractor shall ensure that the manufacturer conducts a statistically-representative, on-going sampling of current production to maintain compliance with dimensional and water absorption requirements. This sample shall be representative of the color blend in the typical package and selected on a consistent basis.

2.2 Bedding And Joint Sand

A. Bedding and joint sand shall be clean, non-plastic, free from deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock.

B. The grading of sand samples shall be done according to ASTM C136. The particles shall be sharp, angular and conform to the grading requirements of ASTM C33 as shown in Table 1.

Table 1: ASTM C 33	
Gradation for Bedding Sand	
Sieve Size	**Percent Passing**
3/8"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10
No. 200	0 to 1

C. Joint sand shall conform to the grading requirements of ASTM C 144 as shown in Table 2.

Table 2: ASTM C 144	
Gradation for Joint Sand	
Sieve Size	**Percent Passing**
No. 4	100
No. 8	95 to 100
No. 16	70 to 100
No. 30	40 to 75
No. 50	10 to 35
No. 100	2 to 15
No. 200	0

3.0 - EXECUTION

3.1 Examination

A. Verify that subgrade preparation, compacted density and elevations conform to the specifications. Compaction of the soil subgrade to at least 95% Standard Proctor Density per ASTM D 698 is recommended. Higher density or compaction to ASTM D 1557 may be necessary for areas subject to heavy vehicular loads or larger commercial projects. Stabilization of the subgrade and /or base material may be necessary with weak or saturated soils.

B. Verify that the compacted base is dry, uniform, even and ready to support sand, pavers and imposed loads. Do not fill low areas with bedding sand when adjusting final base course, use base material.

C. Verify that the elevations of the base are correct, and that density test results, if applicable, conform to the specifications above.

D. Verify that the location, type, installation and elevations of edge restraints around the perimeter satisfy specifications and approved drawings.

E. The start of bedding sand and paver installation verifies owner acceptance of base and edge restraints, so obtain proper approvals before proceeding.

3.2 Installation

A. Provide edge restraints as indicated by project drawings.

B. Spread the sand evenly over the base course and screed to 1" thickness. The bed sand should not be disturbed after final screeding, i.e. raked, compacted by foot or equipment traffic, etc. Do not spread bedding sand beyond the area to be covered by pavers on any given day. If the sand is disturbed or allowed to sit overnight, then rework and re-screed the sand bed prior to laying pavers.

C. Ensure that pavers are free of foreign material before installation. The installer shall unload the pavers from at least two cubes at a time in order to improve color blending.

D. Lay the pavers in the pattern as shown on the drawings. Full pavers are to be laid first. The pavers should be laid hand tight using the "click and drop" method. Maintain straight pattern lines and adjust as necessary.

E. Joints between the pavers shall be between 1/16" and 1/8" wide. Pavers which feature spacer bars (or lugs) may be placed in contact with one another.

F. Fill the gaps at the edges of the paved area with cut pavers or edge units. Pavers that will be placed along the edge should be cut with a masonry saw or paver splitter and should never be cut smaller than one third (1/3) of a full paver.

G. Use a low-amplitude, high-frequency plate vibrator capable of 3000 to 5000 lbs. centrifugal compaction force to vibrate the pavers into the sand. Vibrate the pavers first with no joint sand, then begin sweeping dry joint sand into the joints until they are full. This will require at least two or three passes with the plate vibrator. Do not vibrate within three feet of any unrestrained edge on the paving surface.

H. All work to within three feet of the laying face must be left fully compacted with sand-filled joints at the completion of each day.

I. Sweep off excess sand when the job is complete.

J. The final surface elevations shall not deviate more than 3/8" under a 10 foot long straightedge.

K. The surface elevation of the pavers shall be ⅛" to ¼" above any adjacent drainage inlets, concrete collars or channels.

3.3 Field Quality Control

After removal of the excess sand, check final elevations for conformance to the drawings.

3.4 Protection And Clean Up

A. Protection:

1. Protect work from damage, discoloration and theft.

2. All vehicles and equipment operating on the completed pavers before and after application of the joint sand stabilizer shall be maintained in a clean condition, so that oil, tar, or other staining materials are not deposited on the surface of the pavers or adjacent finished areas.

B. Clean up:

1. All waste materials generated by construction work shall be removed at the end of each completed section and the site shall be left in a clean and safe condition daily.

2. After completion of any repair work, clean all exposed surfaces with clean water and stiff brushes until all stains and dirt are removed. The use of commercial cleaning solutions must be in accordance with the manufacturers' recommendations and approved for use on clay pavers.

3.5 Maintenance

The paver installer shall return to the site at the owner's request for a period up to one year from job completion to rectify any problems in the work caused by a failure to adequately align the pavers, compact the bedding sand, fill the joints, or carry out any other specified activity within the installer's control.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. For additional information on exterior steel painting see specification section 09910.

1.2 SUMMARY

A. This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.

1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.

2. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.

3. Refer to Division 3 for anchor bolt installation in concrete and Division 4 for anchor bolt installation in masonry.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Submit all shop drawings as directed by the architect.

B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards). This data is submitted for information only.

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including nuts and washers.

a. Include Direct Tension Indicators if used.

3. Structural steel primer paint.

4. Shrinkage-resistant grout.

C. Shop drawings including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.

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. Contract documents shall not be used for shop drawing, including erection plans or details.

6. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.

7. All structural steel connections not specifically detailed on the drawings shall be designed to resist forces indicated, by the Contractor.

8. For structural-steel connections indicated to comply with design loads, include structural analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.

9. For each connection, the following shall be noted on the shop drawings:
   a. Required design reaction
   b. Calculation sheet number for design
   c. Capacity of detailed connection
   d. Stamp of Engineer submitting calculations for the connection

10. All shop drawings which do not provide this information will be returned unchecked as an incomplete submittal.

D. Test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges", dated June 10, 1992.

   a. General: AISC "Code of Standard Practice" shall apply except to the extent that references are made to the responsibility of the Owner and/or Architect or Engineer in which event those references shall have no applicability. Where a conflict exists between the Code of Standard Practice and the Contract Documents, the Contract Documents shall govern.

2. AISC "Specifications for Structural Steel Buildings," including "Commentary".

3. AISC "Specifications for Structural Steel Buildings, Section 10, Architecturally Exposed Structural Steel".

4. "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Structural Connections.

5. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."

6. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

B. Qualifications for Welding Work: Qualify welding procedures and welding operators in

accordance with AWS "Qualification" requirements.

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

2. If re-certification of welders is required, retesting will be Contractor's responsibility.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. Deliver anchor rods and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.

1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

B. Structural Steel: ASTM A992, Grade 50 for wide flange beams; ASTM A36 elsewhere.

C. Cold-Formed Steel Tubing: ASTM A500, Grade B.

D. Hot-Formed Steel Tubing: ASTM A501.

E. Steel Pipe: ASTM A53, Type E or S, Grade B; or ASTM A501.

F. Moment Connection Material: Unless noted otherwise on the drawings, stiffener plates, doubler plates, gusset plates and the connecting plates shall be the same grade of steel as members being connected.

G. Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.

H. Anchor Rods: ASTM A307 Grade A, headed type with supplementary requirements S1, unless otherwise indicated.

I. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts.

1. Provide either hexagonal or square heads and nuts, except use only hexagonal units for exposed connections.

J. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and

hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325.

    a. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B695, Class 50, or hot-dip galvanized complying with ASTM A153.

2. Quenched and tempered alloy steel bolts, nuts, and washers, complying with ASTM A490.

K. Electrodes for Welding: Comply with AWS Code.

L. Structural Steel Primer Paint: Red oxide primer.

M. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.

N. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

    a. 100 Non-Shrink Grout (Non-Metallic); Conspec, Inc.
    b. Supreme Grout; Cormix, Inc.
    c. Sure Grip Grout; Dayton Superior.
    d. Euco N.S.; Euclid Chemical Co.
    e. Crystex; L & M Construction Chemicals, Inc.
    f. Masterflow 713; Master Builders.
    g. Sealtight 588 Grout; W. R. Meadows.
    h. Propak; Protex Industries, Inc.
    i. Set Non-Shrink; Set Products, Inc.
    j. Five Star Grout; U.S. Grout Corp.

2.2 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections: Weld or bolt shop connections, as indicated.

1. Bolt field connections, except where welded connections or other connections are indicated.

    a. Provide high-strength threaded fasteners for all principal bolted connections, except where unfinished bolts are indicated.

C. Simple Beam Connections: Standard double angle framed beam connections using bolts as specified.

1. Seated Beam Connections and Stiffened Seated Beam Connections shall not be used unless indicated on the drawings or unless Engineer approval is obtained to verify capacity of supporting member for the resulting eccentricity. The fabricator must verify and bear responsibility that the use of such connections does not interfere with Architectural or MEP requirements.

D. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts."

E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

F. Steel Wall Framing: Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

G. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.

H. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.

I. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING

A. General: Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.

1. Do not paint surfaces to be welded or high-strength bolted with slip-critical-type connections.

2. Do not paint surfaces scheduled to receive sprayed-on fireproofing.

3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Painting: Provide a one-coat, shop-applied paint system complying with Steel Structures Painting Council (SSPC) Paint System Guide No. 7.00.

C. Painting of steel exposed to weathering in the finished configuration of the structure:

1. Surface Preparation: Clean surfaces to be painted. Remove rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning.

2. Prime Coat: Immediately after surface preparation, provide one coat of grey shop applied Organic Zinc Rich Urethane Primer, such as Tnemec 90-97, at 2.5 to 3.5 mils DFT which meets the following performance requirements:
   a. Solids by Volume: 63%

b. Zinc Content: 83% y weight.
c. Salt Spray (Fog): ASTM B 117, Scribed Panels, 50,000 hours exposure.
d. Adhesion: ASTM 4541 – Type V – no less than 2,083 psi(14.36 MPa) pull.
e. Prohesion: ASTM G85 Prohesion Cabinet Testing. 15,000 hours.
f. Cathodic Disbondment: ASTM G8, Method A.
g. Immersion: ASTM D 870 Potable Water Immersion. 7 year exposure.
h. AISC Static Fatigue: Primer shall meet requirements of a Class B surface with a mean slip coefficient no less than 0.50 and a tension creep not in excess of .005 inch over SSPC-SP6 prepared substrate.

3. Touch Up Primer/Preparation before Finish Coats: Immediately after erection all surfaces shall be cleaned per SSPC – SP1 followed by spot repair preparation of SSPC-SP11 Power tool clean to white metal. Remove all foreign materials and contaminates, clean field welds, bolted connections, and abraded areas of shop paint. All damaged and abraded areas shall have feathered edges. Field touch-up with one coat of Prime Coat, paint applied at 2.5-3.5 Mils DFT prior to finish coat.

4. Intermediate Coat: Provide one grey finish coat of an Aliphatic Acrylic Polyurethane, such as Tnemec Series 1075 Endura-Shield II, at 3.0 to 5.0 mils DFT which meets the following performance requirements:
   a. Solids by Volume: 71%
   b. Salt Spray (Fog): ASTM B 117, 2,000 hours exposure.
   c. Abrasion: ASTM 4060 (CS-17 Wheel, 1,000 gram load, 1,000 cycles). No more than 139 mg loss.
   d. Adhesion: ASTM 4541 – no less than 1,423 psi(9.81 MPa) pull.
   e. Flexibility: ASTM D 522 (Method A) – no less than 14.4% elongation.
   f. Hardness: ASTM 3363- no gouging with an HB or less pencil.
   g. Humidity: ASTM 4585- 4,000 hours exposure.
   h. Impact: ASTM B 2794 – no cracking or delamination of film after 35 inch-pounds direct impact.
   i. Prohesion: ASTM G85 – 10,000 hours exposure.

5. Finish Coat: Provide one finish coat (color to be selected by architect) of an Advanced Thermoset Solution Fluoropolymer, such as Tnemec Series 1070 Fluoronar, at 2.0 to 3.0 mils DFT which meets the following performance requirements:
   a. Solids by Volume: 60%
   b. Salt Spray (Fog): ASTM B 117 – 10,000 hours exposure
   c. Abrasion: ASTM 4060 – (CS-17 Wheel, 1,000 gram load, 1,000 cycles) no more than 103 mg loss.
   d. Adhesion: ASTM 4541 – Type V – no less than 1,930 psi(13.3 MPa) pull.
   e. Flexibility: ASTM D 522 (Method A)- no less than 14.83% elongation.
   f. Hardness: ASTM 3363 – no gouging with an 8H or less pencil.
   g. Humidity: ASTM 4585 – 3,000 hours exposure.
   h. Impact: ASTM B 2794 - no cracking or delamination of film after 35 inch-pounds direct impact.

6. Any Field Painting to be brush or roller applied.

7. Owners testing agent to continuously review the surface preparation and application of the painting of steel exposed to weathering in the finished configuration of the structure.

2.4 SOURCE QUALITY CONTROL

A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with

specified requirements.

1. Promptly remove and replace materials or fabricated components that do not comply.

B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.1 ERECTION

A. Surveys: Employ a licensed land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

4. For proprietary grout materials, comply with manufacturer's instructions.

E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

F. Level and plumb individual members of structure within specified AISC tolerances.

G. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean

temperature at which structure will be when completed and in service.

H. Splice members only where indicated and accepted on shop drawings.

I. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces. Each erection bolt on shop drawings shall be noted "Erection Bolt".

1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

J. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

3.2 QUALITY CONTROL

A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

D. Testing agency may inspect structural steel at plant before shipment.

E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

F. Field Inspections and Tests:

1. Check steel as received in the field for possible shipping damage workmanship, piece making and verification of required camber.

G. Shop-Bolted Connections:

1. Inspect or test in accordance with AISC specifications.

2. For bolted connections (bearing-type), all connections shall be visually observed to assure that all bolts, nuts and washers are in place and that all plies of connection material have been drawn together. All bolts shall be verified to be snug tight only.

H. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds, including but not limited to fit-up, intermediate passes and final weld.

3. Perform tests of welds as follows. Inspection procedures listed

    a. Ultrasonic Inspection: ASTM E164. Perform on all full and partial penetration welds.

I. Field-Bolted Connections:

1. Inspect in accordance with AISC specifications.

2. For bolted connections (bearing-type), all connections shall be visually observed to assure that all bolts, nuts and washers are in place and that all plies of connection material have been drawn together. All bolts shall be verified to be snug tight only.

3. Bolts in slotted holes at expansion joints shall have nuts finger tight with threads damaged.

J. Field Welding: Inspect and test during erection of structural steel as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds, including but not limited to fit-up, intermediate passes and final weld.

3. Perform tests of welds as follows:

    a. Ultrasonic Inspection: ASTM E164. Perform on all full and partial penetration welds.

END OF SECTION 05120.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including general and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.

2. Non-Composite floor deck.

B. Related Sections include the following:
1. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
2. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
3. Division 09 painting Sections for repair painting of primed deck.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Submit all shop drawings as directed by the architect.

B. Product data including manufacturer's specifications and installation instructions for each type of decking and accessories.

1. Provide test data for mechanical fasteners used fastening deck to supporting structures.

C. Shop drawings showing layout and types of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut openings, special jointing, and other accessories.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated:

1. American Iron and Steel Institute (AISI), "Specification for the Design of Cold-Formed Steel Structural Members."

2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel."

3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks."

B. Qualification of Field Welding: Use qualified welding processes and welding operators in

accordance with "Welder Qualification" procedures of AWS.

1. Welded decking in place is subject to inspection and testing. General Contractor will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be unsatisfactory. Remove work found to be defective and replace with new acceptable work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. Roof Deck, Inc.
8. United Steel Deck, Inc.
9. Vulcraft Div., Nucor Corp.

2.2 MATERIALS

A. Steel for Galvanized Metal Deck Units: ASTM A 446, grade as required to comply with SDI specifications.

B. Miscellaneous Steel Shapes: ASTM A 36.

C. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

D. Galvanizing: ASTM A 525, G60.

E. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.3 PRODUCTS

A. ROOF DECK.

1. 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:

2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade **33**, **G60** zinc coating.
3. Deck Profile: SEE PLAN
4. Profile Depth: SEE PLAN
5. Design Uncoated-Steel Thickness: SEE PLAN
6. Span Condition: Triple span or more.
7. Side Laps: Overlapped or butted over support at contractor's option

B. NON-COMPOSITE FLOOR DECK

1. Non-Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:
2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
3. Profile Depth: 9/16"

4. Design Uncoated-Steel Thickness: see plan
5. Span Condition: See Plan

.2.4 ACCESSORIES:

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

C. Mechanical Fasteners: Corrosion-resistant self-drilling, self-threading screws.

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

E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

H. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.

I. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 2 - EXECUTION

2.1 EXAMINATION

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

2.2 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.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

2.3 ROOF DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members AS INDICATED IN DRAWINGS:

1. Anchor Diameter: SEE PLAN.
2. Screw Spacing: SEE PLAN

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps as noted on drawings. Fasten perimeter edges of at intervals not exceeding 12" and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws or 5/8" diameter puddle welds as indicated on drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

2.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: See Plan.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart and as indicated on plan.

B. Side-Lap Fastening: Fasten side laps between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1 ½ inch long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches and joints as follows:

1. End Joints: Lapped or butted at Contractor's option

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

2.5 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. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

F. Test all weld studs according to applicable standards.

2.6 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. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

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 Design and or Build work of the following:

1. Exterior load-bearing wall framing
2. Exterior non-load-bearing wall framing
3. Roof rafter framing

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

C. The extent of cold formed metal framing is shown on the drawings, including notes, elevations and details to show basic layout and location of members, typical connections, and type of steel required.

D. Section includes all work and supplementary items required to complete the proper installation of the pre-engineered cold formed metal framing as shown on the drawings and specified herein including headers, outriggers, supplemental rafters and incidental framing for a cold formed metal framing assembly within the extent shown on the drawings.

E. Section includes all work and supplementary items required to complete the proper installation of the pre-engineered cold formed metal framing as shown on the drawings and specified herein including headers, outriggers, supplemental rafters and incidental framing for a cold formed metal framing assembly within the extent shown on the drawings.

F. Cold formed metal framing includes planar structural units consisting of welded, screwed or bolted connected members which are fabricated, cut and assembled prior to delivery or at the job site.

1.3 REFERENCES

A. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

B. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

C. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

D. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

E. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

G. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

H. AISC - Steel Construction Manual.

I. AISI - Specification for the Design of Cold-Formed Steel Structural Members; 1996.

J. AWS D.1.3 - Structural Welding Code - Sheet Steel.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated. Design bridging and other temporary and permanent bracing for same loads as used to design cold formed metal framing plus any temporary loads and permanent loads resulting laterally bracing of members.

1. Engineering Responsibility: Manufacturer's responsibilities include using a qualified professional engineer to prepare structural analysis data for cold formed metal framing. All cold formed metal framing not specifically detailed on the drawings shall be designed to resist forces indicated, by the Contractor, under the direct supervision of a professional engineer registered in the State where the project is located. Engineer/firm shall provide proof of professional liability insurance for said engineering responsibility.
    a. Design calculations for the Cold formed metal framing designed by the Contractor shall be submitted for the files of the Architect and Engineer. Calculations shall bear the seal of a professional engineer registered in the State where the project is located. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittal.
    b. Engineering provided by manufacturer shall be a complete package similar to the "Works" package provided by Aegis Metal Framing or equal. Package to include at a minimum, but not limited to the following:
        1) Professional Engineer seal on shop drawings and calculations.
        2) Design of all trusses including special trusses such as drag strut trusses, blocking trusses and eave blocking to resist lateral load specified to be transferred from the roof diaphragm to the structural system.
        3) All truss to truss connections and all trusses to support connections.
        4) Permanent Bracing layout diagrams with connection requirements showing bracing sections and details.
        5) Construction Bracing (lateral and diagonal) Layout Diagrams for bottom chord plane, web plane and top chord plane showing bracing sections and details.
        6) Minimize Construction Bracing by incorporating Permanent Bracing into the construction bracing where possible.

2. Design Loads: As follows:

    a. Dead Loads: Weights of materials and construction.
    b. Roof Live Loads: 20 PSF
    c. Snow Loads: As indicated in drawings.
    d. Wind Loads: As indicated in drawings.
    e. Seismic Loads: As indicated in drawings.
    f. Loads indicated on drawings plus concentrated loads hung from or supported on trusses. Refer to mechanical, electrical and plumbing drawings and specifications for loading information and location. Loading as required by other subcontractors, such as fire protection, shall be coordinated by the General Contractor.

3. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

    a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height.
    b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
    c. Roof Trusses: Vertical deflection of 1/240 of the span up to ¾ inch total dead load and ¾ inch total live load.
    d. Roof Rafter Framing: Horizontal deflection of 1/240 of the horizontally projected span up to ¾ inch total dead load and ¾ inch total live load.

4. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
5. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

    a. Upward and downward movement of 1/2 inch (13 mm).

6. Holes in Members: Design for holes in members where shown for securing other work to trusses; however, deduct area of holes from the area of chord when calculating strength of member.

B. Cold-Formed Steel Framing, General: Design according to 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 exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
3. Roof Trusses: Design according to AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

1.5 SUBMITTALS

A. This project is a 'Total Design and or Build' construction delivery system and review of submittals by the Owner or his representative does not relieve the 'Design and or Build' Contractor of design duties, construction responsibility or liability for improper design, function

or performance. The review by Owner is not an independent design check of final plans and methods of construction by and will not in any way relive the 'Design and or Build' contractor of sole design and construction responsibility for the successful completion and long term stability of the work.

B. Product Data: For each type of cold-formed metal framing product and accessory indicated.

C. Shop Drawings: Show layout, spacing, sizes, thicknesses, pitch, span, camber and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work. Shop drawings shall include all placement sequences and instructions.
   1. Submit all shop drawings on three copies only unless specified in the general conditions. Two prints will be returned to the architect. All other reproductions required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
   2. Architect's and Engineer's Shop Drawing Review: Review of shop drawings will be for general considerations only. Compliance with requirements for materials, fabrication, engineering, dimensions, bracing, and erection is the Contractor's responsibility.
   3. If there are questions, clarifications, modifications, or other items where information, a response, or approval is requested, such items must be written on the cover sheet to the submittal. Only indicating such items on the shop drawings or within the calculations is not sufficient. Where items are not specifically listed on the cover sheet and subsequently explicitly approved by the Structural Engineer of Record, such items are not to be considered approved or considered.
   4. Submit design analysis and test reports indicating loading, section properties, allowable stress, stress diagrams and calculations, and similar information needed for analysis and to insure trusses comply with requirements.
   5. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation licensed to practice in the state where the project is located. Shop drawings which do not contain this information will be returned unchecked.
   6. Submittals shall additionally conform to the requirements shown on the General Notes of the project Structural Drawings.
   7. Provide permanent bracing drawings for the metal stud truss system. Permanent bracing shall be designed by the contractor under the direct supervision of the professionally registered engineer licensed in the state that the project is located. The permanent bracing shop drawings and calculations shall be submitted with the truss shop drawings and calculations. The permanent bracing and metal stud shop drawings are to be considered one submittal. If one is submitted without the other the submittal will be returned rejected.

D. Welding certificates.

E. Qualification Data: For professional engineer and testing agency.

F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

   1. Steel sheet.
   2. Expansion anchors.
   3. Power-actuated anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Horizontal drift deflection clips

7. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: For cold-formed metal framing.

1.6 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

G. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

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

1.7 FABRICATOR'S QUALIFICATIONS

A. Cold formed metal framing shall be designed, fabricated, and erected by a firm which has a record including a minimum of five years of successfully designing, fabricating, and erecting cold formed metal framing assemblies similar to scope required and which practices a quality control program. Fabricators shall additionally be qualified with at least one year experience in using Building Information Modeling (BIM) from inception to producing shop drawings.

B. Fabricators who wish to qualify for approval under this Section of the specification shall submit evidence of compliance with this specification no later than ten (10) days prior to the bid date. Only those fabricators approved in writing by the Architect prior to the bid date will be accepted.

1.8 DELIVERY, STORAGE, AND HANDLING

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

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

C. Do not store materials on structure in a manner that might cause distortion or damage to supporting structures.

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. AllSteel Products, Inc.
2. California Expanded Metal Products Company.
3. Clark Steel Framing.
4. Dale/Incor.
5. Dietrich Metal Framing; a Worthington Industries Company.
6. Formetal Co. Inc. (The).
7. Innovative Steel Systems.
8. MarinoWare; a division of Ware Industries.
9. Southeastern Stud & Components, Inc.
10. Steel Construction Systems.
11. Steeler, Inc.
12. Super Stud Building Products, Inc.
13. United Metal Products, Inc.

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: Minimum of Grade 33 or as required by structural performance.
2. Coating: G60 (Z180).

B. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50 (340), Class 1 or 2 or as required by structural performance.
2. Coating: G90 (Z275).

2.3 EXTERIOR LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
2. Minimum Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: as required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm) or matching steel studs.
2. Minimum Flange Width: 1-1/4 inches (32 mm).
3. Section Properties: as required by structural performance.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 18ga
2. Minimum Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: as required by structural performance.

D. Steel Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:

1. Minimum Base-Metal Thickness: 18 ga
2. Top Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: as required by structural performance.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
2. Minimum Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: as required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 18 ga or matching steel studs.
2. Minimum Flange Width: 1-1/4 inches (32 mm)].
3. Section Properties: as required by structural performance.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation

d. The Steel Network, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Dietrich Metal Framing; a Worthington Industries Company.
    b. MarinoWare, a division of Ware Industries.
    c. SCAFCO Corporation
    d. The Steel Network, Inc.

3. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
4. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.

E. Contractors' Option Double Deflection Tracks: Manufacturer's 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, and as follows:

    a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
    b. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.

2. Inner Track: Of web depth indicated, and as follows:

    a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
    b. Flange Width: outer deflection track flange width plus 1 inch (25 mm).

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.

6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Rafter hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 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.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

D. Cold formed metal framing to be fabricated at the fabricator's shop in the largest sections possible to transport and erect.

E. All cold formed metal framing shall be fabricated and erected in strict accordance with the current printed instructions of the approved subcontractor or fabricator.

F. All cold formed metal framing components shall be straight and true prior to fabrication. Flattening or straightening of components, when necessary, shall be accomplished in a manner so as to not damage the component.

G. All cold formed metal framing components shall be cut neatly to fit snugly against adjacent members.

H. No splices will be allowed in cold formed metal framing except as authorized in writing by the Architect or as shown on the approved shop drawings.

I. Framing components shall be field or shop fabricated and joined to one another by means of welding or through the use of screws.

J. Completed cold formed metal framing shall be free from twists, bends, or open joints with all members straight and true to line.

K. Welds must be thoroughly cleaned and wire brushed and primed and painted with a high zinc content paint capable of providing an equal or greater degree of protection than the original G-60 galvanized coating.

L. Bridging: Fabricate horizontal or diagonal type bridging for cold formed metal framing as required to prevent buckling of members where sheathing applied to the cold formed metal framing members is not present or is not adequate to brace the cold formed metal framing member. Bridging shall transfer all forces to the roof diaphragm.

M. End Anchorage: Fabricate end anchorages to secure cold formed metal framing to adjacent construction.

N. Fabricate all clips, angles, henways and other miscellaneous pieces necessary to attach cold formed metal framing to the substructure or to attach other components within this section to one another.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

A. Structural Adequacy: Contractor shall prepare the structure to insure proper and adequate structural support for the materials specified.

B. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

C. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

D. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or rafter locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

E. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or rafter locations.

3.3 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. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed rafters, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

K. Weld in compliance with AWS D.1.3.

3.4 EXTERIOR LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: To match stud spacing.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm).

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced a minimum of 48 inches (1220 mm) apart or as required by structural performance. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm).

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
4. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows but not more than 48 inches (1220 mm) apart or as required by structural performance. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

    a. Install solid blocking at 96-inch (2440-mm) centers.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 ROOF RAFTER INSTALLATION

A. Install perimeter rafter track sized to match rafters. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install rafter bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten rafters to both flanges of rafter track.

1. Install rafters over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
2. Reinforce ends and bearing points of rafters with web stiffeners, end clips, rafter hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space rafters not more than 2 inches (51 mm) from abutting walls, and as follows:

1. Rafter Spacing: 24 to 48 inches or as required by structural performance.

D. Frame openings with built-up rafter headers consisting of rafter and rafter track, nesting rafter, or another combination of connected rafters if indicated.

E. Install rafter reinforcement at interior supports with single, short length of rafter section located directly over interior support, with lapped rafters of equal length to rafter reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals as required by structural performance Fasten bridging at each rafter intersection as follows:

1. Bridging: Rafter-track solid blocking of width and thickness indicated, secured to rafter webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and rafter-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of rafters and secure solid blocking to rafter webs.

G. Secure rafters to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous rafter framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable rafter-framing assembly.

3.7 TRUSS INSTALLATION

A. Install, bridge, and brace trusses according to Shop Drawings and requirements in this Section.

B. Truss Spacing: 48 inches (1220 mm).

C. Do not alter, cut, or remove framing members or connections of trusses.

D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

E. Erect trusses without damaging framing members or connections.

F. Align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.

G. Install continuous bridging and permanently brace trusses as required by structural performance and designed according to LGSEA's Technical Note 551e, "Design Guide for Permanent Bracing of Cold-Formed Steel Trusses."

H. Trusses shall be braced against racking. Lifting of trusses shall be done so as to not cause local distortion in any member.

I. All trusses shall be erected using equipment of adequate capacity to safely perform the work.

J. The General Contractor is responsible for checking the dimensions and assuring the fit of all members and trusses before erection begins.

K. All work shall be erected plumb and level and to dimensions and spacings indicated on the drawings. Provide bridging and permanent bracing as shown in the shop drawings.

L. Assemblies shall be of the size and spacing shown on the approved shop drawings.

M. Provide web stiffeners and reinforcement at reaction points where required by analysis or to suit details.

N. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members.

O. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.

P. Anchor trusses securely at all bearing points to comply with methods and details indicated.

Q. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand design loads, and comply with other indicated requirements.

R. Do not cut or remove truss members.

S. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

T. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening.

3.8 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports per Specification Section 01410.

B. Field and shop welds will be subject to testing and inspecting.

C. Provide Access for testing agency to places where truss work is being fabricated or produced so that required inspections, observations and testing can be accomplished.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace work where test results indicate that it does not comply with specified requirements.

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

G. Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirements regardless of when testing agency completed inspection, observation or testing.

H. Site fabricated trusses shall have all screw connections reviewed. Truss member sizes and configurations shall be reviewed for all trusses. Testing cost shall be included in base bid.

3.9 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

1.0 - GENERAL

1.1 Scope
Furnish and install all miscellaneous metals as indicated on drawings, including that shown only on Architectural Drawings, and/or as specified.

1.2 Submittals
Submit shop drawings for approvals.

1.3 Applicable Standards
Fabrication and erection, except as specified otherwise, shall be in accordance with American Institute of Steel Construction (AISC) Specifications for the Design, Fabrication and Erection of Structural Steel for Building.

1.4 Qualification
Manufacturer's names, models, or catalog numbers, referred to herein are intended to show the type, quality and intent of items required. Products of other manufacturers equal or better in quality, similar in design are acceptable subject to the Architect's approval.

1.5 Substitutions
Substitutions of sections or modifications of details shall be submitted with the shop drawings for approval. Approved substitutions, modifications, and necessary changes in related portions of the work shall be coordinated by the contractor and shall be accomplished as no additional cost.

2.0 - PRODUCTS

2.1 General Materials

A. Metals shall be free from defects impairing strength, durability, or appearance and of the best commercial quality for the purposes specified. All materials shall be new materials and shall have structural properties to sustain safely or withstand strains or stressed to which normally subjected. All exposed fastenings shall be of same material, color and finish as the metal to which applied unless otherwise shown.

B. Provide all accessories such as anchors, hangers, belts, toggle bolts, expansion bolts, rods, shelf angles, clip angles, shims, connections, stiffeners, reinforcements, screws, etc., required for proper complete fabrication, assembly and installation of all miscellaneous steel, metal work and masonry. Bolts, screws, expansion bolts, toggle bolts, etc, shall be brass, bronze, stainless steel or aluminum when used with these metals.

C. Steel lintels and miscellaneous structural shapes where called for shall be of shapes, lengths and weights, as shown and detailed on the drawings, spanning openings where so indicated, shall be complete with bolts, anchors, etc., for building in. Lintels shall not have less than eight (8") inch bearing upon masonry.

D. Galvanized steel shall be hot-dipped galvanized in accordance with the Standard Specifications of the American Hot-Dip Galvanizing Association. Galvanizing shall be done after fabrication.

E. All materials shall be well formed to shape and size with sharp lines. Conceal fasteners where practical. Thickness of metals and details of assembly and

supports shall give ample strength.

F. Welding shall conform to American Welding Society's Standard Code for Arc and Gas Welding in Building Construction. Welding shall be continuous along entire area of contact, except where tack welding is specifically shown or specified. Tack welding will not be permitted on exposed surface. Grind all exposed welds smooth.

2.2 Painting and Protective Coating

A. Thoroughly clean off all miscellaneous metal, using power tool cleaning to remove all dirt, grease, rust, and scale and foreign matter.

B. Treat only concealed galvanized metal with galvanized metal primer as per manufacturer's directions before painting. Exposed galvanized metal to be primed and finished under Painting Section.

C. Unless otherwise specified, paint all metal items, including concealed galvanized metal, one shop coat of Red or Grey oxide zinc chromate TT-P-636-C. Surfaces inaccessible after assembly shall be painted before assembly. Work paint thoroughly into joints, etc. Do not paint bronze, aluminum or stainless steel.

D. Insulate faces of all metals in contact with different metals, wood, masonry, and/or concrete; give each contact surface one coat approved alkali-resistant bituminous paint. Let both surfaces dry before installing metals.

2.3 Miscellaneous Metal Items

The following items are intended as a guide to such work in this project and do not necessarily limit the scope of this section.

A. All structural shapes indicated and/or required.

B. Miscellaneous Steel Lintels. Provide miscellaneous steel lintels indicated on Architectural and/or Structural Drawings or as required. All miscellaneous steel lintels are subject to structural engineer's review and approval.

C. Steel Stairs as indicated for 125 lb./sq./ft. live load capacity steel pan construction. Tread, riser, and landing pans of 14 ga. U.S.S. Stringers 10" channel at 8.4 lbs./ft. minimum or as indicated or required. Provide all channels, angles, closures, clips, anchors, as required. Cement fill 2" treads and 3" landings under Concrete Section. Prime under this Section.

D. Interior and Exterior Round Member Stair And Ramp Handrail, Guardrails and Brackets as indicated and detailed. Handrail to be 3 ft. min. Wood handrail under CARPENTRY - SECTION - 06210.

E. Protective Bollards shall be steel pipe with prefabricated stock cap 6" diameter 7' steel painted pipe bollards filled with concrete set 3'-6" deep in 15" diameter concrete footing. Bollards shall be placed 3'-6" from connection and spaced around the perimeter at 48" o.c. max.

F. Protective Bumper Guards shall be 4" x 4" steel tubing with stock cap, filled with concrete after setting. Tubing shall be 3'-0" above concrete and set into concrete minimum of 2'-0". Provide continuous horizontal steel channel C-10 x 15.3.

G. Metal Ladders - Provide steel ladders where indicated of 3/8" x 2-1/2" steel bar stringers spaced 20" o.c. with 3/4" square bar rungs set at 45 degrees and welded

to stringer 12" o.c. Anchor ladder to masonry with clip angles or bent plates designed to hold rungs 8" from wall. Space anchors not more than 5'-0" o.c. Prime paint under this Section. At each non-caged ladder over 14 ft. in height shall be provided with a climbing safety system equal to VI-GO Ladder Climbing Safety System as manufactured by Miller by Sperrian. (See Elevator Pit and Roof Access Ladders.)

H. Downspout Boots shall be equal to Jay R Smith MFG. Co. (Smith Industries) special downspout boots. Cast Iron Body with 3" Bronze Access Plug and Strap with 5/16" Dia. Cast Holes for flat head bolts, Typical. 5 x 4 Size.

I. Roof Scuttle shall be 2'-6" x 3'-0" Bilco Type S-20 roof scuttle with latch. Manufacturers: Bilco, Babcock-Davis, American Hatch Corp., or approved equal. Metal shall be 14 gauge galvanized steel, prime painted. Counter-balances, insulation, hold open arm, roof flanges and counterflashing flanges shall be furnished complete and waterproof.

J. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated single-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware. Manufacturer - Bilco Company . Type and Size: Single-leaf lid, 30 by 36 inches. Curb and Lid Material: Aluminum sheet, 0.090 inch thick. Finish: Mill. Maintain a minimum curb height of 12 inches above finished roof surface. Curb height must be adjusted to thickness of roof insulation with a minimum base flashing height recommended by roofing membrane manufacturer.

K. Stair Nosings-Treads for concrete filled steel pan stairs and concrete stairs on grade slab shall be equal to American Safety Tread Co., Helena, Alabama, Abrasive Cast Metal Nosing # 820, full width of stairs with anchor devices as recommended by the manufacturer.

3.0 - EXECUTION

3.1 Fabrication

A. Verify measurements in field for work fabricated to fit job conditions.

B. Fabricate form work true to detail with clean, straight, sharply defined profiles. Iron shall have smooth finished surfaces unless indicated otherwise. Shearing and punching shall leave clean, true lines and surfaces.

C. Fastenings shall be concealed where practical. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to the weather shall be formed to exclude water. Provide holes and connections for the work of other trades.

D. Joints shall be rigid at adjoining sections for a strong assembly. Weld or rivet permanent connections. Welds shall be continuous and finished flush and smooth on surfaces that will be exposed after installation. Do not use screws or bolts where it can be avoided; where screws or bolts are used, the heads shall be countersunk, screwed up tight and threads nicked to prevent loosening. Unexposed welded joints may be continuous or spot welded as required. Remove weld spatter from adjacent surfaces.

3.2 Installation

A. Erect work in thorough, first class manner with mechanics experienced in the erection of iron work.

B. Work shall be strong, secure, and adequate for the purpose intended.

C. Schedule delivery of items to be built into the masonry so as not to delay the progress of the work and to coordinate for proper installation.

D. Place and properly secure to form work items such as anchors, sleeves, and inserts which are to be cast in concrete.

END OF SECTION

1.0 – GENERAL

1.1 Related Documents

All Drawings, General and Supplementary Conditions including Division One Specifications apply to this Section.

1.2 Summary

A. Product

Principle items specified in this section are: Glass and metal modular railing system.

B. Work Included

Provide all materials, accessories, labor and equipment necessary to fabricate and completely provide system and installations of all handrails, guardrails, and infill panels as shown in general on drawings or specified herein.

1.3 Related Sections

A. Section 03300 – Cast-in Place Concrete: Coordination with substrate

B. Section 05500 – Miscellaneous Metals

C. Section 06100 – Rough Carpentry: Blocking Requirements and Installation

D. Section 08810 – Glass and Glazing

1.4 Definitions

Terms and definitions from ASTM E985 and ISO/TC 59 for railing related items apply to this section.

1.5 References

A. American National Standards Institute (ANSI) - Z97.I Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings.

B. American Society for Testing and Materials (ASTM) A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. American Society for Testing and Materials (ASTM) B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

D. American Society for Testing and Materials (ASTM) B221 - Aluminum-Alloy Extruded Rod, Wire, Shape and Tube.

E. American Society for Testing and Materials (ASTM) C1048 - Standard Specification for Heat-Treated Flat Glass - Hind HS, Kind FT Coated and Uncoated Glass.

F. American Society for Testing and Materials (ASTM) D659 - Method of Evaluating Degree of Chalking of Exterior Paints.

G. American Society for Testing and Materials (ASTM) E 894 - Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.

H. American Society for Testing and Materials (ASTM) E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

I. NAAMM Metal Finish Manual; National Association of Architectural Metal Manufacturers.

1.6 System Performance Requirements

A. Railings shall meet or exceed the requirements of all applicable building codes.

B. Railings shall have high strength stainless steel in order to comply with 1.4.1 with adequate safety margin.

C. All internal members shall be stainless steel, nylon or wood to eliminate the possibility of rust.

D. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

E. Railings Structural Requirements:
1. Rail and guardrail assemblies and attachments shall withstand a minimum Concentrated load of 200 pounds (90719 g) applied horizontally or vertically down at any point on the top rail.
2. Infill area of guardrail system capable of withstanding a horizontal concentrated load of 200 pounds applied to one square foot (8165 g/sm) at any point in the system. Load not to act concurrently with loads on top rail of system in determining stress on guardrail.
3. Handrail assemblies and guards shall be designed to resist a load of 50 pounds per linear foot (0.73 kN/m) applied in any direction at the top and to transfer this load through the supports to the structure.

1.7 Submittals

A. Submit the following items under the provisions of Section 01350:
B. Shop drawings, showing fabrication and installation of handrails and guard railings including plans, elevations, sections, details of components and attachments to other units of work.
C. Product data for material products to be supplied in the form of a Material Safety Data Sheet from manufacturer.
D. Structural engineered computations or test data / evaluations, material properties and other information needed to ensure satisfactory structural compliance to applicable building codes to be supplied by the manufacturer with Engineer's seal.
E. Initial Selection:
F. 6" long guardrail samples complete with supports and accessories.
Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
G. Final Verification: Qualification data for authorized installers specified in "Quality Assurance" is to demonstrate their capabilities and experience. Include list of completed projects with project names and architect names.

1.8 Quality Assurance

A. Single Source Responsibility: Materials shall be supplied and installed by a single firm.

B. Components of installation shall be in accordance with 2003 International Building Code and N.F.P.A.

C. Execution tolerance plus/minus 5/64" (2 mm).

1.9 Storage

A. Materials to be delivered to the job site in good condition and adequately protected against damage as handrails are a finished product.

B. Store on site in a location and manner to avoid damage. Stacking should be done in a manner that will prevent bending. Store material in a clean, dry location away from uncured concrete and masonry. Any protection on the railings during transportation should remain until installed.

C. Keep handling on site to a minimum. Exercise caution to avoid damage to finishes of material.

D. Materials must be kept in original packing until installation.

1.10 Project Conditions

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings.
   1. Where field measurements cannot be made without delaying the railing fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products to not delay fabrication, delivery and installation.

C. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

1.11 Warranty

A. Finish Warranty: Manufacturer shall warranty installed system for the periods described herein, starting from Date of Substantial Completion. When notified in writing from Owner, manufacturer/installer shall, promptly and without inconvenience and cost to Owner, correct said deficiencies.

   1. Finish coating shall not peel, blister, chip, crack or check in finish, and shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D659.
   2. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D2244.
   3. Finish Warranty, Kynar 2-Coat Finish: 5 years.

4. Finish Warranty, Kynar 3-Coat Finish: 10 years.

2.0 - PRODUCT:

2.1 Mechanically Fastened Stainless Steel /Glass Guardrail System.

Manufacturer shall be Handrail Design Inc. (HDI), J.M. Gruca, Inc., or approved equal, a U.S. manufacturer of a custom pre-engineered, mechanically fastened guardrail and handrail system, in strict compliance with all technical requirements of the drawings and specifications. Miscellaneous metal fabricators/suppliers will not be acceptable. This standard is based upon HDI Railing Systems, 3905 Continental Drive, Lancaster, PA 17512

2.2 Materials: Guardrails

A. All rails, shoe base, top caps and other tubular components shall be non welded assemblies as generally indicated on Architectural Drawings constructed using the following:

1. Stainless steel grade UNS 1.4301 & 1.4305, type 303 & 304 respectively; surface to be # 6 finish (240 grain/grit); 2 1/2" diameter top cap.

2. 2 1/2" x 4 1/8" aluminum base channel with 18 gauge stainless steel cladding.

3. Nylon inserts to be nylon 6, ref polyamid type B3S manufactured by BASF.

4. Expansion cement: Hydraulic, conforming to ASTM C595, USFD in conjunction with EPDM setting block for 3/4" glass.

B. Fastening bolts to be stainless steel to match base clamping plate.

2.3 Glass products, glazing and infill materials.

Clear tempered, ASTM C1048, 3/4" minimum laminated safety glass quality q3 with exposed polished edges.

2.4 Fasteners

Anchors shall be fabricated from stainless steel materials with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E488.

2.5 Fabrication

A. Fabricate railing system for compliance with structural requirements of applicable code.

B. Pre-assemble railings prior to shipping to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and for coordination with shop drawings.

C. Stainless steel tubing cuts shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints.

3.0 – EXECUTION

3.1 Preparation

A. Provide information on fastening point locations where necessary to relevant parties.

B. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another contractor, notify Architect of unsatisfactory preparation prior to proceeding with installation.

3.2 Installation

A. Installation shall be by a qualified, authorized representative of the manufacturer not less than 5 years experience in this field.

B. Installation must be in accordance with standard or non-standard, yet applicable details (instructions) included on installation/shop drawings.

C. Install components plumb and in-line, accurately fitted, free from distortion or defects and securely anchored to structure.

D. Provide anchors, plates, angles, etc., necessary for connecting railings to structure.

E. Any and all field welding shall be by a certified welder.

F. Access must be made available for anchors that require through bolting either vertically or horizontally.

G. Install in accordance with manufacturer's instructions.

H. Fit exposed connections accurately together to form tight joints, except as necessary for expansion.

I. Perform cutting, drilling, and fitting required for installation. Set accurately in location, alignment and elevation, plumb, level, and true, measured from established lines and levels.

J. For in-place construction, provide anchorage devices and fittings to secure to in-place construction; including threaded fittings for concrete inserts, toggle bolts and through-bolts. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.

K. Do not cut or abrade finishes which cannot be completely restored in the field.

3.3 Erection tolerances

A. Maximum variation from plumb shall be 1/8".

B. Maximum offset from true alignment for every 50-foot of railing shall be 1/8", non-accumulative.

3.4 Protection after installation

A. Provide protective covering on all hand and guardrails if construction is not yet finished in the area.

B. Upon delivery railing will have protective wrapping over cap only. Immediately upon completion of installation of railing, remove cap cover and clean all work for inspection and approval.

C. When cleaning painted aluminum surfaces use plain water containing a mild soap or detergent. No abrasive agents or harsh chemicals shall be used.

D. Touch-up, repair or replace damaged products before Substantial Completion.

3.5 Maintenance and cleaning.

A. Railings shall be cleaned, including infill panels, by contractor to the satisfaction of the owner.

B. Wipe with moistened cloth only. Do not use cleaning agents with abrasive or acid/alkaline content.

3.6 Correction of deficiencies

All deficiencies in work and/or items not meeting specified requirements shall be corrected in order to meet specification requirements at no additional cost to owner.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Wood roof trusses.
2. Wood truss bracing.
3. Metal truss accessories.

B. Related Sections include the following:

1. Division 2 Section "Termite Control" for site application of borate treatment to wood trusses.
2. Division 6 Section "Sheathing" for roof sheathing and subflooring.

C. Allowances: Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Division 1 Section "Allowances."

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

B. TPI: Truss Plate Institute, Inc.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated on General Notes of Structural Drawings.

2. Maximum Deflection Under Design Loads: As indicated on General Notes of Structural Drawings.

B. Design trusses for loads indicated on drawings plus concentrated loads hung from or supported on trusses. Refer to mechanical, electrical and plumbing drawings and specifications for loading information and location. Loading as required by other subcontractors, such as fire protection, shall be coordinated by the General Contractor

1.5 SUBMITTALS

A. Submit all shop drawings on one reproducible print and two copies only. The reproducible print will be returned. All other reproductions required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
1. Architect's and Engineer's Shop Drawing Review: Review of shop drawings will be for general considerations only. Compliance with requirements for materials, fabrication, engineering, dimensions, bracing, and erection is the Contractor's responsibility.

B. If there are questions, clarifications, modifications, or other items where information, a response, or approval is requested, such items must be written on the cover sheet to the submittal. Only indicating such items on the shop drawings or within the calculations is not sufficient. Where items are not specifically listed on the cover sheet and subsequently explicitly approved by the Structural Engineer of Record, such items are not to be considered approved or considered.

C. Product Data: For fire-retardant treated lumber, metal-plate connectors, metal truss accessories, and fasteners.
1. 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.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

D. Shop Drawings: **Prepared by or under the supervision of a qualified professional engineer.** Show fabrication and installation details for trusses. All designs shall bear the name and seal of a Structural Engineer licensed to practice in the state where the project is located. Shop drawings which do not contain this information will be returned unchecked

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.
6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
7. Submit stamped design analysis and test reports indicating loading, section properties, allowable stress, stress diagrams and calculations, and similar information needed for analysis and to insure trusses comply with requirements.

8. Submittals shall additionally conform to the requirements shown on the General Notes of the project Structural Drawings.
9. Show all bearing and anchorage details.
10. Specify and detail all supplemental strapping, bracing clips and other accessories required for proper installation and permanent member bracing.
11. Shop drawings shall include all placement sequences and instructions.

E. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Source Limitations for Connector Plates: Obtain metal connector plates from a single manufacturer.

D. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

E. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Grade and Species: Provide visually graded dimension lumber for truss chord and web members, of not less than the following grade and the following species:

1. Grade for Chord Members: No. 2.
2. Grade for Web Members: Construction, Stud, or No. 3.
3. Species: Southern pine; SPIB.

C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 6 Section Rough Carpentry.

2.2 METAL CONNECTOR PLATES

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpine Engineered Products, Inc.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
5. Jager Building Systems, Inc.
6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. TEE-LOK Corporation; a subsidiary of Berkshire Hathaway Inc.
9. Truswal Systems Corporation.

C. General: Fabricate connector plates to comply with TPI 1.

D. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

1. Use for interior locations where stainless steel is not indicated.

2.3 FASTENERS

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

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.4 METAL TRUSS ACCESSORIES

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

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:

1. Cleveland Steel Specialty Co.
2. Harlen Metal Products, Inc.
3. KC Metals Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. Southeastern Metals Manufacturing Co., Inc.
6. USP Structural Connectors.

D. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published

values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

E. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations where stainless steel is not indicated.

F. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1 inch deep by 0.040 inch thick, made to fit between 2 adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.6 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.

1. Anchor trusses to girder trusses as indicated.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Division 6 Section Rough Carpentry.

J. Install wood trusses within installation tolerances in TPI 1.

K. Do not cut or remove truss members.

L. Replace wood trusses that are damaged or do not meet requirements.

1. Do not alter trusses in field.

3.2 REPAIRS AND PROTECTION

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

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

C. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.

1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 06176

1.0 - GENERAL

1.1 Section Includes

A. Surface preparation.

B. Application of a solvent type liquid applied dampproofing membrane.

Note: This product shall not be installed until adjacent roof construction has been dried-in. CMU walls must be dry on both sides before application.

1.2 Related Sections

A. Section 03300 – Cast-in-Place Concrete.
B. Section 04200 – Unit Masonry

1.3 References

A. Spray or Brush-on dampproofing coating
   1. ASTM D4479-00 - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.

1.4 Submittals

A. Comply with Section 01350 - Submittal Procedures.

B. Submit manufacturer's product data and application instructions.

1.5 Delivery, Storage, and Handling

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area in accordance with manufacturer's instructions.

C. Store at temperatures of 40°F (5°C) and above to facilitate handling.

D. Do not store at temperatures above 90°F (32°C) for extended periods.

E. Keep away from sparks and flames.

F. Protect materials during handling and application to prevent damage or contamination.

1.6 Environmental Requirements

A. Product not intended for uses subject to abuse or permanent exposure to the elements.

B. Do not apply membrane when air or surface temperatures are below 35°F (2°C).

C. Do not apply to frozen concrete or masonry.

D. Do not apply when rain is imminent.

D. Do not apply when rain is imminent.

2.0 - PRODUCTS

2.1 Manufacturer

A. W.R. Meadows, Inc or pre- approved manufacturer with similar solvent based products.

2.2 Materials

A. Spray applied solvent dampproofing should be an asbestos-free, non-fibered asphalt compound that meets the U.S. EPA Architectural Coatings Rule requirements for VOC content.
   1. Spray-Mastic by W.R. Meadows.

B. Brush applied solvent dampproofing should be an asbestos-free, fibered, asphalt compound that meets the U.S. EPA Architectural Coatings Rule requirements for VOC content. For use to protect exterior below-grade masonry walls.
   1. Semi-Mastic by W.R. Meadows.

2.3 Accessories

A. Waterproofing Protection Course: Protection Course.

B. Rolled Matrix Drainage System: Mel-Drain™ Rolled Matrix Drainage System.

3.0 - EXECUTION

3.1 Examination

A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 Surface Preparation

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Concrete surfaces must be clean, smooth and free of standing water.

E. Patch all holes and voids and smooth out any surface misalignments.

3.3 Application

A. Apply dampproofing in accordance with manufacturer's instructions.

B. Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.

3.4 Protection

A. Protect membrane on vertical and horizontal applications with immediate application of protection course, if no drainage system is used, or rolled matrix drainage system.

B. Backfill within 24-48 hours using care to avoid damaging the dampproofing.

END OF SECTION

1.0 - GENERAL

1.1 Scope
The work under this section consists of all building insulation except rigid roof insulation.

1.2 Submittals
Submit samples of all materials hereinafter specified for approval.

1.3 Protection
All thermal insulation shall be maintained dry throughout construction. Wet insulation shall be rejected.

2.0 - PRODUCTS

2.1 Material

A. 1. Primary: FSK Thermal insulation shall be batt, or blanket type having a vapor barrier on one face which shall be extended to form a 1" flange to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E - 84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts. Vapor barrier side laps shall be lapped and taped over support members. Vapor barrier materials shall be FSK foil-type and also comply with requirements for a ceiling return air plenum regardless.

2. Supplemental: Unfaced Thermal insulation shall be allowed provided it is coupled with a layer of FSK faced insulation to achieve the total required r-value and shall be batt, or blanket type to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E-84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts.

Thermal Resistance Values (R) as follows:

R-30 9" - 10"
R-22 7"
R-19 6" - 6-1/2"
R-11 3-1/2" - 4"

B. Unfaced Thermal insulation shall be batt, or blanket type to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E - 84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts.

Thermal Resistance Values (R) as follows:

R-30 9" - 10"
R-22 7"
R-19 6" - 6-1/2"
R-11 3-1/2" - 4"

C. Masonry Foam Fill Insulation shall be approved equal to:
   1. Core Foam Masonry Foam Insulation by cfiFOAM.
   2. Other Pre-approved manufacturers:
      a. Applegate C Foam Insulation by Applegate R Foam, Inc.
      b. Core-Fill 500 by Tailored Chemical Products, Inc.
   3. Minimum Product Performance Standards
      a. Fire-Resistance Ratings: Foam shall neither add to nor detract from fire-resistance ratings of insulated fire-resistance rated CMU walls per prevailing building codes.
      b. Surface Burning Characteristics: Class A per ASTM E84; Flame Spread Index ≤ 25; Smoke Developed Index ≤ 450.
      c. Thermal Resistance: R-4.6/inch @ 75°F per either ASTM C518 or ASTM C177
      d. Potential Heat: ≤ 100 Btu/lb. when tested per NFPA 259 (ASTM D5865).
   4. Installation Guidelines
      a. Fill all open cells and voids in hollow concrete masonry walls where shown on the drawings.
      b . The foam insulation shall be pressure injected through a series of 5/8" to 7/8" diameter holes drilled to access each column of block cells e.g. 8" o/c beginning approximately four (4) feet above the finished floor.
      c. Repeat this procedure at 10' to 16' intervals above the first horizontal row of holes (or as needed) until the empty core cells are completely filled.
      d. In walls where horizontal bond beams occur, repeat the procedure above the bond beams to assure insulating the entire wall.
      e. If "Hi-Flow" nozzles by cfiFOAM, Inc. are used, foam may be injected at up to twenty (20) foot vertical intervals.
      f. Patch holes with mortar and score to resemble adjacent surfaces. Insulation shall not be injected into wet walls.
   5. Quality Assurance
      a. Manufacturing Standards; Provide insulation from a single approved source. Product components shall be of the same brand from the same approved source arriving at the site either pre-mixed according to the manufacturer's printed instructions or in unopened factory sealed containers.
      b. Installer Qualifications for Foamed-In-Place Masonry Insulation:
         1.) Engage an authorized contract installer who has been trained, authorized and equipped by the product manufacturer.
      c. At the Architect's request, the Installer shall provide infrared scanned images of the work prepared by a "Block Wall Scan IR" or equivalent trained IR technician to confirm that empty core cells are filled with foam insulation.
         1.) Insulation voids shall be foamed at no added cost to the Owner.

D. Rigid thermal insulation shall be 1" thick by 16" wide for cavity walls and 24" wide if indicated for slabs. The insulating material shall have a minimum compressive strength of 25 psi and maximum water vapor transmission rate of 1.1 perm-inch and shall conform to ASTM C578, Type III-IV, R-value/inch @ 75 degrees F 5.0. Adhesive, in cavities, shall be equal to Styrofoam brand mastic #7 or #11 as distributed by Dow. All joints shall be taped.

E. Sound Attenuation Batt Insulation shall be 3-1/2" thick fiberglass insulation with a Noise Reduction coefficient of 1.05. Equal to Owens Corning.

F. Air/Vapor Barrier - Basis of Design: Spunbonded polyolefin, non-woven, non-perforated barrier equal to Dupont Tyvek Commercial Wrap, Class A and related assembly components. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations.

1. Shall be allowed as a substitution and similar to FSK facing material. As such this material would be used in conjunction with unfaced insulation and shall be provided continuous and attached to applicable framing members. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations.

3.0 - EXECUTION

3.1 Installation

A. Thermal Insulating material shall be laid tight and installed so as to avoid gaps and settlement. All voids, offsets, and bends shall be completely filled. R values shall be provided as indicated in single layer or multiple layers totaling the "R" value indicated. If multiple layers are used to meet total "R" value indicated, layers must be provided perpendicular to one another. The layer closest to the conditioned space must be provided with FSK facing on the interior face where visible for an Inspection.

Insulation shall be laid tight and continuous over all areas where indicated.

B. Masonry foam fill insulation shall be provided at all exterior wall assemblies and where indicated to thoroughly fill CMU cells and voids continuous from bottom to top of exterior and applicable masonry walls. Install in accordance with manufacturer's printed recommendations and procedures.

C. Rigid thermal insulation

1. Walls - Adhere insulation to walls in a horizontal position, closely butted and with vertical joints staggered. Provide joint mastic and joint tape to the foam and apply in accordance with manufacturer's recommendations.

2. Floor Slab - Lay insulation on vapor barrier butted end to end at full perimeter of exterior walls.

   Backfill against insulation with fill and gravel.

3. During storage and insulation, observe good fire safety practices, including job site housekeeping.

4. If adhesive is required, use mastic for bonding foam board to non-absorbent surfaces such as dense concrete, metal, brick, glass, and paint.

D. Sound Attenuation Batt Insulation shall be placed on ceiling or stud system and secured and sealed in accordance with manufacturer's recommendations and specifications. Place around or over mechanical equipment rooms, toilet rooms, window in-fill spaces, and other areas as indicated.

E. Mesh, shall be provided for supporting overhead horizontal insulation and attached to applicable framing members as required, not to exceed 16" o.c. Mesh material shall be provided to maximize width as project conditions permit. Mesh fabric shall be steel wire type with nominal 2" grid. Continuous metal straps at 16" o.c. shall be an acceptable substitute.

F. Air/Vapor Barrier - Shall be allowed as a substitution and similar to FSK facing material. As such this material would be used in conjunction with unfaced insulation and shall be provided continuous and attached to applicable framing members. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations. Basis of Design: Spunbonded polyolefin, non-woven, non-perforated barrier equal to Dupont Tyvek Commercial Wrap, Class A and related assembly components.

END OF SECTION

1.0 - GENERAL

1.1 Summary

A. Provide air and moisture barrier, and compatible EIFS for vertical above grade exterior walls

B. Related Sections

Section 07610: Standing Seam Roof

Section 07910: Caulking and Sealants

1.2 Submittals

A. Manufacturer's specifications, details, installation instructions and product data

B. Manufacturer's code compliance report

C. Manufacturer's standard warranty

D. Applicator's industry training credentials

E. Samples for approval as directed by architect or owner

F. Sealant manufacturer's certificate of compliance with ASTM C 1382

G. Prepare and submit project-specific details (when required by contract documents)

1.3 References

A. ASTM Standards:

- B 117 Test Method for Salt Spray (Fog) Testing
- C 297 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
- C 578 Specification for Preformed, Cellular Polystyrene Thermal Insulation
- C 1177 Specification for Glass Mat Gypsum for Use as Sheathing
- C 1382 Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints
- D 522 Test Methods for Mandrel Bend Test of Attached Organic Coatings
- D 882 Standard Test Methods for Tensile Properties of Thin Plastic Sheeting
- D 968 Test Method for Abrasion Resistance of Organic Coatings by Falling Abrasive
- D 1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- D 2247 Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
- D 3273 Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- E 84 Test Method for Surface Burning Characteristics of Building Materials
- E 96 Test Methods for Water Vapor Transmission of Materials
- E 119 Method for Fire Tests of Building Construction and Materials
- E 330 Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
- E 331 Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
- E 1233 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Difference

E 2098 Test Method for Determining Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish System after Exposure to a Sodium Hydroxide Solution
E 2134 Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS)
E 2178 Test Method for Air Permeance of Building Materials
E 2273 Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish System (EIFS) Clad Wall Assemblies
E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
E 2485 Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings
E 2486 Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)
E 2568 Standard Specification for PB Exterior Insulation and Finish Systems
E 2570 Test Method for Water-Resistive (WRB) Coatings used Under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage
G 153 Recommended Practice for Operating Light-and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials
G 154 Recommended Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials

B. Building Code Standards
AC 235 Acceptance Criteria for EIFS Clad Drainage Wall Assemblies (November, 2009)

C. National Fire Protection Association (NFPA) Standards
1. NFPA 268 Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source
2. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus

D. Other Referenced Documents
1. American Association of Textile Chemists and Colorists AATCC-127 Water Resistance: Hydrostatic Pressure Test
2. APA Engineered Wood Association E 30, Engineered Wood Construction Guide
3. ICC-ES ESR-1233, StoGuard with Gold Coat, StoGuard with Emerald Coat, and StoGuard Vapor Seal Water-Resistive Barriers and StoEnergy Guard
4. ICC-ES ESR-1748, StoTherm® NExT®

1.4 Design Requirements

A. Wind Load
1. Design for maximum allowable system deflection, normal to the plane of the wall, of L/240.
2. Design for wind load in conformance with code requirements.
3. Maximum wind load resistance: ± 188 psf (9.00 kPa), provided structural supports and sheathing/sheathing attachment are adequate to resist these pressures.

B. Moisture Control
1. Prevent the accumulation of water behind the EIFS or into the wall assembly, either by condensation or leakage through the wall construction, in the design and detailing of the wall assembly:

a. Provide flashing to direct water to the exterior where it is likely to penetrate components in the wall assembly, including, above window and door heads, beneath window and door sills, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, at floor lines, and at the base of the wall.

b. Air Leakage Prevention – provide continuity of the air barrier system at foundation, roof, windows, doors, and other penetrations through the wall with connecting and compatible air barrier components to minimize condensation and leakage caused by air movement.

c. Vapor Diffusion and Condensation – perform a dew point analysis and/or dynamic hygrothermal modeling of the wall assembly to determine the potential for accumulation of moisture in the wall assembly by diffusion. Adjust insulation thickness and/or other wall assembly components accordingly to minimize risk. Avoid the use of vapor retarders on the interior side of the wall in warm, humid climates.

C. Impact Resistance

Provide ultra-high impact resistance of the EIFS to a minimum height of 6'-0" (1.8 m) above finished grade at all areas accessible to pedestrian traffic and other areas exposed to abnormal stress or impact. Indicate the areas with impact resistance other than "Standard" on contract drawings.

D. Color Selection

Select finish coat with a light reflectance value of 20 or greater. Architect to select from full range of colors.

E. Joints

1. Provide minimum 3/4 inch (19 mm) wide joints in the EIFS where they exist in the substrate or supporting construction, where the cladding adjoins dissimilar construction or materials, at changes in building height, at expansion, control, and cold joints in construction, and at floor lines in multi-level wood frame construction. Size joints to correspond with anticipated movement. Align terminating edges of EIFS with joint edges of through wall expansion joints and similar joints in construction. Refer to Sto Details.
2. Provide minimum 1/2 inch (13 mm) wide perimeter sealant joints at all penetrations through the EIFS (windows, doors, mechanical, electrical, and plumbing penetrations, etc.).
3. Specify compatible backer rod and sealant that has been evaluated in accordance with ASTM C 1382, and that meets minimum 50% elongation after conditioning.
4. Provide joints so that air barrier continuity is maintained across the joint, and drain joints to the exterior, or provide other means to prevent or control water infiltration at joints.

F. Grade Condition

Provide minimum 6 inch (152 mm) clearance above grade or as required by code.

G. Trim, Projecting Architectural Features and Reveals

1. All trim and projecting architectural features must have a minimum 1:2 [27°] slope along their top surface. All reveals must have minimum ¾ inch (19 mm) insulation thickness at the bottom of the reveal. All horizontal reveals must have a minimum 1:2 [27°] slope along their bottom surface. Increase slope for northern climates to prevent accumulation of ice/snow and water on surface. Where trim/feature or bottom surface of reveal projects more than 2 inches (51 mm) from the face of the EIFS wall plane, protect the top surface with

waterproof base coat. Periodic inspections and increased maintenance may be required to maintain surface integrity of the EIFS finish on weather exposed sloped surfaces. Limit projecting features to easily accessible areas and limit total area to facilitate and minimize maintenance.

2. Do not use the EIFS on weather exposed projecting ledges, sills, or other projecting features unless supported by framing or other structural support and protected with metal coping or flashing.

H. Insulation Thickness
   1. Minimum EPS insulation thickness is 1 inch (25 mm).
   2. Maximum EPS insulation thickness is 12 inches (305 mm), except as noted below for fire-resistance rated wall assemblies.

I. Fire Protection
   1. Do not use EPS foam plastic in excess of 12 inches (305 mm) thick on types I, II, III, or IV construction unless approved by the code official.
   2. Where a fire-resistance rating is required by code use the EIFS over a rated concrete or concrete masonry assembly. Limit use over rated frame assemblies to non-load bearing assemblies (the EIFS is considered not to add or detract from the fire-resistance of the rated assembly). Maximum allowable EPS thickness: 4 inches (102 mm).
   3. Refer to manufacturer's testing or applicable code compliance report for other limitations that may apply.

1.5 Performance Requirements

A. Comply with ASTM E 2568, ASTM E 2570, and the following:

Table 1 Air/Moisture Barrier Performance

TEST	METHOD	CRITERIA	RESULT
1. Water Penetration Resistance	AATCC 127 (Water Column)	Resist 21.6 in (55 cm) water for 5 hours before and after aging	Pass
2. Water Penetration Resistance after Cyclic Wind Loading	ASTM E 1233 / ASTM E 331	No water at exterior plane of sheathing after 10 cycles @ 80% design load and 75 minutes water spray at 6.24 psf (299 Pa) differential	No water penetration
3. Water Resistance Testing	ASTM D 2247	Absence of deleterious effects after 14 day exposure	No deleterious effects
4. Water Vapor Transmission	ASTM E 96 Method B (Water Method)	Measure	Sto Gold Fill®*: 7.10 perms [408 ng/(Pa·s·m²)] Sto Gold Coat: > 10 perms [574 ng/(Pa·s·m²)]
5. Air Leakage (material)	ASTM E 2178	≤ 0.004 cfm/ft2 at 1.57 psf (0.02 L/s•m2 at 75 Pa)	Pass
6. Air Leakage (assembly)	ASTM E 2357	≤ 0.04 cfm/ft2 (0.2 L/s•m2)	Pass
7. Structural Integrity	ASTM E 330	2-inches (51 mm) H_2O pressure (positive & negative) for 1 hour.	Pass

TEST	METHOD	CRITERIA	RESULT
8. Dry Tensile Strength	ASTM D 882	20 lbs/in (3503 N/m), minimum before and after aging	Sto Gold Fill:* 159 lbs/in (27845 N/m)) before aging 213 lbs/in (37302 N/m) after aging
9. Pliability	ASTM D 522	No Cracking or Delamination using ⅛" (3 mm) mandrel at 14°F (-10°C) before and after aging	Pass
10. Surface Burning	ASTM E 84	Flame Spread 0 – 25 for NFPA Class A, UBC Class I	Flame Spread: 5 Smoke Density: 10
11. Tensile Adhesion	ASTM C 297	>15 psi (103 kPa)	>30 psi (207 kPa) to Plywood, OSB, Glass Mat Faced Gypsum sheathings

* Note: Sto Gold Fill testing with Sto Detail Mesh reinforcement

Table 2 EIFS Weather Resistance and Durability Performance*

TEST	METHOD	CRITERIA	RESULTS
1. Accelerated Weathering	ASTM G 153 (Formerly ASTM G 23)	No deleterious effects* at 2000 hours when viewed under 5x magnification	Pass
2. Accelerated Weathering	ASTM G 154 (Formerly ASTM G 53)	No deleterious effects* at 2000 hours	Pass
3. Freeze/Thaw Resistance	ASTM E 2485	No deleterious effects* at 10 cycles when viewed under 5x magnification	Pass
4. Water Penetration	ASTM E 331 (modified per ICC-ES AC 235)	No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes at 6.24 psf (299 Pa) or 20% of design wind pressure, whichever is greater	Pass at 12.0 psf (575 Pa) after 30 minutes
5. Drainage Efficiency	ASTM E 2273	90% minimum	> 90%
6. Tensile Adhesion	ASTM E 2134	Minimum 15 psi (103kPa) tensile strength	Pass
7. Water Resistance	ASTM D 2247	No deleterious effects*at 14 day exposure	Pass @ 28 days
8. Salt Spray	ASTM B 117	No deleterious effects* at 300 hours	Pass @ 300 hrs
9. Abrasion Resistance	ASTM D 968	No cracking or loss of film integrity at 528 quarts (500 L) of sand	Pass @ 528 quarts (1000 L)
10. Mildew Resistance	ASTM D 3273	No growth supported during 28 day exposure period	Pass @ 28 days

TEST	METHOD	CRITERIA	RESULTS
11. Impact Resistance	ASTM E 2486	Level 1: 25-49 in-lbs (2.83-5.54J) Level 2: 50-89 in-lbs (5.65-10.1J) Level 3: 90-150 in-lbs (10.2-17J) Level 4: >150 in-lbs (>17J)	Pass with one layer Sto Mesh Pass with two layers Sto Mesh Pass with one layer Sto Intermediate Mesh Pass with one layer Sto Armor Mat and one layer Sto Mesh

* No deleterious effects: no cracking, checking, crazing, erosion, rusting, blistering, peeling or delamination

Table 3 Air/Moisture Barrier and EIFS Fire Performance

TEST	METHOD	CRITERIA	RESULT
1. Fire Endurance	ASTM E 119	Maintain fire resistance of existing rated assembly	Pass (4 inch [102 mm] maximum allowable insulation thickness)
2. Intermediate Scale Multi-Story Fire Test	NFPA 285 (formerly UBC Standard 26-9)	1. Resistance to vertical spread of flame within the core of the panel from one story to the next 2. Resistance to flame propagation over the exterior surface 3. Resistance to vertical spread of flame over the interior surface from one story to the next 4. Resistance to significant lateral spread of flame from the compartment of fire origin to adjacent spaces	Pass with 12 inches (305 mm) insulation
3. Radiant Heat Ignition	NFPA 268	No ignition @ 20 minutes	Pass with 1 and 12 inches (25 and 305 mm) insulation
4.Surface Burning (individual components)	ASTM E 84	Individual components shall each have a flame spread of 25 or less, and smoke developed of 450 or less	Flame Spread: < 25 Smoke Developed: < 450

Table 4 EIFS Component Performance

TEST	METHOD	CRITERIA	RESULT
1. Alkali Resistance of Reinforcing Mesh	ASTM E 2098	Greater than 120 pli (21 dN/cm) retained tensile strength	Pass
2. Requirements for Rigid PVC Accessories	ASTM D 1784	Meets cell classification 13244C	Pass

1.6 Quality Assurance

A. Manufacturer Requirements

1. Member in good standing of the EIFS Industry Members Association (EIMA)

2. Air/moisture barrier and EIFS manufacturer for a minimum of thirty (30) years
3. Manufacturing facilities ISO 9001:2008 Certified Quality System and ISO 14001:2004 Certified Environmental Management System

B. Contractor Requirements
1. Engaged in application of similar systems for a minimum of three (3) years
2. Knowledgeable in the proper use and handling of Sto materials
3. Employ skilled mechanics who are experienced and knowledgeable in air/moisture barrier and EIFS application, and familiar with the requirements of the specified work
4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project
5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with Sto's published specifications and details and the project plans and specifications

C. Insulation Board Manufacturer Requirements
1. EPS board listed by an approved agency
2. EPS board manufactured under Sto licensing agreement and recognized by Sto as being capable of producing EPS insulation board to meet EIFS requirements
3. EPS board labeled with information required by Sto, the approved listing agency, and the applicable building code.

D. Mock-up Testing
Construct full-scale mock-up of typical air/moisture barrier and EIFS/window wall assembly with specified tools and materials and test air and water infiltration and structural performance in accordance with ASTM E 283, ASTM E 331 and ASTM E 330, respectively, through independent laboratory. Mock-up shall comply with requirements of project specifications. Where mock-up is tested at job site maintain approved mock-up at site as reference standard. If tested off-site accurately record construction detailing and sequencing of approved mock-up for replication during construction.

E. Inspections
1. Provide independent third party inspection where required by code or contract documents
2. Conduct inspections in accordance with code requirements and contract documents

1.7 Delivery, Storage And Handling
A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product

B. Protect coatings (pail products) from freezing and temperatures in excess of 90°F (32° C). Store away from direct sunlight.

C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.8 Project/Site Conditions
A. Maintain ambient and surface temperatures above 40°F (4°C) during application and drying period, minimum 24 hours after application of Air/Moisture barrier and EIFS products

B. Provide supplementary heat for installation in temperatures less than 40°F (4°C)

C. Provide protection of surrounding areas and adjacent surfaces from application of products

1.9 Coordination/Scheduling

A. Provide site grading such that the EIFS terminates above grade a minimum of 6 inches (150 mm) or as required by code

B. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuously connected air and moisture barrier

C. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall

D. Install window and door head flashing immediately after windows and doors are installed

E. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior

F. Install splices or tie-ins from air/moisture barrier over back leg of flashings, starter tracks, and similar details to form a shingle lap that directs incidental water to the exterior

G. Install copings and sealant immediately after installation of the EIFS when coatings are dry, and such that, where sealant is applied against the EIFS surface, it is applied against the base coat or primed base coat surface

H. Schedule work such that air/moisture barrier is exposed to weather no longer than 30 days

I. Attach penetrations through the EIFS to structural support and provide water tight seal at penetrations

1.10 Warranty

Provide manufacturer's standard warranty.

2.0 - PRODUCTS

2.1 Manufacturers

A. Provide Air/Moisture Barrier and EIFS coatings and accessories from single source manufacturer or approved supplier

B. The following are acceptable manufacturers: (Basis of Design)
Sto Corp. – Air/Moisture Barrier, EIFS
Plastic Components, Inc. – EIFS Accessories

C. Other manufacturers shall submit product data to Architect at least 10 days prior to bid. Comply with Section 01360 - Product Substitution. Acceptance will be in writing via Addendum.

2.2 Air/Moisture Barrier

A. Joint Treatment, Rough Opening Protection, and Detail Components:

1. One component rapid drying gun-applied rough opening protection for frame and CMU walls without mesh or fabric reinforcement. Also use as a joint treatment for sheathing when used with Mesh. Also used to seal fish mouths, wrinkles, seams, gaps, holes, or other voids in air barrier materials

B. Waterproof Coating: – ready mixed waterproof coating for concrete, concrete masonry, wood-based sheathing, and glass mat gypsum sheathing

C. Transition Membrane:– flexible air barrier membrane for continuity at transitions such as sheathing to foundation, dissimilar materials (CMU to frame wall), wall to balcony floor slab or ceiling, flashing shingle lap transitions, floor line deflection joints, masonry control joints, and through wall joints in masonry or frame construction.

2.3 Adhesive

A. Factory blended one-component polymer-modified portland cement based high build adhesive

2.4 Insulation Board

A. EPS Insulation Board: nominal 1.0 lb/ft^3 (16 kg/m^3) Expanded Polystyrene (EPS) insulation board in compliance with ASTM E 2430 and ASTM C 578 Type I requirements and listed, labeled, and furnished in accordance with this specification.

2.5 Base Coat

A. Waterproof Base Coat

Sto Flexyl – fiber reinforced acrylic based waterproof base coat mixed with portland cement (for use as a waterproof base coat over Sto BTS Plus or BTS Xtra for foundations, parapets, splash areas, trim and other projecting architectural features)

2.6 Reinforcing Meshes

A. Standard Mesh - nominal 4.5 oz/yd^2 (153 g/m^2), symmetrical, interlaced open-weave glass fiber fabric made with alkaline resistant coating for compatibility with Sto materials

2.7 Primer

A. Acrylic based tintable primer with sand for roller application

2.8 Finish Coat

Stolit® Lotusan® – acrylic based textured wall finish with graded marble aggregate and self-cleaning properties

2.9 Job Mixed Ingredients

A. Water – clean and potable

B. Portland cement – Type I, Type II, or Type I-II in conformance with ASTM C 150

2.10 Accessories

A. Starter Track – rigid PVC (polyvinyl chloride) plastic track Part No. STDE as furnished by Plastic Components, Inc., 9051 NW 97th Terrace, Miami, FL 33178 (800 327 – 7077).

B. Mesh Corner Bead Standard – one component PVC (polyvinyl chloride) accessory with integral reinforcing mesh for outside corner reinforcement.

C. Drip Edge Profile - one component PVC (polyvinyl chloride) accessory with integral reinforcing mesh that creates a drip edge and plaster return

2.11 Mixing

A. Sto Gold Fill – mix with a clean, rust-free high speed mixer to a uniform consistency

B. Sto Gold Coat – mix with a clean, rust-free high speed mixer to a uniform consistency

C. Sto BTS Plus – mix ratio with water: 5-6.5 quarts (4.7-6.2 L) of water per 47 pound (21.3 kg) bag of Sto BTS Plus. Pour water into a clean mixing pail. Add Sto BTS Plus, mix to a uniform consistency and allow to set for approximately 5 minutes. Adjust mix if necessary with additional Sto BTS Plus or water and remix to a uniform trowel consistency. Avoid retempering. Keep mix ratio consistent. Do not exceed maximum water amount in mix ratio.

D. Sto Flexyl – mix ratio with portland cement: 1:1 ratio by weight. Pour Sto Flexyl into a clean mixing pail. Add portland cement, mix to a uniform consistency and allow to set for approximately five minutes. Adjust mix if necessary with additional Sto Flexyl and remix to a uniform trowel consistency. Avoid retempering. Keep mix ratio consistent.

E. Watertight Coat – pour liquid component into a clean mixing pail. Add dry component, mix to a uniform consistency and allow to set for approximately five minutes. Adjust mix if necessary and remix to a uniform trowel consistency. Avoid retempering. Keep mix ratio consistent.

F. Primer – mix with a clean, rust-free high speed mixer to a uniform consistency

G. Stolit Lotusan – mix with a clean, rust-free high speed mixer to a uniform consistency. A small amount of water may be added to adjust workability. Limit addition of water to amount needed to achieve the finish texture.

H. Mix only as much material as can readily be used.

I. Do not use anti-freeze compounds or other additives

3.0 - EXECUTION

3.1 Acceptable Installers

A. Must conform to Quality Assurance requirements of this specification.

3.2 Examination

A. Inspect concrete and masonry substrates prior to start of application for:

1. Contamination—algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, laitance, mildew or other foreign substances
2. Surface absorption and chalkiness
3. Cracks—measure crack width and record location of cracks
4. Damage and deterioration such as voids, honeycombs and spalls

5. Moisture content and moisture damage—use a moisture meter to determine if the surface is dry enough to receive the products and record any areas of moisture damage

6. Compliance with specification tolerances—record areas that are out of tolerance (greater than ¼ inch in 8-0 feet [6mm in 2438 mm] deviation in plane)

B. Inspect sheathing application for compliance with applicable requirement and installation in conformance with specification and manufacturer requirements:

1. Glass Mat Faced gypsum sheathing compliant with ASTM C 1177

2. Exterior Grade and Exposure I wood based sheathing – APA Engineered Wood Association E 30

3. Cementitious sheathing – consult manufacturer

4. Attachment into structural supports with adjoining sheets abutted (gapped if wood-based sheathing) and fasteners at required spacing to resist design wind pressures as determined by design professional

5. Fasteners seated flush with sheathing surface and not over-driven

C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the Air/Moisture Barrier and the EIFS installation to the General Contractor. Do not start work until deviations are corrected.

3.3 Surface Preparation

A. Remove surface contaminants on concrete, concrete masonry, gypsum sheathing, or coated gypsum sheathing surfaces

B. Repair cracks, spalls or damage in concrete and concrete masonry surfaces and level concrete and masonry surfaces to comply with required tolerances

C. Apply conditioner (consult Sto) by spray or roller to chalking or excessively absorptive surfaces or pressure wash to remove surface chalkiness

D. Remove fasteners that are not anchored into supporting construction and seal holes with air barrier material

E. Seal over-driven fasteners with air barrier material and install additional fasteners as needed to comply with fastener spacing requirement

F. Fill large gaps between sheathing or voids around pipe, conduit, scupper, and similar penetrations with spray foam and shave flush with surface (refer to Sto Details)

G. Replace weather-damaged sheathing and repair or replace damaged or cracked sheathing.

3.4 Installation

A. Air/Moisture Barrier Installation over Exterior or Exposure), Glass Mat Faced Gypsum Sheathing in Compliance with ASTM C 1177, and Concrete, or Concrete Masonry (CMU) Wall Construction

1. Transition Detailing with Transition Membrane:
   At floor line deflection joints up to 1 inch (25 mm) wide, and static joints and transitions such as: sheathing to foundation, dissimilar materials (i.e., CMU to frame wall), flashing shingle-lap transitions, and wall to balcony floor slab or ceiling:
   a. Apply waterproof coating (Sto Gold Coat) liberally to properly prepared surfaces with brush, roller, or spray.
   b. Place pre-cut lengths of Transition Membrane centered over the transition in the wet coating. At changes in plane crease the membrane and similarly place the membrane material in the wet coating. At floor line deflection joints achieve a slightly concave profile (recessed into the joint) of the membrane.
   c. Immediately top coat the membrane with additional coating and apply pressure with brush or roller to fully embed the membrane in the coating and achieve a smooth and wrinkle-free surface without gaps or voids.
   d. Apply coating liberally along all top horizontal edges on walls and along all edges on balcony floor slabs to fully seal the edges.
   e. Overlap minimum 2 inches (51 mm) at ends and adhere lap seams together with coating. Shingle lap vertical seams and vertical to horizontal intersections with minimum 2 inch (51 mm) overlap.

B. At movement joints up to 1 inch (25 mm) wide with up to + 50% movement such as masonry control joints, and through wall joints in masonry or frame construction:
1. Insert backer rod sized to friction fit in the joint (diameter 25% greater than joint width).
2. Recess the backer rod ½ inch (13 mm).
3. Apply the waterproof coating liberally to properly prepared surfaces with brush, roller, or spray along the outer surface on each side of the joint (not in the joint).
4. Immediately place the membrane by looping it into the joint against the backer rod surface to provide slack.
5. Embed the membrane in the wet coating along the outer surface on the sides of the joint by top coating with additional coating material and applying pressure with a brush or roller.

C. For all applications, after the membrane installation is complete and the waterproof coating is dry:
1. Apply a final liberal coat of the waterproof coating to all top horizontal edges on walls to ensure waterproofing integrity. Similarly apply coating at all edges on balcony floor slabs.
2. Inspect the installed membrane for fish mouths, wrinkles, gaps, holes or other deficiencies. Correct fish mouths or wrinkles by cutting, then embedding the area with additional coating applied under and over the membrane.
3. Seal gaps, holes, and complex geometries at three dimensional corners with StoGuard, RapidFill or StoGuard RapidSeal.

D. Transition Detailing with StoGuard RapidFill
At flashing shingle laps, and through wall penetrations such as pipes, electrical boxes, and scupper penetrations:

1. Flashing leg or penetration flange must be seated flat against the wall surface without gaps. Apply StoGuard RapidFill liberally with a caulking gun in a zig-zag pattern across the flashing leg or flange/wall surface seam and spread to a thickness that covers the flange and fastener penetrations and directs water away from the wall. Extend application minimum 1 inch (25 mm) onto both surfaces (flashing leg/flange and wall surface).
2. At through wall penetrations without flanges ensure the penetrating element (i.e., pipe or scupper) is fitted snug against abutting wall surfaces. Apply a fillet bead with a caulking gun around the penetration and tool against both surfaces (penetration and wall surface) to create a bead profile that directs water away from the penetration. Extend application minimum 1 inch (25 mm) onto both surfaces.

E. Rough Opening Protection
1. Apply a generous bead of sealant with a caulking gun in a zig-zag pattern along the inside and outside surface of the rough opening. 2. Spread with a 6 inch (152 mm) wide plastic drywall knife all the way around the opening.

F. Sheathing Joint Treatment
1. Fill with Mesh: place 4 inch (102 mm) wide mesh centered along sheathing joints and minimum 9 inch (229 mm) wide mesh centered and folded at inside and outside corners. Immediately apply Sto Gold Fill by spray or trowel and spread with a trowel to create a smooth surface that completely covers the mesh.

G. Air/Moisture Barrier Coating Installation
1. Gypsum Sheathing: apply waterproof coating by spray or roller over sheathing surface, including the dry joint treatment, rough opening protection, and transition areas, to a uniform wet mil thickness of 10 mils in one coat. Use ½ inch (13 mm) nap roller for plywood. Use ¾ inch (19 mm) nap roller for glass mat faced gypsum sheathing. Protect from weather until dry.
2. CMU Surfaces:
   a. Repair static cracks up to 1/2 inch (13 mm) wide with StoGuard RapidFill. Rake the crack with a sharp tool to remove loose or friable material and blow clean with oil-free compressed air. Apply the crack filler with a trowel or putty knife over the crack and tool the surface smooth. Protect repair from weather until dry.
   b. Liberally apply two coats of Sto Gold Coat to the surface with a ¾ inch nap roller or spray equipment to a minimum wet thickness of 10 – 30 mils each, depending on surface condition. Additional coats may be necessary to provide a void and pinhole free surface. Protect from weather until dry.

H. Air /Moisture Barrier Connections and Shingle Laps
1. Coordinate installation of connecting air barrier components with other trades to provide a continuous air tight membrane.
2. Coordinate installation of flashing and other moisture protection components with other trades to achieve complete moisture protection such that water is directed to the exterior, not into the wall assembly, and drained to the exterior at sources of leaks (windows, doors and similar penetrations through the wall assembly).
3. Splice-in head flashings above windows, doors, floor lines, roof/sidewall step flashing, and similar locations with StoGuard detail component to achieve shingle lap of the air/moisture barrier such that water is directed to the exterior.

3.5 EIFS Installation

A. Starter Track

1. Strike a level line at the base of the wall to mark where the top of the starter track terminates.
2. Attach the starter track even with the line into structural supports with the proper fastener: Type S-12 corrosion resistant screws for steel framing with minimum 3/8 inch (9 mm) and three thread penetration, galvanized or zinc coated nails for wood framing with minimum 3/4 inch (19 mm) penetration, and corrosion resistant concrete or masonry screws with minimum 1 inch (25 mm) penetration for concrete or CMU. Attach between studs into blocking as needed to secure the track flat against the wall surface. Attach at maximum 16 inches (406 mm) on center into framing. For solid wood sheathing or concrete/masonry surfaces, attach directly at 12 inches (305 mm) on center maximum.
3. Butt sections of starter track together. Miter cut outside corners and abut. Snip front flange of one inside corner piece (to allow EPS insulation board to be seated inside of track) and abut.
4. Install Starter Track at other EIFS terminations as designated on detail drawings: above roof along dormers or gable end walls, and beneath window sills with concealed flashing (refer to Sto Details).

B. Detail Splice Strips for Starter Track, Flashing at Floor Lines, Head of Windows and Doors

Starter Track, Window/Door Head Flashing, Floor Line Flashing, and Roof/Side Wall Step Flashing: Install minimum 4 inch (100 mm) wide detail component over back flange of starter track, floor line flashing, head flashing, and roof/side wall step flashing. Center the detail component so it spans evenly between the back leg of flashing (or accessory) and the coated sheathing. Make a smooth transition to the coated sheathing with a trowel, knife, or roller, depending on the detail component material being used. When Sto Gold Fill with StoGuard Mesh is the detail component apply another coat of the waterproof coating over the detail area. Do not leave detail components exposed for more than 30 days.

C. Backwrapping

Apply a strip of detail mesh to the dry air/moisture barrier at all system terminations (windows, doors, expansion joints, etc.) except where the Starter Track is installed. The mesh must be wide enough to adhere approximately 4 inches (100 mm) of mesh onto the wall, be able to wrap around the insulation board edge and cover a minimum of 2 ½ inches (64 mm) on the outside surface of the insulation board. Attach mesh strips to the air/moisture barrier and allow them to dangle until the backwrap procedure is completed (paragraph 3.04 G1). Alternatively, pre-wrap terminating edges of insulation board.

D. Adhesive Application and Installation of Insulation Board

Ensure the air/moisture barrier surface (Sto Gold Coat) is free of surface contamination.

1. Install the insulation board within 30 days of the application of the air/moisture barrier coating (Sto Gold Coat), or clean the surface and recoat with Sto Gold Coat.
2. Rasp the interior lower face of insulation boards to provide a snug friction fit into the Starter Track. *(Note: rasping prevents an outward bow at the Starter Track).*
3. Use either polyurethane spray foam adhesive or cementitous adhesive:
   Cementitious Adhesive : apply adhesive to the back of the insulation board with the proper size (1/2 x ½ x 2 inch [13 x 13 x 51 mm]) stainless steel notched trowel. Apply uniform ribbons of adhesive parallel with the SHORT dimension of the board so that when boards are placed on the wall the ribbons will be VERTICAL. Apply adhesive uniformly so ribbons of adhesive do not converge.

Immediately place insulation boards in a running bond pattern on the wall with the long dimension horizontal. Start by inserting the lower edge of the boards inside the starter track at the base of the wall until they contact the bottom of the track. Apply firm pressure over the entire surface of the boards to ensure uniform contact of adhesive. IMPORTANT: do not delay installation once adhesive is applied. If adhesive "skins" remove it and apply fresh adhesive.

4. Bridge sheathing joints by a minimum of 6 inches (152 mm). Interlock inside and outside corners.
5. Butt all board joints tightly together to eliminate any thermal breaks. Care must be taken to prevent any adhesive from getting between the joints of the boards.
6. Cut insulation board in an L-shaped pattern to fit around openings. Do not align board joints with corners of openings.
7. Check for satisfactory contact of the insulation board with the substrate. If any boards have loose areas use the spray foam adhesive dispensing pistol to create a hole through the board and inject adhesive to attach the loose area. Allow the adhesive to expand to the outer face of the board while withdrawing the pistol. Cut excess adhesive flush with the surface of the insulation. Do not use nails, screws, or any other type of non-thermal mechanical fastener.

E. Slivering and Rasping of Insulation Board Surface

1. Make sure insulation boards are fully adhered to the substrate before proceeding.
2. Fill any open joints in the insulation board layer with slivers of insulation or the spray foam adhesive.
3. Rasp the insulation board surface to achieve a smooth, even surface and to remove any ultraviolet ray damage.

F. Trim, Reveals and Projecting Aesthetic Features

1. Attach features and trim where designated on drawings with adhesive to a base layer of insulation board or to the coated sheathing surface. Fill any gaps between the trim and base layer of insulation with spray foam adhesive and rasp flush with the trim surface. Slope the top surface of all trim/features minimum 1:2 (27°) and the bottom of all horizontal reveals minimum 1:2 (27°).
2. Cut reveals/aesthetic grooves with a hot-knife, router or groove-tool in locations indicated on drawings.
3. Offset reveals/aesthetic grooves minimum 3 inches (75 mm) from insulation board joints.
4. Do not locate reveals/aesthetic grooves at high stress areas.
5. Ensure minimum ¾ inch (19 mm) thickness of insulation board at the bottom of the reveals/aesthetic grooves.

G. Completion of Backwrapping

Complete the backwrapping procedure by applying base coat to exposed edges of insulation board and approximately 4 inches (100 mm) onto the face of the insulation board. Pull mesh tight around the board and embed it in the base coat with a stainless steel trowel. Use a corner trowel for clean, straight lines. Smooth any wrinkles or gaps in the mesh.

H. Accessory Installation

1. Corner Bead: cut the corner bead accessory to proper length as needed. Use full pieces wherever possible and avoid using short filler pieces. Offset accessory butt joints from substrate joints. Apply base coat with a stainless steel trowel to an approximate thickness of 1/8 inch (3 mm) to the outside corner area that will receive the accessory. Immediately place the accessory directly into the wet base coat material. Do not slide into place. Press the

accessory into place. A corner trowel is best for this purpose. Embed and completely cover the mesh and PVC by troweling from the corner to the edge of the mesh so that no mesh or PVC color is visible. Avoid excess build-up of base coat and feather along mesh edges. Adjoin separate pieces by abutting PVC to PVC and overlapping the mesh "tail" from one piece onto the next piece. Fully embed the accessory and mesh "tail" in base coat material. When installing field mesh reinforcement overlap accessory mesh and PVC. Remove any excess base coat from the outside corner.

2. Drip Edge: install the drip edge accessory prior to application of field mesh (paragraph 3.4.2 I5 below). Install with arrow on mesh pointing UP. Cut the accessory to proper length as needed. Use full pieces wherever possible and avoid using short filler pieces. Offset accessory butt joints from substrate joints. Apply base coat with a stainless steel trowel to an approximate thickness of 1/8 inch (3 mm) to the area that will receive the accessory. Immediately place the accessory directly into the wet base coat material and press into place. Do not slide into place. Embed and completely cover the mesh and PVC by troweling from the drip edge screed rail to the edge of the mesh. Avoid excess build-up of base coat, feather along mesh edges, and remove any excess base coat from the drip edge nosing. Abut adjoining pieces and install as described above. When installing field mesh reinforcement overlap accessory mesh 4 inches (10 cm) on both vertical and horizontal faces so the PVC is overlapped, and remove any excess base coat from the drip edge nosing. On vertical and horizontal faces of the accessory install finish to the drip edge lines and remove any protruding finish from the drip edge nosing.

I. Base Coat and Reinforcing Mesh Application

1. Ensure the insulation board is firmly adhered and free of surface contamination or UV degradation, and is thoroughly rasped before commencing the base coat application.
2. Apply minimum 9x12 inch (225x300 mm) diagonal strips of detail mesh at corners of windows, doors, and all penetrations through the system. Embed the strips in wet base coat and trowel from the center to the edges of the mesh to avoid wrinkles.
3. Apply detail mesh at trim, reveals and projecting architectural features. Embed the mesh in the wet base coat. Trowel from the base of reveals to the edges of the mesh.
4. Ultra-High impact mesh application (recommended to a minimum height of 6'-0" [1.8 m] above finished grade at all areas accessible to pedestrian traffic and other areas exposed to abnormal stress or impact, and where indicated on contract drawings): apply base coat over the insulation board with a stainless steel trowel to a uniform thickness of approximately 1/8 inch (3 mm). Work horizontally or vertically in strips of 40 inches (1016 mm), and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Butt ultra-high impact mesh at seams. Allow the base coat to dry.
5. Standard mesh application: Apply base coat over the insulation board, including areas with Ultra-High impact mesh, with a stainless steel trowel to a uniform thickness of approximately ⅛ inch (3 mm). Work horizontally or vertically in strips of 40 inches (1016mm), and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Overlap mesh not less than 2-½ inches (64 mm) at mesh seams and at overlaps of detail mesh. Feather seams and edges. Double wrap all inside and outside corners with minimum 6 inch (152 mm) overlap in each direction (optional if corner bead accessory is used – see NOTE to paragraph 3.4.2 H1 above).Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color shows

through the base coat when it is dry. Re-skim with additional base coat if mesh color is visible.

6. Sloped Surfaces: for trim, reveals, aesthetic bands, cornice profiles, sills or other architectural features that project beyond the vertical wall plane more than 2 inches (51 mm) apply waterproof base coat with a stainless steel trowel to the sloped surface and minimum four inches (100 mm) above and below it. Embed standard mesh or detail mesh in the waterproof base coat and overlap mesh seams a minimum of 2-½ inches (65 mm).
7. Allow base coat to thoroughly dry before applying primer or finish.

J. Primer Application
1. Ensure the base coat surface is free of surface contamination before commencing the primer application.
2. Apply primer evenly with brush, roller or proper spray equipment over the clean, dry base coat and allow to dry thoroughly before applying finish.

K. Finish Coat Application
1. Ensure the base coat surface or primed base coat is free of surface contamination before commencing the finish application.
2. Apply finish directly over the base coat or primed base coat when dry. Apply finish by spray or stainless steel trowel, depending on the finish specified. Follow these general rules for application of finish:
   a. Avoid application in direct sunlight.
   b. Apply finish in a continuous application, and work to an architectural break in the wall.
   c. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results. Cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing. Adjust work schedule and provide protection.
   d. Do not install separate batches of finish side-by-side.
   e. Do not apply finish into or over sealant joints. Apply finish to outside face of wall only.
   f. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.

3.6 Protection

A. Provide protection of installed materials from water infiltration into or behind them

B. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry

3.7 Cleaning, Repair And Maintenance

A. Clean and maintain the EIFS for a fresh appearance and to prevent water entry into and behind the system. Repair cracks, impact damage, spalls or delamination promptly.

B. Maintain adjacent components of construction such as sealants, windows, doors, and flashing, to prevent water entry into or behind the EIFS and anywhere into the wall assembly

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section covers the pre-finished, pre-fabricated Architectural metal soffit panel system. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.

B. Drawings and general provisions of the Contract, including general and Supplementary Conditions and Division 01 Specifications, apply to this section.

1.2 SUMMARY

A. Section Includes
   1. Factory formed metal wall panels

B. Related work specified elsewhere (Note: select from the below or add appropriate sections)
   1. Flashing and Trim: Division 7- Flashing and Sheet Metal
   2. Sealants: Division 7 Joint Sealers Sections

1.3 DEFINITIONS

A. Metal Wall Panel Assembly: Metal soffit panels, attachment system components, miscellaneous metal framing, thermal, and accessories necessary for a complete weathertight system.

1.4 QUALITY ASSURANCE

A. Manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.

B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) *Architectural Sheet Metal Manual.*

C. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.

1.5 SUBSTITUTIONS

A. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.

1.6 SYSTEM DESCRIPTION

A. Material to comply with:
   1. ASTM A792/A792M Standard Specification for Sheet Steel, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip process

1.7 SOFFIT PANEL SYSTEM PERFORMANCE TESTING

A. General Performance: Metal soffit panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.

B. Panels to meet:
   1. Metal Soffit System shall be designed to meet applicable Local Building Code and the Soffit System shall have been tested by the Manufacturer per

ASTM E-330 and have the applicable Load Tables published from this Air Bag testing for negative loads.

1.8 WARRANTIES

A. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finish within specified warranty period.
   1. Exposed Panels Finish - deterioration includes 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 a paint to adhere to a bare metal.
   2. Warranty Period: 20 Years from the date of substantial completion

B. Applicator shall furnish written warranty for a two (2) year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight condition

1.9 SUBMITTALS

A. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.
B. Provide finish samples of all colors specified.
C. Shop drawings: Show fabrication and installation layouts of metal soffit panels or metal soffit panels, details of edge conditions, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work
D. Coordination Drawings: Plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installer of the items involved.

1.10 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instruction and lead time requirements to avoid construction delays.
B. Deliver components, sheets, metal wall panels and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
C. Unload, store and erect metal wall panels in a manner to prevent bending, warping, twisting and surface damage.
D. Stack metal wall panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.
E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

1.11 PROJECT CONDITIONS

A. Weather Limitations: proceed with installation only when existing and forecasted weather conditions permit metal wall panel work to be performed.

B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PANEL DESIGN

A. General: Provide factory-formed metal wall panels designed for soffit applications where a flush or flat appearance is desired. A round interlock leg and concealed fastening system act to improve the flush appearance while providing additional strength.
B. Wall panels shall be Flush Wall 11" widths with 1" height.
C. Panels to be produced Smooth - Factory Standard. Specifier note: Factory standard is smooth unless specified. Specifier Note: Depending on producing factory, panels may be specified with venting strips or perforated, aluminum panels only, for soffit applications. Check with local factory for capabilities.
D. Forming: Use continuous end rolling method. No end laps on panels. No portable rollforming machines will be permitted on this project, no installer-owned or installer-rented machines will be permitted. It is the intent of the Architect to provide Factory-Manufactured panel systems only for this project.

2.2 ACCEPTABLE MANUFACTURERS

A. This project is detailed around the metal wall product of Petersen Aluminum Corp, Acworth, GA, 800-272-4482Petersen Aluminum Corp, Phoenix, AZ, 833-750-1935 Flush Wall
B. Or pre-approved equal

2.3 MATERIALS AND FINISHES

A. Preformed metal panels shall be fabricated of 24 GA and shall be Herr-Voss corrective leveled for flat appearance.
B. Color shall selected from all available manufacture option
   1. Color to be selected by owner and architect during the submittal process

C. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over a 0.25 to 0.3 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil, to meet AAMA 621. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesions, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
D. If Strippable coating to be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and handling, film shall be removed before installation.
E. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting.
F. Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the wall panel system. Exposed fasteners shall not restrict free

movement of the roof panel system resulting from thermal forces, except at designed points of roof panel fixity

G. Substrate shall be as noted on the structural drawings

H. Sealants
   1. Provide two-part polysulfide class B non-sag type for vertical and horizontal joints or
   2. One part polysulfide not containing pitch or phenolic extenders or
   3. Exterior grade silicone sealant recommended by roofing manufacturer or
   4. One part non-sag, gun grade exterior type polyurethane recommended by the roofing manufacturer.

2.4 FABRICATION

A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.

B. Fabricate components of the system in factory, ready for field assembly.

C. Fabricate components and assemble units to comply with fire performance requirements specified.

D. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine alignment of structural steel and related supports, primary and secondary roof framing, solid roof sheathing, prior to installation.

B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.

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

3.2 FASTENERS

A. Secure units to supports.

B. Place fasteners as indicated in manufacturer's standards.

3.3 INSTALLATION

A. Compliance: Comply with manufacturer's product data, recommendations and installation instructions for substrate verification, preparation requirements and installation.

B. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years successful experience with similar applications.

C. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.

D. Provide uniform, neat seams.

E. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leakproof installation.

F. Remove all strippable coating and provide a dry-wipe down cleaning of the panels as they are erected.

3.4 DAMAGED MATERIAL

A. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

3.5 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damage installed products. Clean installed products in accordance with manufacturer's instruction prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 07540 – THERMOPLASTIC POLYOLEFIN (TPO) ROOFING SYSTEM

1.0 - GENERAL

1.1 Description

A. The work of this section consists of providing TPO Adhered Roofing System as outlined below:
   1. Apply the Adhered Roofing System in conjunction with the indicated roof Insulation.

1.2 Scope Of Work

A. Provide all labor, material, tools, equipment, and supervision necessary to complete the installation of the .060" thick minimum (white, gray or tan color as selected by Architect) reinforced TPO (Thermoplastic Polyolefin) reinforced membrane Adhered Roofing System including flashings and insulation as specified herein and as indicated on the drawings in accordance with the manufacturer's most current specifications and details to meet performance criteria specified herein.

B. The roofing contractor shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.

C. The roofing contractor shall confirm all given information and advise the Architect, prior to bid, of any conflicts that will affect their cost proposal.

D. Any contractor who intends to submit a bid using a roofing system other than the approved manufacturers must submit for pre-approval in writing ten (10) days prior to the bid date. Comply and submit in accordance with Section 01360.

1.3 Related Sections

A. Section 07621 – Sheet Metal Work Flashing and Trim

B. Section 10428 – Roof Information Plaque

1.4 Submittals

A. Prior to starting work, the roofing contractor must submit the following:

   1. Shop drawings showing layout, details of construction and identification of materials.
   2. A sample of the manufacturer's Membrane System Warranty.
   3. Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
   4. Attachment pattern for insulation and membrane to comply with wind zone requirements.

B. Upon completion of the installed work, submit copies of the manufacturer's final inspection to the Architect prior to the issuance of the manufacturer's warranty.

C. Manufacturer Certificates: Signed by manufacturer certifying that roof panels comply with performance requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.
2. Submit signed approval of project drawings and specifications meeting manufacturer's requirements for specified manufacturer's warranties.
3. Submit evidence of Installer/contractor meeting requirements for specified warranties.
4. Contractor to register roofing project with the manufacturer prior to the pre-roofing conference and prior to submitting shop drawings. As part of the submittals package, copy of the acknowledgement of the manufacturer is required.

Note: Copy of Acknowledgement Letter from manufacturer that project has been registered shall be included with submittals and prior to pre-roofing conference.

A **minimum** of three (3) field inspections shall be made by a technical (non-sales) representative of the Roofing System Manufacturer at start, mid-way and upon completion of the work. Written reports shall be made and copies of these reports must be submitted to the Architect within 3 days of the inspections. These inspections must be made by a manufacturer's representative employed by the manufacturer. Notify Architect 72 hours prior to inspections.

1.5 Product Delivery, Storage and Handling

A. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.

B. Comply with the manufacturer's written instructions for proper material storage.

1. Store membrane in the original undisturbed plastic wrap in a cool, shaded area. Membrane that has been exposed to the elements for approximately 7 days must be prepared with Commercial Innovations Weathered Membrane Cleaner (or other Manufacturer's recommended product) prior to hot air welding.
2. Store curable materials (adhesives and sealants) between 60F and 80F in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to 60F minimum temperature before using.
3. Store materials containing solvents in dry, well ventilated spaces with proper fire and safety precautions. Keep lids on tight. Use before expiration of their shelf life.

C. Insulation must be on pallets, off the ground and tightly covered with waterproof protective materials.

D. Any materials which are found to be damaged shall be removed and replaced at the contractor's expense.

1.6 Work Sequence

A. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections

of the membrane system.

B. Do not disrupt activities in occupied spaces.

1.7 Site Conditions

A. If discrepancies are discovered between the actual conditions and those noted on the drawings, immediately notify the Architect in writing. Necessary steps shall be taken to make the building watertight until the discrepancies are resolved.

1.8 Pre-Roofing Conference

A. Pre-Installation Roofing Conference: Convene a pre-roofing conference approximately two (2) weeks before scheduled commencement of roofing system installation and associated work.

Require attendance of installer of each component of associated roofing work, Contractor, Architect, Owner, Alabama Construction Management, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, testing agencies and governing authorities. Objectives of conference include:

1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
2. Review roofing system requirements (drawings, specifications and other contract documents).
3. Review required submittals both completed and yet to be completed.
4. Review construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
5. Review required inspection, testing, certifying and material usage accounting procedures.
6. Discuss weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
7. Record discussion of conference including decisions and agreements (or disagreements) reached and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

B. The Architect will record the proceedings and distribute them to the participants for record.

C. The intent of the conference is to resolve issues affecting the installation and performance of roofing work. Do not proceed with roofing work until such issues are resolved to the satisfaction of the Owner and Architect.

D. The Representative for the Roofing Materials Manufacturer shall bring a copy of the warranty(ies) for the roofing material(s) for comparison to the warranty(ies) specified. This sample warranty is required to be job specific, covering all requirements, per the specifications. If the sample warranty is

not provided as required, the conference will be voided, an inspection fee will be issued, and it will have to be rescheduled.

1.9 Job Site Protection

A. The roofing contractor shall adequately protect building, paved areas, service drives, lawn, shrubs, trees, etc. from damage while performing the required work. Provide canvas, boards and sheet metal (properly secured) as necessary for protection and remove protection material at completion. The contractor shall repair or be responsible for costs to repair all property damaged during the roofing application. **Do not store roofing materials on the roof.**

B. During the roofing contractor's performance of the work, the owner will continue to occupy the existing building. The contractor shall take precautions to prevent the spread of dust and debris, particularly where such material may sift into the building. The roofing contractor shall provide labor and materials to construct, maintain and remove necessary, temporary enclosures to prevent dust or debris in the construction area(s) from entering the remainder of the building.

C. Do not overload any portion of the building, by either use of or placement of equipment, storage of debris, or storage of materials.

D. Protect against fire and flame spread. Maintain proper and adequate fire extinguishers.

E. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day's work and clean drains, if required. At completion, test drains to ensure the system is free running and drains are watertight. Remove strainers and plug drains in areas where work is in progress. Install flags or other telltales on plugs. Remove plugs each night and screen drain.

F. Store moisture susceptible materials above ground and protect with waterproof coverings.

G. Remove all traces of piled bulk material and return the job site to its original condition upon completion of the work.

1.10 Safety

A. The contractor shall be fully responsible for all means and methods as they relate to safety and shall comply with all applicable local, state and federal requirements that are safety related. Safety shall be the responsibility of the contractor. All related personnel shall be instructed daily to be mindful of the full time requirement to maintain a safe environment for the facility's occupants including staff, visitors, workers and the occurrence of the general public on or near the site.

1.11 Workmanship

A. Applicators installing new roof, flashing and related work shall be factory trained and approved by the manufacturer they are representing.

B. All work shall be of highest quality and in strict accordance with the manufacturer's published specifications and to the Owner's satisfaction.

C. There shall be a supervisor on the job site at all times while work is in progress.

D. The contractor shall be responsible for weathertightness under this section.

1.12 Quality Assurance and Performance Requirements

A. The membrane roofing system must achieve a UL Class A and FM1-90 or higher rating. (No exceptions). Provide additional materials or higher quality to meet FM-I-90 and wind speed requirements of 120 mph or higher (Risk Category 3) and Severe Hail (SH) requirements. (No exclusions for hail less than 2")

B. Unless otherwise noted in this specification, the roofing contractor must strictly comply with the manufacturer's current specifications and details.

C. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer.

D. All roofing materials shall be new and provided by same source as required to comply with manufacturer's system warranty.

E. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified including operation of hot air welding equipment and power supply. Provide at least one thoroughly trained and an experienced superintendent on the job at all times roofing work is in progress.

F. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the Architect. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the Architect's consideration.

G. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the Architect seventy-two (72) hours prior to the manufacturer's final inspection.

H. FMG Listing: Provide roofing membrane, base flashings, and component materials that meet the requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: UL Class A – FM 1-90 (120 mph wind speed minimum) Risk Category 3
2. Hail Resistance: Severe Hail (SH) (No exclusions for 2" hail)

I. Membrane Roofing System must meet or exceed impact resistance requirements of IBC 2021 Section 1504.7 and Wind Speed Requirements as applicable to the Zone where the Building is located as required by the IBC 2021Edition.

J. Certification of Roofing System
Contractor(s), Roofing Material Manufacturer, and Roofing Material Manufacturer's Field Inspector shall each execute the Certification of Roofing System, a copy of which immediately follows this Section.

K. Product must meet Testing requirements of ASTM D5019, "Standard Specification for Reinforced Non-Vulcanized Polymeric Sheet Used in Roofing Membrane"

1.13 Job Conditions and Special Handling

A. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.

B. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

C. When loading materials onto the roof, the Authorized Roofing Applicator must comply with the requirements of the Owner/Architect to prevent overloading and possible disturbance to the building structure.

D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.

E. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.

F. Provide protection, such as 3/4-inch-thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters. Remove debris and loose fasteners promptly.

G. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

H. New roofing installation shall be complete and weather tight at the end of each work day.

I. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.14 Warranty

A. Provide manufacturer's special 20 year weathertightness No Dollar Limit (NDL) Roofing System Warranty. Hail Resistance: Severe Hail (SH) (No exclusions for 2" hail)

B. Pro-rated System Warranties shall not be accepted.

C. The roof and associated work shall be guaranteed by the General Contractor against leaks from faulty or defective materials and workmanship for a period of five (5) years, starting on the date of acceptance of the project by the Owner.

D. Manufacturer's roofing guarantees shall contain language regarding the governing of the guarantee by the State of Alabama, otherwise amend the requirement and state that the Laws of the State of Alabama shall govern

all such guarantees.

E. Roofing Installers Warranty: Submit roofing Installer's warranty on Installers letterhead, signed by Installer, covering all work of this contract, including incidental items, for the following warranty period:

Warranty Period: Five (5) years from date of Substantial Completion.

F. State of Alabama General Contractor's Roof Guarantee: Covering Work of this Section, including all components of the roofing system for the following warranty period:

Warranty Period: Five (5) years from date of Substantial Completion.

G. All warranties shall be dated within 30 days of substantial completion.

H. **The Representative for the Roofing Materials Manufacturer shall bring a copy of the warranty(ies) for the roofing material(s) for comparison to the warranty(ies) specified. This sample warranty is required to be job specific, covering all requirements, per the specifications. If the sample warranty is not provided as required, the conference will be voided, an inspection fee will be issued, and it will have to be rescheduled.**

2.0 - PRODUCTS

2.1 General

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

1. Carlisle SynTec, Incorporated. (60 mil)
2. Johns Manville (60 mil)
3. Commercial Innovations, Inc (SealTite) (60 mil)
4. Versico Roofing System (TPO - Versiweld - 60 mil)

B. All products (including insulation, fasteners, fastening plates and edgings) must be manufactured and supplied by the roofing system manufacturer and covered by the system warranty.

2.2 Membrane

Provide 60 mil min. thick reinforced TPO (Thermoplastic Polyolefin) membrane as needed to complete the roofing system. Membrane thickness over the reinforcing scrim (top-ply thickness) shall be nominal 15 mil thick. Color to be selected by Architect.

2.3 Insulation/Underlayment

A. When applicable, insulation shall be installed in multiple layers. The first and second layers of insulation shall be mechanically fastened to the substrate in accordance with the manufacturer's published specifications.

B. Insulation shall be as indicated.

C. Coverboard (SecuRock, Densdeck, ½" SecurShield HD ISO)

2.4 Adhesives and Cleaners

A. All products shall be provided from approved manufacturer and specifically formulated for the roofing system specified herein.

1. Bonding Adhesive
2. Edge Sealant
3. Sealer: Water Cut-Off Mastic (as recommended by roofing manufacturer)
4. Pocket Sealant: TPO Molded Pocket Sealant (as recommended by roofing manufacturer)
5. Membrane Cleaner

2.5 Fasteners and Plates

A. To be used for mechanical attachment of insulation and to provide additional membrane securement:

1. Pre-Assembled Fasteners: A pre-assembled 3" diameter Plastic Plate and standard Phillips head fastener used for insulation attachment into steel or wood decks. Installed using Olympic Fastening Tools.

2. CI Term Bar Nail-Ins: A 1-1/4" long expansion anchor with a zinc plated steel drive pin used for fastening the Termination Bar or Seam Fastening Plates to concrete, brick, or block walls.

3. Seam Fastening Plates: a 2 inch diameter metal plate used for additional membrane securement.

4. Insulation Fastening Plates: a nominal 3 inch diameter plastic or metal plate used for insulation attachment.

2.6 Metal Edging and Membrane Terminations

Termination Bar: 1 inch wide and .098-inch-thick extruded aluminum bar pre-punched 6 inches on center; incorporates a sealant ledge to support Lap Sealant and provide increased stability for membrane terminations.

2.7 Other Materials

Metal Flashing, specified under Section 07621.

3.0 - EXECUTION

3.1 General

A. Comply with the manufacturer's published instructions for the installation of the membrane roofing system including proper substrate preparation, job site considerations and weather restrictions.

B. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking water.

3.2 Insulation Placement and Attachment

A. Install insulation or membrane underlayment over the substrate with boards

butted tightly together with no joints or gaps greater than 1/4 inch. Stagger joints horizontally and vertically if multiple layers are provided.

B. Secure insulation to the substrate with the required insulation adhesive and manufacturer's specification to meet wind zone requirements (FM I-90) and 130 MPH wind speed at roof level.

3.3 Membrane Placement and Attachment

A. Position membrane over the acceptable substrate. Fold membrane sheet back lengthwise (onto itself) so half the underside of the membrane is exposed.

B. Apply Bonding Adhesive in accordance with the manufacturer's published instructions, to the exposed underside of the membrane and the corresponding substrate area. Do not apply Bonding Adhesive along the splice edge of the membrane to be hot air welded over the adjoining sheet. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.

1. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a soft bristle push broom to achieve maximum contact.

2. Fold back the unbonded half of the sheet lengthwise and repeat the bonding procedures.

C. Position adjoining sheets to allow a minimum overlap of 2 inches.

D. Hot air weld the membrane sheets using the Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's hot air welding procedures.

E. Pull the membrane back along the welded splice so the entire underside of the membrane is exposed once the Hot Air Weld has been completed.

F. Apply Bonding Adhesive to the exposed underside of the membrane sheet and the substrate.

G. Allow adhesive to dry until tacky and roll the membrane into the substrate and brush down the bonded section with a bristle broom following the procedure noted above.

H. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously.

3.4 Membrane Splicing/Hot Air Welding Procedures

A. Hot air weld the membrane using an Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's specifications. At all splice intersections, roll the seam with a silicone roller to ensure a continuous hot air welded seam. (Note: When using .060" thick membrane, all splice intersections shall be overlaid with non-reinforced flashing)

B. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes).

C. Repair all seam deficiencies the same day they are discovered.

D. Apply Cut Edge Sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete. Cut Edge Sealant is not required on vertical splices.

3.5 Flashing

A. Flashing of parapets, curbs, expansion joints and other parts of the roof must be performed using reinforced membrane. Non-reinforced membrane can be used for flashing pipe penetrations, Sealant Pockets, and scuppers, as well as inside and outside corners, when the use of pre-molded accessories is not feasible.

B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.6 Walkways

A. Install walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the specifier's drawing.

B. Hot air weld walkway pads to the membrane in accordance with the manufacturer's specifications.

3.7 Daily Seal

A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

B. Complete an acceptable membrane seal in accordance with the manufacturer's requirements.

3.8 Clean Up

A. Perform daily clean up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

END OF SECTION

CERTIFICATION OF ROOFING SYSTEM

Project: _____

Architect's Job No:_____**DCM Project No.** _____

Owner: _____

General Contractor: _____

Roofing Subcontractor: _____

Roofing Material Manufacturer: _____

Roofing Material Manufacturer's Inspector: _____

The undersigned Contractors, Manufacturer Representative and Inspector do hereby state that the Roofing System for the Project identified above has been provided in compliance with all Codes specified and as required by Local and State of Alabama laws and regulations and has been provided in compliance with the specified Performance Requirements.

SIGNATURES

General Contractor: _____

Signature Printed Name

Roofing Subcontractor: _____

Signature Printed Name

The Roofing Material Manufacturer further states that the Roofing System Provided by Manufacturer to the Roofing Contractor complies with International Building Code 2021 for the Roofing System that has been installed.

Roofing Material Manufacturer: _____

Signature Printed Name

The Roofing Material Manufacturer's Field Inspector certifies that he/she has made field inspections in the proper number and sequence to assure Roofing Material Manufacturer that the Roofing System supplied has been installed to comply with Manufacturer's installation requirements as well as the 2021 IBC.

Roofing Material Manufacturer's Inspector: _____

Signature Printed Name

1.0 - GENERAL

1.1 Scope

Section includes a complete Architectural Standing Seam Metal Roofing System with preformed and pre-finished standing seam metal roofing panels, underlayment, fasteners, clips, perimeter and penetration flashings, roof curbs, cap flashing, closures, sealant, gutters, downspouts, seam caps, trim, vapor barriers, expansion joint covers, soffit system and miscellaneous accessories required to provide the entire roofing and sheet metal assemblies complete and weathertight as intended by contract documents.

1.2 Related Sections

A. Section 06100 - Rough Carpentry
B. Section 07910 - Caulking and Sealants
C. Mechanical/Plumbing - See Drawings
D. Electrical - See Drawings

1.3 References

A. American Iron and Steel Institute (AISI), Specification for the Design of Cold-Formed Steel Structural Members, (August, 1986).

B. American Institute of Steel Construction (AISC) Manual of Steel Construction, (Current Edition).

C. American Society for Testing and Materials (ASTM):
   1. A446: Specification for Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process, structural (physical) property.
   2. A525: Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   3. A792: Specification for Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
   4. E283: Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
   5. E331: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
   1. 1987 Architectural Sheet Metal Manual.

E. Underwriter's Laboratories (UL) Building Materials Directory:
   1. UL 580: Tests for Wind Uplift Resistance of Roof Materials.

1.4 Quality Assurance

A. Prior to starting work, the roofing contractor must submit the following:
   1. Shop drawings showing layout, details of construction and identification of materials.
   2. A sample of the manufacturer's Membrane System Warranty.
   3. Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
   4. Attachment pattern for insulation and membrane to comply with wind zone requirements.

B. Upon completion of the installed work, submit copies of the manufacturer's final inspection to the Architect prior to the issuance of the manufacturer's warranty.

C. Manufacturer Certificates: Signed by manufacturer certifying that roof panels comply with performance requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.
2. Submit signed approval of project drawings and specifications meeting manufacturer's requirements for specified manufacturer's warranties.
3. Submit evidence of Installer/contractor meeting requirements for specified warranties.
4. Contractor to register roofing project with the manufacturer prior to the pre-roofing conference and prior to submitting shop drawings. As part of the submittals package, copy of the acknowledgement of the manufacturer is required.

D. Manufacturer Qualifications:
Provide primary roofing material products from a single source including under layments all produced by a single manufacturer. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.

E. Installer's Qualifications: Installer / sub-contractor must be currently in the primary business of roofing with not less than (5) five consecutive years of recorded successful experience with roofing systems comparable to that of this project under the same company name and be **authorized by the roofing material manufacturer as trained and approved for installation** of such roofing materials indicated for this project. Joint ventures shall not be allowed.

F. A full-time field supervisor or foreman with minimum of (5) years of experience in a roofing supervisory role, having performed on projects of comparable scope and type shall be required to be on site at all times during roofing work.

G. The Roofing Contractor shall be responsible for weathertightness of the entire roofing system.

H. The Roofing Contractor shall inspect and accept condition of the roof deck and components of mechanical penetrations prior to installation of the roofing system.

Note: Copy of Acknowledgement Letter from manufacturer that project has been registered shall be included with submittals and prior to pre-roofing conference.

A **minimum** of three (3) field inspections shall be made by a technical (non sales) representative of the Roofing System Manufacturer at start, mid-way and upon completion of the work. Written reports shall be made and copies of these reports must be submitted to the Architect within 3 days of the inspections. These inspections must be made by a manufacturer's representative employed by the manufacturer. Notify Architect 72 hours prior to inspections.

The Representative for the Roofing Materials Manufacturer shall bring a copy of the warranty(ies) for the roofing material(s) for comparison to the warranty(ies) specified. This sample warranty is required to be job specific, covering all requirements, per the specifications. If the sample warranty is not provided as required, the conference will be voided, an inspection fee will be issued, and it will have to be rescheduled.

1.5 Pre-Roofing Conference:

A. Prior to roof deck installation, a required Pre-Roofing Conference shall be held as scheduled by Architect upon request by the Contractor. Required attendees include the Owner, Architect, DCM Inspector, 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. Comply with requirements in Division 1.

B. Immediately prior the Roofing installation work, the General Contractor shall hold a subcontractors pre-installation meeting at the site to review matters discussed at the State required Pre-Roofing Conference, methods and procedures related to roofing system including, but not limited to, the following:

1. Review methods and procedures related to roofing installation, including manufacturer's written instructions and warranty requirements.

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. Examine and accept deck substrate conditions for compliance with requirements, including flatness and fastening.

4. Review structural loading limitations of roof deck during and after roofing.

5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

6. Review governing regulations and requirements for insurance and certificates if applicable.

7. Review temporary protection requirements for roofing system during and after installation.

8. Review roof observation and repair procedures.

1.6 System Description

A. Design Requirements:

1. Architectural Standing Seam Metal Roofing System with continuous, one-piece, preformed, pre-finished, mechanically-seamed, single length roof pans, concealed attachment cleats and other components required for specific project conditions. Sheet steel shall conform to ASTM A792.

2. Formed pre-finished sheet metal flashing, trim, roof drainage systems, curbs, soffit system, etc. to withstand wind loads, structural movement, thermal movement, and exposure to weather without failing, rattling, leaking, fastener disengagement or allowing water infiltration to building interior. Comply with recommendations in FMG Loss Prevention Data Sheet 1-49:

3. Manufacturer is responsible for providing evidence acceptable to Architect that Manufacturer's specified roof system is capable of meeting thermal, wind uplift and performance requirements specified and as required by all local codes and 2021 International Building Code.

B. Thermal Movement:

1. Completed sheet metal system shall be capable of withstanding expansion and contraction of components cause by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

2. Interface between sheet metal component panels and concealed expansion clip shall provide for applicable thermal movement in each direction along the longitudinal direction.

3. Location and sizes of metal roofing rigid connectors shall be project specific as indicated an Engineer's (registered in the State of Alabama) certification and located on shop drawings.

4. Temperature Change Range: 120 degrees F ambient; 180 degrees F material surfaces.

C. Uniform Wind Load Capacity:

1. Design Loads (Roof Panels and Clips): Pressures are normal to roof surface in accordance with ANSI A58.1. Where load tests are required to certify performance, factor of safety shall be 2.5 on panel buckling or on clip-to-panel connections. For Wind Loads, an allowable increase factor of 4/3 may be employed (this results in net factors of safety of 1.875 on panel bending or clip failure from wind loads). Factor of safety for panel capacity of Live Loads shall be 2.0. Minimum wind speed 120 mph.

2. Roof Panel Clip Requirements: Connection of panel anchor clips to substructure or roof deck system shall be designed to resist loads developed by pressures with proper regard for prying forces and/or bending due to eccentric loading. Performance shall be evaluated at extreme positions of thermal movement. A 1/3 increase in allowable load is permitted for wind pressures. Allowable stresses for design shall be in accordance with specifications in AISI "Cold Formed Steel Design Manual", factor of safety on testing of connections shall be 2.5. Clips shall be double anchored through the deck to prevent rotation.

3. Installed roof system shall carry positive uniform design loads with maximum system deflection of L/180 as measured at rib (web) of panel. Comply with UL 580 / Uplift Rating UL 90. Minimum wind speed 120 mph.

D. Performance Requirements:

1. Underwriter's Laboratories, Inc., (UL), Wind Uplift Resistance Classification For Roof Assembly shall be Class I-90, as installed, pursuant to Construction Number 312, 312 with batt insulation, 335, 335-modified, or 403, as defined by UL 580. Certified statements from manufacturer without proper UL Classification will not be acceptable.

2. Completed metal roof system shall have maximum static pressure air infiltration of 0.066 cfm/square feet of roof area with 6.24 psf air pressure differential when tested in accordance with ASTM E283.

3. No uncontrolled water penetration (dynamic pressure), other than condensation, when exposed to dynamic rain at 6.24 psf differential static pressure for not less than five minutes duration, when tested in accordance with ASTM E 1646

4. Calculated pull-out capacities for fasteners shall be certified by registered professional Engineer in the State of Alabama as selected by Owner. Minimum safety factor for anchoring fasteners into metal shall be 2.35. Minimum safety factor for anchoring fasteners into concrete shall be 4.0.

5. Installation shall comply with requirements of: FM I-90, FM Fire/windstorm Classification 1A-90 and FM Severe Hail and 2021 International Building Code Hail Impact and Windspeed. No exclusions for Hail under 2".

6. Entire roofing system and sheet metal assemblies are to be provided in detail for weathertightness under peak weather conditions.

E. Certification of Roofing System
Contractor(s), Roofing Material Manufacturer, and Roofing Material Manufacturer's Field Inspector shall each execute the Certification of Roofing System, a copy of which immediately follows this Section.

1. This certification endorsement by the manufacturer shall assure the Owner/Architect that the materials supplied for this project are in compliance with materials and performances as specified in this section.
2. Field Inspector shall further stipulate by signing the certification that he has inspected the project as required and has found no unresolved issues with installation of the manufacturer's materials as supplied.

1.7 Submittals

A. Shop Drawings: Architectural details show design concept and relationship of roof and sheet metal system to other conditions. It is the responsibility of the Installer to prepare detailed shop drawings that adapt the indicated roof and sheet metal assemblies and configuration to conditions of this Project and specified requirements. Shop drawings shall be reviewed by manufacturer's Technical Department before submittal to Architect. Installer shall recommend and make any detail modifications required by manufacturer to ensure a proper and weathertight system.

1. Show roofing and sheet metal system with flashings and accessories in plan, elevation, sections and details for each type of product indicated.

2. Include metal thicknesses and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations. Also indicate attachment locations, thermal expansion provisions, and special supports. Submittal shall include manufacturer's written comments, all fastener descriptions and spacing, sealant description and locations, bend radii, metal thicknesses, dimensions of individual components and profiles, and other pertinent information.

3. Indicate relationships with adjacent and interfacing work.

4. Distinguish between factory and field assembly work.

5. Submit erection drawings showing proposed sequence of laying panels. Provide manufacturer's instructions for storage, handling and installation, and their standard construction details for conditions on the Project.

6. Submit documentation that system attachment will meet UL-90 rating for resistance to wind uplift loads.

B. Product Data: Submit manufacturer's detailed material and system description, sealant and closure installation instructions, engineering performance data, and specifications.

C. Submit a sample 16 sq inch (min.) chip of each type of actual material color, complete with factory finish. Architect shall select from industry standard Energy Star Colors.

D. Quality Control Submittals:

1. Design Calculations:
   a. Submit design calculations sealed by registered Engineer in the State of Alabama indicating compliance with specified

performance criteria and certified fastener pullout calculations. Indicate fastener types, spacings and number required for each clip. Pullout calculations shall be for panel clips.

b. Empirical calculations for roof panel and clip-to-panel performance will not be accepted.

2. Test Reports:
   a. Submit reports from independent testing laboratory that bears stamp of Alabama registered Engineer (P.E.) to certify compliance with specified performance criteria.

   b. Each prequalified manufacturer shall provide complete and current data for specified roof system as follows:

      1) Thermal cycle testing of metal roof panels and panel clips as specified.
      2) Uniform ultimate wind uplift load capacity test for metal roof panels as specified.
      3) Ultimate pull-out capacity for panel clips, tested as specified.
      4) UL 90 Classification test data as specified.
      5) Static air infiltration resistance test data as specified.
      6) Water penetration test data as specified.
      7) Fastener pull-out calculations as specified.

E. Submit a sample of Manufacturer's warranties.

1.8 Installer/Manufacturer Quality Assurance

A. Manufacturer: Company specializing in Architectural Sheet Metal Products with fifteen (15) years minimum experience. Being listed as prequalified manufacturer does not release manufacturer from providing complete, current and acceptable test data for each performance, thermal, and wind load requirement specified for specific profile proposed.

B. Comply with SMACNA's "Architectural Sheet Metal Manual, 6th Edition." Any clarifications will be in accordance with this standard. Conform to dimensions and profiles shown unless more stringent requirements are indicated.

C. No product substitutions shall be permitted without meeting specifications. Substitutions shall be submitted 10 days prior to bid date and acceptance put forth in an addendum. **No substitutions shall be made after the bid date**.

D. Installer shall be responsible for material and labor in the form of a single source contract. Split contracts are not acceptable.

E. Installer Qualifications:
   1. Installer must be an Authorized Installer or Licensee, acceptable to roof system manufacturer for the complete finished sheet metal package. Manufacturer will determine initial acceptability of installer's qualifications for specified roof systems.

   2. Installer's primary business must be the installation of roofing systems.

   3. Installer must have minimum of five (5) years of experience installing preformed metal roofing systems.

   4. Installer must have successfully completed minimum of five (5) significant installations of preformed metal roofing systems, including installation of long, field-formed panels. Submit complete description of each previous

project, including name and phone numbers of representatives of the Owner, Architect, Manufacturer and Contractor.

5. Submit name and resume' of installer's proposed job superintendent, including list of similar projects completed by superintendent.

6. Installer must execute 100% of metal roof system installation with installer's own employees.

F. Pre-installation Conference: Conduct required coordination meetings / conferences to comply with requirements of this section and Division 1

G. Manufacturer's Twenty (20) Year Watertightness Warranty:
1. General Contractor shall send drawings to manufacturer for review before bid date to ascertain compliance of materials for accurate bidding purposes.

2. Installer, immediately upon award of bid, shall request application from manufacturer for manufacturer's Twenty (20) Year NDL or equivalent watertightness warranty.

3. Installer shall complete application forms and return to manufacturer with shop drawings for review and approval well in advance of installation date.

4. After completion of project, installer shall submit letter of certification from manufacturer that roof installation is in accordance with approved shop drawings and manufacturer's requirements, and that entire roof installation will be issued specified Twenty (20) Year watertightness warranty.

1.9 Delivery, Storage and Handling

A. Deliver pre-fabricated accessories to Project site in manufacturer's unopened containers.

B. Protect components during shipment, storage, handling and erection from mechanical abuse, stains, discoloration and corrosion.

C. Provide protective interleaving between contact areas of exposed surfaces to prevent abrasion during shipping storage and handling.

D. Store materials off ground, providing for drainage, under cover providing for air circulation, and protected from wind movement, foreign material contamination, mechanical damage, cement, lime or other corrosive substances.

E. Handle materials to prevent damage to surfaces, edges and ends of roofing sheets and sheet metal items. Damaged material shall be rejected and removed from site.

F. Protect from wind-related damage. Provide on-site storage, or other acceptable protection prior to installation.

G. Examine materials upon delivery. Reject and remove physically damaged, stained or marred material from Project site.

H. Panels with strippable film must not be stored in the open where exposed to the sun. Strippable film shall be removed only immediately before installation.

1.10 Site Conditions

A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for preformed metal roofing system.

B. Protection:

1. Provide protection or avoid traffic on completed roof surfaces.
2. Do not overload roof structure with stored materials.
3. Do not support roof-mounted equipment directly on roofing system.

C. Determine that work of other trades which penetrate roof or is to be made watertight by roof is in place and accepted prior to installation of roofing system. Actual roof penetration shall be located and provided under this section.

1.11 Scheduling

A. Coordinate staging and setup area required for field fabrication equipment provided by metal roofing manufacturer.

B. Provide temporary equipment (cranes, hoists, forklifts) as required.

1.12 Warranties

A. Provide Manufacturer's Premium NDL or manufacturer's equivalent Twenty (20) Year Weathertightness Roofing System Warranty fully executed, fully in force and dated within (30) days of project Substantial Completion. Sample warranty and outline of warranty program shall be submitted and approved prior to Pre-Installation Conference. NOTE: Entire source of material and labor shall be the sole responsibility of one Subcontractor. Split contracts are not acceptable. Warranty shall state:

1. Warranty shall be limited to the value of the installed roof assembly, signed by manufacturer of primary roofing materials and his authorized installer, agreeing to replace/repair defective materials and workmanship as required to maintain roofing system in watertight condition with No Dollar Limit (NDL).

2. Warranty shall not exclude any conditions such as flashing, interior gutters, curbs, penetrations, etc., which are an integral part of the roofing system.

3. Warranty shall include manufacturer approval of shop drawings and at least two (2) job site technical inspections by the manufacturer's field representative.

4. **All warranties shall contain language acknowledging the governing laws shall be according to the laws of the State of Alabama. Manufacturer's roofing guarantees (or warranties) which contain language regarding the governing of the guarantee (or warranty) by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees (or warranties).**

B. Provide Manufacturer's Premium (20) year Sheet Metal Finish Warranty stating:

1. Architectural coating finish will be Free of fading or color change in excess of 2 NBS units as measured per ASTM D 2244-68.

2. Architectural coating finish will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D 659-74.

3. Architectural coating finish will not peel, crack, chip or exhibit any other mechanical failure of paint to adhere to the substrate.

C. Furnish General Contractor's Five (5) Year Roofing Warranty in compliance with State of Alabama DCM General Roofing Guarantee. All sheet metal flashings, trim and components provided under this section shall be covered under the State of Alabama DCM General Contractor's Roofing Warranty.

D. The Subcontractor shall guarantee in writing all sheet metal roofing work and flashings to remain free from leaks, loosening, excessive buckling, failure to stay in place, and similar defects of materials and workmanship for a period of five (5) years from the date of acceptance of the work.

E. The Representative for the Roofing Materials Manufacturer shall bring a copy of the warranty(ies) for the roofing material(s) for comparison to the warranty(ies) specified. This sample warranty is required to be job specific, covering all requirements, per the specifications. If the sample warranty is not provided as required, the conference will be voided, an inspection fee will be issued, and it will have to be rescheduled.

2.0 - PRODUCTS

2.1 Architectural Standing Seam Metal Roofing System

A. Panels shall be pre-finished factory formed 16" wide with 2" high vertical ribs and intermediate symmetrical striations. Vertical side ribs shall be provided continuous to lap, seal and interconnect with adjoining adjacent panels by means of mechanical seaming.

B. Attachment shall be provided by means of double fastened concealed clips at side laps to allow free thermal movement of roof panels over structure within regional temperature ranges.

C. Provide all accessories as required for a complete weathertight system to meet UL I-90 ratings including, but not limited to: clips, cleats, pressure plates and sealant tape. Attachment shall be provided to withstand negative loading.

D. Comply with ASTM E 1514

E. Panels shall be continuous full length, no end laps.

F. Exposed fasteners are not acceptable at eaves, valleys, or anywhere else contiguous to concealed fastener standing seam systems.

G. Substitutions shall fully comply with specified requirements and will be considered by submittal ten (10) days prior to bid date with applicable technical information and sample watertightness warranty.

H. Concealed Continuous Inner Rib:

1. Standing seam metal roof shall be fastened to framing members with concealed anchorage.

2. Concealed anchorage shall accommodate panel movement in each direction longitudinally to adequately accommodate temperature differential and panel movement for this Project.

3. Manufacturer shall design fastener device and spacing of fasteners to maintain required wind uplift resistance at connection.

I. Closures:
Ridge and hip closures shall be factory fabricated from 24 gauge sheet metal matching roof panels. Hip closures shall be field cut. Ridge closures are to be die-formed to match panel configuration.

J. Approved Manufacturers: AIM, Inc. - Architectural Integrated Metals, Inc. , MBCI Morin, ACI Metal Roofing Systems , and Peterson Aluminum (Pac Clad) providing that products meet or exceed these specifications. Other Manufacturers must submit product information in compliance with Section 01360 at least 10 days prior to bid. Other approved manufacturers will be included in Addendum.

2.2 Underlayment

A. Self-Adhering, Elastomeric Sheet: 30 to 40 mils thick minimum, asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer according to application. After installation of underlayment there should be a Maximum exposure of 60 days regardless if manufacturer's product allows for extended exposure.

2.3 Rigid Roof Insulation

A. Provide a 1 " thick layer of polyisocyanurate rigid roof insulation over structural deck system. Stagger joints. Attach as recommended by manufacturer to comply with FM 1-90 and 120 mph wind speed and wind uplift requirements.

2.4 Roof Drainage Accessories

A. Gutters: Fabricate from pre-finished 24 gauge metallic-coated steel to profile indicated, complete with sealed / profiled end pieces, sealed outlet tubes, and other accessories as required. Fabricate in minimum 120-inch- long sections.

1. Gutter Straps: fabricated from 16-gauge galvanized steel, 1 ¼" width, spaced at 30" centers.
2. Gutter Accessories: Fabricate expansion-joint covers, outlet tubes, ends and other gutter accessories from same metal as gutters.
3. Gutter Style: As Indicated on Drawings
4. Expansion Joints: 50 feet o.c. maximum

B. Downspouts: Provide sealed outlet tube at connection to gutter. Fabricate rectangular downspouts from pre-finished 24 gauge metallic-coated steel complete with mitered elbows. Furnish with anchored metal hangers, formed from same material as downspouts.

1. Hangers: Hemmed edges 1 ¼ inch width.

2. Provide one precast concrete splash block or downspout boot as indicated with each downspout.

2.5 Sheet Materials

A. Finished steel sheet material shall be 24 gauge Pre-finished Galvalume (Aluminum-zinc alloy-coated steel – "Hot Dipped Process") per ASTM A792/A792M-97a

B. Unfinished steel sheet metal materials shall be Galvalume ASTM 792-86, AZ 55, "Satin Finish.

C. Finished materials shall be provided with 70% Kynar 500 Fluorocarbon coating, applied by the manufacturer on a Continuous Coil Coating Line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility and longevity as specified by the Kynar 500 finish supplier. Color as selected by Architect.

D. Removable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film shall be removed immediately before installation.

2.6 Accessory Materials

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners:
1. Concealed fasteners for standing seam roofing system shall be 300 series alloy stainless steel pancake head, size and spacing per manufacturer's recommendation for installation over rigid insulation/metal deck, to attach to 24 gauge clips spaced per manufacturer's recommendation to comply with FM1-90/ 120 mph wind speed.

2. Miscellaneous fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

a. Exposed Fasteners: Heads matching color of sheet metal by means factory-applied coating.
b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex head washer gasket.
c. Blind Fasteners: Exposed rivets shall be self-plugging type minimum 3/16" diameter 300 series alloy high-strength stainless-steel with stainless-steel stems.
d. Exposed Rivets:
Exposed rivets shall be self-plugging type minimum 3/16" diameter 300 series alloy stainless steel with stainless steel stems.

C. Sealants:
1. Standing Seam Sealant: Factory applied extruded vinyl weather seal.

2. Flashing Sealant: shall be approved equal to Tremco Spectrum 1.

3. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

4. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

5. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

2.7 Fabrication

A. Preformed Roofing Metal Panels:
1. Prefinished 24 gauge, Grade C G-90 galvanized steel panel shall conform to ASTM A446 within acceptable tolerances of ASTM A525 of continuous field formed full lengths.

2. Panels shall have minimum 2" vertical rib height, spaced at 16" o.c.

3. Panels shall be designed as true standing seam shape, requiring no trapezoidal foam closures, plugs or fillers at eaves.

4. Standing seams shall mechanically interlock with concealed anchorage to prevent entrance or passage of water.

5. Seams shall allow anchorage to resist negative loading and allow expansion and contraction of panels due to thermal changes.

6. Integral snap seams which are not mechanically seamed are not acceptable.

7. Standing seams shall contain a factory applied Extruded Vinyl Weather Seal with the continuous inner rib system to prevent siphoning of moisture through the sidejoint seam (vinyl not available with intermittent clip system).

8. Panels shall be fabricated in continuous lengths as required. No horizontal endlap joints shall be permitted in roof panel lengths. Panels shall be full length from peak to eave as indicated.

9. Transverse or endlap seams will not be permitted.

10. Design panels to use concealed fasteners. Exposed fasteners in roofing pans will not be permitted.

11. Standing seam must prevent water capillary action, or otherwise prevent water infiltration.

12. Examine panels as they are formed to ensure panels are being formed within acceptable tolerances.

B. Flashing and Trim:

1. General: Custom / Shop fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of work indicated. Field verify measurements for accurate fit before shop fabrication.

2. Fabricate roofing and related sheet metal work in accordance with accepted shop drawings, manufacturer's recommendations and applicable standards.

3. Provide flashings in minimum 10'-0" sections except as otherwise noted. Form flashing using single pieces for full width. Provide shop fabricated, mitered and joined corners.

4. All exposed adjacent flashing, ridge, and valleys shall be of the same material and finish as the roof panels.

5. All flashings, hem exposed edges on underside 1/4 inch.

6. All roof penetrations shall be flashed by Metal Roofing Contractor/Installer. All circular roof penetrations shall be made of a one piece construction from an EPDM membrane with aluminum base. Roof curbs shall be furnished by Mechanical Contractor and upon acceptance, installed by Roofing Contractor/Installer.

7. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that indicated for each application.

8. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks with exposed edges folded back to form hems.

9. Sheet Metal Accessory Seams: Fabricate nonmoving seams for accessories with soldered flat-lock seams.

10. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

11. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

12. Conceal fasteners and expansion provisions where possible on exposed sheet metal flashing and trim,

13. Concealed cleats: galvanized 20-gauge

14. Equipment support flashing, expansion joint covers, counterflashing, flashing receivers, eave and rake flashing: pre-finished 24-gauge

3.0 - EXECUTION

3.1 Inspection

A. Examine alignment, attachment and placement of building roof structure and substrates before proceeding with installation of preformed metal materials. Substrate to be within 1/4" to true in 20 feet.

B. Examine roof deck before starting installation. Deck must be clear, clean and smooth, free of depressions, waves or projections, dry and must remain dry and free of ice and snow, after roofing application commences.

C. Structural support such as diagonal bracing and connections shall be tightened in place before work can proceed.

D. Field check dimensions and check support alignment with taut string or wire. Support misalignment will cause panel to oil can.

E. Do not proceed with installation until conditions are satisfactory. Notify Architect in writing of unsatisfactory conditions. Commencement of installation of the metal panels indicates acceptance of all roof structure conditions.

3.2 Installation

A. General Installation Requirements:

1. Install roofing and flashings in accordance with accepted shop drawings and manufacturer's product data, within specified tolerances. Minimum standards shall be as established by Sheet Metal & Air Conditioning Contractors' National Association, Inc. (SMACNA) and National Roofing Contractors Association (NRCA).

2. Separate dissimilar metals and masonry or concrete from metals with bituminous coating. Use fasteners with gasket where required to prevent corrosive action between fastener, substrate and panels.

3. Limit exposed fasteners to extent indicated on shop drawings.

4. Anchorage shall allow for temperature expansion and contraction movement without stress or elongation of panels, clips or anchors. Attach clips to structural substrate using fasteners of size and spacing as

determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.

5. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with manufacturer's recommendations, accepted shop drawings and applicable standards.

6. Torch cutting or cutting with abrasive tools of sheet metal including roofing, flashing and trim is not permitted.

7. Bed flanges in coating of elastomeric sealant where required for waterproof performance.

8. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal..

9. Install sheet metal flashing and trim in strait line and level indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

10. Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

11. Underlayment: Where installing metal flashing directly on substrates, install a slip sheet of elastomeric underlayment. After installation, underlayment shall not be exposed in excess of 60 days.

B. Preformed Standing Seam Metal Roof Panels:

1. Fasten concealed anchorage with fasteners as recommenced by manufacturer and at spacings as required for wind uplift.

2. Verify with manufacturer locations of fixed connections and expansion connections.

3. Install starter and edge trim before installing roof panels.

4. Remove protective strippable film immediately prior to installation of roof panels.

5. Install panels to either Continuous Rib or Clips per manufacturer's details.

6. Seam Panel sidelaps using power-driven Seamer as recommended by manufacturer to ensure watertightness.

7. Erect metal roofing with lines, planes, rises and angles sharp and true, and plane surfaces free from objectionable wave, warp, dents, buckle or other physical defects with minimum oil canning.

8. Do not allow traffic on completed roof. If required, provide cushioned walk boards.

9. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.

10. Remove and replace any panels or components which are damaged beyond successful repair.

C. Flashing:

1. Provide fascias, vents and/or coping to shape indicated and/or recommendations for installation of work where not specifically detailed in shop drawings. Set sheet metal items level, strait lined and plumb.

2. Provide concealed fasteners and provisions for expansion wherever possible.

3. Fold back edges of concealed side of exposed edge to form ½" hem.

4. Secure to wood with screws.

5. Seal flashing and trim joints with elastomeric sealant as required for watertight construction.

6. Reglet Flashing: Saw-cut reglets a minimum of one (1") inch deep by one quarter (¼") inch wide into masonry substrate/wall and Insert metal flashings into reglets, anchor with fasteners and wedges and seal joints thoroughly.

7. 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.

8. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten

9. Provide breakaway type expansion joint system as indicated above 4 hour walls of same material and finish as roof panels.

10. Set metal already partly formed in place and fasten by means of cleats. Use cleats to keep laps closed when face width exceeds 8".

D. Roof Drainage and Accessories:

1. General: Provide gutters, down pipes and scuppers to shapes indicated and/or required. Systems shall include all items sized as necessary to carry off water to splash blocks or into boots. Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

2. Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps maximum 30 inches on center. Provide end closures and seal watertight with sealant. Slope to downspouts.

   a. Front top elevation of gutter shall be installed minimum 1" below front top elevation of low point roof edge attached with loosely lock straps to front gutter bend and anchor to roof edge.
   b. Install gutter with joints not exceeding 50 feet on center to allow for linear expansion with expansion joint caps.

3. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fastener straps designed to hold downspouts securely 1 inch away from walls; locate fastener straps at top and bottom and between approximately 48" inches o.c..

a. Provide elbows at base of downspout to direct water away from building.
b. Connect downspouts to underground drainage system where indicated with transition fittings.

4. Expansion-Joint Covers: Install expansion-joint covers where indicated or required to adhere with profiles indicated. Lap joints a minimum of 4 inches (100 mm) in direction of water flow.

5. Down pipe straps shall be 20 gauge metal hangers, 1-1/2" wide anchored into wall each side of down pipe. Straps shall be minimum 8'-0" apart with minimum two per pipe.

6. Provide prefabricated downspout outlet tubes at gutter/downspout intersection for attachment. Seal thoroughly.

7. Provide prefinished rain water diverters at all valley/gutter intersections.

3.3 Field Quality Control

A. Tolerances:

1. Applicable erection tolerances: Maximum variation from true planes or lines shall be 1/4" in 20'-0", 3/8" in 40'-0" or more.

2. Roof structure and roof system are designed for minimum roof slope of 1/2:12 (refer to roof plans for areas and slope).

B. Manufacturer's Twenty (20) Year Weathertightness Warranty Field Inspections:

1. The manufacturer's factory technician shall inspect the installer's work during the course of the metal roof construction:
   a. First, upon completion of underlayment and trim installation and prior to panel installation.
   b. Second, at the conclusion of the panel installation.

2. The factory technician is to review all details with the Subcontractor's designated superintendent for conformance to the approved shop drawings and the requirements of the weathertightness warranty. Any corrections shall be the responsibility of the installer.

C. Damaged or deteriorated sheet metal material beyond minor repair, shall be subject to rejection and replacement as determined by the Architect.

D. Touch-up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

3.4 Cleaning

A. Clean roof in accordance with manufacturer's recommendations.

B. Clean exposed surfaces immediately upon installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, pieces of flashing and temporary protective film materials. Maintain in a clean condition during construction. Leave and maintain in clean condition. Touch up minor abrasions and scratches in finish per manufacturer's recommendations with touch-up paint supplied by manufacturer.

C. To prevent rust staining and scratches on finished surfaces, immediately remove fillings produced by drilling or cutting.

D. Promptly remove all scrap and construction debris from the site.

3.5 Final Inspection

A. Final inspection will be performed by the Architect with Department of Construction Management (DCM)Inspector. Schedule with the Architect Three (3) weeks in advance.

B. Fully executed roof warranties must be presented at time of Final Inspection.

END OF SECTION

CERTIFICATION OF ROOFING SYSTEM

Project: _____

Architect's Job No:_____ **DCM Project No.** _____

Owner: _____

General Contractor: _____

Roofing Subcontractor: _____

Roofing Material Manufacturer: _____

Roofing Material Manufacturer's Inspector: _____

The undersigned Contractors, Manufacturer Representative and Inspector do hereby state that the Roofing System for the Project identified above has been provided in compliance with all Codes specified and as required by Local and State of Alabama laws and regulations and has been provided in compliance with the specified Performance Requirements.

SIGNATURES

General Contractor: _____

Signature Printed Name

Roofing Subcontractor: _____

Signature Printed Name

The Roofing Material Manufacturer further states that the Roofing System Provided by Manufacturer to the Roofing Contractor complies with International Building Code 2021 for the Roofing System that has been installed.

Roofing Material Manufacturer: _____

Signature Printed Name

The Roofing Material Manufacturer's Field Inspector certifies that he/she has made field inspections in the proper number and sequence to assure Roofing Material Manufacturer that the Roofing System supplied has been installed to comply with Manufacturer's installation requirements as well as the 2021 IBC.

Roofing Material Manufacturer's Inspector: _____

Signature Printed Name

1.0 - GENERAL

1.1 Scope

The work under this section consists of all sheet metal work, including metal flashing, trim and roof drainage accessories.

1.2 Applicable Standards / Quality Assurance

A. The workmanship and methods employed for forming, anchoring, joining, and measures for expansion and contraction of sheet metal work shall conform to the applicable details and standards as indicated in the "Architectural Sheet Metal Manual, 6th Addition" as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. and referred to as "The SMACNA Manual," unless other methods are indicated on the project drawings or specified herein.

B. See Division 1 for required Pre-Roofing Conference.

C. Prior to fabrication, verify field conditions and coordinate the work if this section with trades of adjoining work as required to provide a complete weathertight system consistent with roofing manufacturer's warranty requirements. The work of this section is subject to acceptance by the Roofing Material Manufacturer and Roofing Contractor. Verify the substrate to be sound, dry, properly sloped, clean, and secure prior to installation of sheet metal work.

D. Workmanship shall be of best quality. Shop fabricate sheet metal components whenever possible without tool marks and oil-canning. The various sections shall be uniform and have true lines. The joints at corners, angles and different sections shall be accurately fitted and rigidly secured. Exposed edges are to be folded back, joints are to be flat lock seamed and soldered, expansion is to be provided for in long run work. Provide materials of this section and installation to promote longevity and prevent water infiltration.

E. Galvanic action shall be prevented where two different metals are joined together. Use bitumastic coating or other approved method.

F. Sheet Metal and Flashing / Trim shall be provided in thickness or weight to withstand wind loads according to zone (but in no case less than 90 MPH winds), thermal movement and building movement as required to avoid compromise of quality. Roof edge flashing components shall meet or exceed recommendations of FMG Loss Prevention Data Sheet 1-49.

G. Comply with the following material and finish standards: ASTM D 2244-68, ASTM D 659-74, ASTM A 653/A 653M, ASTM A 755/A 755M, ASTM A 792/A 792/M, ASTM C 1311 and ASTM D 4586

1.3 Related Documents

Drawings and Division 1 of the Specifications

1.4 Handling and Storage

Sheet metal items shall be carefully handled to prevent damage and shall be stored above the ground in a covered dry location. Damaged items that cannot be restored to a like new condition will be rejected and shall be replaced. Materials shall not be stored on the roof.

1.5 Verifying Dimensions

The contractor shall verify governing dimensions at the building and examine adjoining work on which sheet metal is dependent for installation according to the intent of this specification.

1.6 Examination of Surfaces

The contractor shall examine all surfaces to be covered with sheet metal, shall report any defective surfaces to the architect, and shall not begin work until the defective surfaces have been corrected.

1.7 Submittals and Samples

A. Submit product data, color charts and samples with intended factory finish and profiles of each product as detailed in SECTION 01350.

B. Submit Shop Drawings with plan layouts, elevations and enlarged construction details of each applicable roof condition, identified and shown with dimensions, profiles and relationship to adjoining components and materials. Indicate the following as applicable: gauge, weight, thickness, fastening, joining, support, anchoring, expansion measures, etc.

2.0 - PRODUCTS

2.1 Sheet Metal Materials

A. Zinc-Coated (Galvanized) Steel Sheet -G90 (Z275) coated, structural quality. (minimum 24 ga.)

B. Factory Finished Baked Enamel Aluminum-Zinc-Coated (Galvalume) Steel Sheet, Class AZ50 coating designation Grade 40, Class AZM150 coating designation Grade 275.

1. Material shall be minimum 24 ga. approved equal to "MBCI Batten-Lock", "AMS Lock-Seam" or "AEP-SPAN Span-Lock" with factory sealant and striations.
2. Factory finish shall be approved equal to KYNAR 500. Color to be selected by the Architect through the submittal process.

2.2 Underlayment

Cold applied, self-adhering elastomeric sheet 30 mils minimum thickness with releasable paper backing. Install as per manufacturer's recommendations.

2.3 Sealing Materials

A. Sealant shall be elastomeric polyurethane polymer as recommended by manufacturer for use with the work of this section for a finished weathertight installation.

B. Elastic Sealing Tape with releasable paper backing shall be provided as recommended by manufacture for use with the work of this section for a permanent weathertight installation.

C. Asphalt Roofing Cement shall be asbestos free and comply with ASTM D 4586 and used only as recommended by manufacture for use with the work of this section for a finished weathertight installation.

D. Butyl Sealant shall comply with ASTM C 1311 and used only as recommended by manufacture for use with the work of this section for a finished weathertight

installation.

E. Bituminous Asphalt Mastic, cold applied, shall be asbestos free and used only as recommended by manufacture for use with the work of this section for a finished weathertight installation.

2.4 Fastening

A. Unless indicated otherwise, fastening system shall be concealed with cleats for expansion / contraction abilities, at exposed visible finished flashing and trim.

B. Nails, self-tapping screws, bolts, rivets, and other fastenings for sheet metal shall be of the size and type suitable for the intended use. Exposed fasteners shall match contacted sheet metal finish.

2.5 Sheet Metal Work - Roof Drainage Accessories and Fabricated Components

A. Gravel guards, high and low; Counter Flashing; Flashing Receivers; Eave and Rake Flashing and Equipment Support Flashing as indicated and/or required shall be fabricated from prefinished 24-gauge sheet metal material.

B. Fascias and/or Coping to shape indicated and/or required. shall be fabricated from prefinished 24-gauge sheet metal material and attach continuously with 20 gauge concealed cleats.

C. Boots where indicated - Metal Downspouts boots, if specified, shall be provided under Miscellaneous Metals; otherwise provide PVC Boots to fit and transition from rectangular downspout sections to round underground pipe sections.

D. Scuppers and Leader Heads to shape / style indicated. Systems shall include all items sized as necessary to carry off water to splash blocks or into boots. Bronze overflow Outlet Nozzles as associated with roof drains, shall be required as indicated – see Plumbing.

E. Sandwich Panels 1" insulated sandwich panel Kynar aluminum skin over aluminum honeycomb core equal to Rock West Composites. Color to be selected by Architect.

2.6 Miscellaneous Sheet Metal Work

Sheet metal items not covered elsewhere in this section shall be as indicated on the drawings and as required to form a watertight installation. Profiles, bends, and intersections shall be sharp, even, and true. Joints shall be locked, or lapped and soldered, as applicable.

A. Metal Flashing and Counter Flashing exposed to view. Fabricate and install in accordance with related work manufacturer's requirements.

1. Flashing for all projections through walls and/or roof which are not furnished under other sections.

2. Metal flashing for equipment specified under Plumbing, Mechanical, and/or Electrical Sections, projecting through the walls and/or roof shall be furnished under the respective sections and accepted / installed under this section.

B. Accessories

All accessories or other items essential to completeness of sheet metal installation,

though not specifically shown or specified, shall be provided compatible with comparable material specified.

2.7 Plumbing Vent Flashing

All plumbing stacks projecting through the roof shall be flashed appropriately according to compatibility with roofing system with either: 3 lb. lead flashing extending up plumbing vent stack and turned down into vent stack (minimum 1") or prefabricate Deck-tight as approved by the roofing system manufacturer.

2.8 Project Identification Plaque

Provide an engraved aluminum plaque, nominal 4"x 6" x 1/8" thick, with information pertinent to the project including the following: Date of roofing installation, Roofing Manufacturer, Contractor, Architect, Roofing Product, Warranty period, etc.

3.0 - EXECUTION

3.1 General

A. All sheet metal work, including but not limited to: flashing, counter flashing, gravel stops, post / pipe flashing, fascia, trim flashing, rake flashing, scuppers, pans, etc. shall be quality installed as required and/or indicated on the drawings for a complete weathertight system.

B. Surfaces to which sheet metal is applied shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect the application or appearance.

C. Materials furnished under this section which are to be built in by others shall be delivered to the site in time to avoid delays to construction progress.

D. All cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed under this section. Torch cutting or abrasive saw cutting shall not be allowed.

E. Where sheet metal is in contact with dissimilar metals, mortar, concrete or masonry materials, the dissimilar surfaces shall be kept from direct contact by painting the contact surfaces with a coating of an approved bitumastic compound. Sheet metal in contact with treated wood shall have an underlayment backing of waterproof membrane for contact separation.

F. Plumbing vents roof penetrations shall be located and provided by the Roofing Contractor in coordination with the Plumbing Contractor.

3.2 Fabrication

A. Fabricate and install sheet metal with lines, arises, and angles sharp and true and plane surfaces free from wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form a 1/2" wide hem on the side concealed from view. Finished work shall be free from water leakage under all weather conditions.

B. All items shall be fabricated in maximum lengths. All joints shall be held to a minimum and spaced symmetrical. Joints shall be neatly sealed with an elastomeric sealant to achieve weathertightness.

3.3 Expansion

All sheet metal work shall be so designed and anchored that the work will not be "oil-can" distorted nor the fastenings seriously stressed from expansion and contraction of the metal.

3.4 Installation

A. This contractor shall cooperate and coordinate with other trades in the correct placing of anchorage and the preparation of surfaces which are to receive sheet metal work. Any defects in the work of other trades shall be reported to the architect. The beginning of installation work by this contractor shall indicate his acceptance of adjoining work.

B. All sheet metal work shall be set level and to true planes as indicated on the drawings and installed as intended in a first quality manner according to standards of SMACNA and industry standards for a complete watertight flashing system.

C. Anchor bolt or screws used to secure the work to other materials or at expansion joint covers shall be tightened sufficiently to properly secure the work and still permit expansion and contraction of the assembly.

D. Install roof drainage accessories as required for a complete watertight roof drainage system according to the standards of SMACNA.

E. Utilize appropriate fasteners to penetrate substrate as follows: 1 ¼" minimum for nails and ¾" minimum for screws. Fasteners into treated wood shall be stainless steel.
   1. Fasten roof edge flashing per recommendation of FMG Loss Prevention Data Sheet 1-49 according to zone but space not more than 4" o.c. staggered.
   2. Bottom limits of roof edge flashing shall be provided with interlocked continuous cleats fastened to substrate 12" o.c.

F. Pipe / Post Flashing shall be wrap-around umbrella type with tightened s.s. draw band and flared upper edge with sealant fill to achieve minimum 5" of coverage at pipe / post perimeter.

G. Permanently attach the Project Identification Plaque where readily visible from the roof and in immediate proximity of the work of this project.

3.5 Roof Flashing Installation

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, NRCA's "Roofing and Waterproofing Manual" and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and no less than 4" on center staggered.
   1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 12" centers through the vertical leg face.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of roof flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over counter flashing. Lap

counterflashing joints a minimum of 4 inches (100 mm) and bed with elastomeric sealant.

1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant; interlocking folded seam or blind rivets and sealant as indicated.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof.

3.6 Wall Flashing Installation

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets: Saw-cut reglets a minimum of one (1") inch deep by one quarter (¼") inch wide into masonry substrate/wall at locations indicated.

3.7 Miscellaneous Flashing Installation

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

3.8 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 sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

E. After installation is completed, all sheet metal work shall be cleaned with solution recommended by Metal Manufacturers. Refinish metal where necessary, replace damaged parts, and leave in complete and finished condition.

3.9 Warranty

A. Provide Manufacturer's Standard Twenty (20) Year Finish Warranty to support factory finish shall not chalk, peel, crack, fade or change in color in excess of 2 NBS units as per ASTM D 2244-68.

B. The work of this section shall be concurrently covered under the "General Contractor's Five (5) Year Roofing Guarantee" as required by the State of Alabama per Division 1.

END OF SECTION

1.0 - GENERAL

1.1 Related Documents

The Bidding Requirements, Contracting Requirements, and applicable parts of Division 1 - General Requirements, as listed in the Index, shall be included in and made a part of this Section.

1.2 Summary

A. Provide consistent firestop caulking and sealing systems of an approved material, or combination of materials installed to retain the integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and/or hot gases through penetrations, blank openings, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers in accordance with the requirements of the applicable Building Codes for this project.

B. Trade specific components of rated assemblies shall be provided by applicable trades as specified elsewhere including, but not limited to: fire dampers, pipe collars, sleeves, etc.

C. Fire caulking and sealant shall be used in locations including, but not limited to, the following:

1. Penetrations through fire-resistance-rated floor and roof assemblies requiring protected openings including both empty openings and openings that contain penetrations.

2. Penetrations through fire-resistance-rated wall assemblies including both empty openings and openings that contain penetrations.

3. Membrane penetrations in fire-resistance-rated wall assemblies where items penetrate one side of the barrier.

4. Joints in fire-resistance-rated assemblies to allow independent movement.

5. Perimeter Fire Barrier System between a rated floor/roof and an exterior wall assembly.

6. Joints, through penetrations and membrane penetrations in Smoke Barriers and Smoke Partitions.

7. Edge joints and intersection of rated building components.

1.3 Related Work

Examine Contract Documents for requirements that affect Work of this Section. Other Specification Section that relate directly to Work of this Section include, but are not limited to:

Division 3 - Concrete
Division 4 - Unit Masonry
Division 9 - Gypsum Wallboard
Division 15 - Mechanical
Division 16 - Electrical

1.4 References

Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

A. American Society for Test and Materials (ASTM).
   1. E 84 Test Method for Surface Burning Characteristics of Building Materials
   2. E 119 Test Method for Fire Tests of Building Construction and Materials
   3. E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees F.
   4. E 814 Fire Tests of Through-Penetration Fire Stops
   5. E 1399 Cyclic Movement and Measuring Minimum and Maximum Joint Widths
   6. E 1966 Test Method for Resistance of Building Joint
   7. E 2174 Standard Practice for On-Site Inspection of Installed Fire Stops
   8. E 05.11.14 Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA); ASTM permanent number assignment pending approval of Draft.

B. Factory Mutual (FM) Research:
   FM Approval Standard of Firestop Contractors - Class 4991

C. Firestop Contractors International Association (F.C.I.A.):
   M.O.P. Manual of Practice

D. International Firestop Council (IFC):
   1. Ref. 1 Recommended IFC Guidelines for Evaluating Firestop Engineering Judgements (April 2001)
   2. Ref. 2 Inspectors Field Pocket Guide

E. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electric Code
   2. NFPA 101 - Life Safety Code
   3. NFPA 221 - Fire Walls and Fire Barriers (preliminary to be released)
   4. NFPA 251 - Fire Tests of Building Construction and Materials

F. Underwriters Laboratories, Inc. (UL):
   1. UL 263 Fire Tests of Building Construction and Materials
   2. UL 723 Surface Burning Characteristics of Building Materials
   3. UL 1479 Fire-Tests of Through-Penetration Fire Stops
   4. UL 2079 Tests for Fire Resistance of Building Joint Systems

1.5 System Performance Requirements

A. Penetrations: Provide firestopping systems that are produced to resist the spread of fire, and the passage of smoke and other gases according to requirements indicated, including, but not limited, to the following:

   1. Penetrations passing through fire resistance rated wall and floor assemblies and other locations as indicated on the drawings.

   2. Seal all open conduits at penetration and open end.

   3. Penetration sleeves.

B. Fire Resistive Joints: Provide joint systems with fire-resistance ratings indicated, as determined per UL 2079 or (ASTM E 1399 and E 1966), but not less than the fire-resistance rating of the construction in which the joint occurs.

C. For firestopping exposed to view, traffic, moisture, and physical damage, provide appropriate firestop systems for these conditions.

1.6 Submittals

A. Submit Manufacturer's Product Data Sheets for each type of product selected. Certify that Firestop Material shall be asbestos free and complies with local regulations.

Certification by Firestopping Manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's) and are nontoxic to building occupants.

B. Submit system design listings, including illustrations from a qualified testing and inspection agency that is applicable to each firestop configuration.

C. Submit contractor qualifications as noted in "Quality Assurance" article, listed below.

D. Refer to and comply with applicable sections of Submittals - Section 01350.

1.7 Quality Assurance

A. Fire-Test-Response Characteristics: Provide firestopping System Design Listing by a testing and inspection agency in accordance with the appropriate ASTM Standard(s) per Article 1.5. A qualified testing and inspection agency may be UL, FM Research, Intertek Testing Services, Omega Point Laboratories (OPL) or another agency performing testing and follow-up inspection services for firestop materials that is acceptable to the authority having jurisdiction.

B. Contractor Qualifications:

1. FM approved in accordance with FM Standard 4991 - Approval of Firestop Contractors.

2. Licensed by the State or local authority, where applicable.

3. Shown to have successfully completed comparable scale projects.

4. Firestop Contractors International Association Contractor Member in good standing.

C. Single Source Responsibility: Provide firestop caulking and sealing for each kind of penetration and construction condition indicated from a single manufacturer.

1. Materials of different manufacture shall not be intermixed in the same firestop system or opening.

2. Tested and listed firestop systems are to be used.

D. Field Mockup: Prior to installing firestopping, demonstrate qualities of materials and execution.

1. Notify Architect in advance of the dates and times when mockups will be installed.

2. Obtain Architect's acceptance before continuing Work.

3. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work. Accepted mockups may become part of completed unit of Work.

1.8 Delivery, Storage and Handling

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer.

B. Store and handle firestopping materials in accordance with manufacturers' written instructions.

1.9 Project Conditions

Environmental Conditions: Install firestopping in accordance with manufacturers' written instructions.

1.10 Sequencing and Scheduling

A. Project coordination is essential to inform and educate all the parties involved with the firestopping process of their role and how they can affect firestopping on the project. These details shall be included during the Subcontractor's progress meetings.

B. Do not cover up firestopping installations until Owner's inspection agency or the Authorities Having Jurisdiction have examined each installation.

1.11 Environmental Regulations

A. All materials shall be asbestos free and comply with local VOC Regulations.

B. If required, hazardous disposal of firestop materials shall be strictly observed as noted on the individual MSDS.

2.0 - PRODUCTS

2.1 Firestopping - General

A. Approved products are:
1. 3M, STI, Dow-Corning, Hilti, and Tremco. Bidders may submit data to the Architect no later than ten (10) days prior to bid date for consideration of other manufacturers' products. Requirements for submittals must comply with 1.6 - Submittals, listed below, and as indicated in Submittals - Section 01350.

2. Firestop products produced by FCIA Manufacturer Members in good standing.

3. Mineral wool fiber safing pre-approved equal to IIG MinWool - 1200 Safing. High Temperature Insulation with 4" thickness, FSP vapor retarder on one side, Mildew resistant and will not support corrosion. Three hour fire resistance and noncombustible per ASTM E136.

3.0 - EXECUTION

3.1 Examination

Examine substrates and conditions affecting performance of firestopping. Notify the responsible party or parties of any unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 Preparation

A. Priming: Prime substrates where recommended by Firestopping Manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond. Do not allow spillage and migration onto exposed surfaces.

B. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so without disturbing the firestopping seal with substrates.

3.3 Installation

A. General: Comply with the "System Performance Requirements" and with the Firestop Manufacturer's installation instructions.

Install joint fillers to provide support of firestop materials during application and at the position required to produce the cross-sectional shapes and depths to allow optimum sealant movement.

B. Completely fill recesses provided for each joint configuration; providing uniform, cross-sectional shapes and depths relative to joint width that optimize movement capability.

C. Tool non-sag firestop materials immediately after their application and prior to the time skinning begins. Form smooth, uniform beads of configuration indicated or required to eliminate air pockets and to ensure contact and adhesion with sides of joint.

3.4 Field Quality Control

A. Perform a general walk through inspection with the General Contractor and applicable Subcontractors prior to Architect's major inspections to assure completeness of the work. All work is subject to Architect's inspection and Building Inspector's satisfaction.

B. Where omissions or deficiencies are found, provide, repair or replace the firestopping so that it is complete and complies with requirements of tested and listed system design.

3.5 Cleaning

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses. Use methods and cleaning materials approved by manufacturers of firestopping products and/or assemblies in which openings and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances. If damage is caused by others, Owner and General Contractor are to instruct Firestop Contractor to make appropriate repairs and charge to appropriate trades.

1.0 - GENERAL

1.1 Scope
The work under this section consists of caulking and sealants.

1.2 Work Included
See the drawings for all items and places requiring caulking. Completely seal with specified caulking compound joints around door frame and frame base and window frames (inside and outside); all other openings in masonry, concrete, or precast concrete joints in or between precast concrete panels; beneath all exterior thresholds; around plumbing fixtures; all places indicated on the drawings to be caulked; and all other places where caulking is required, whether specifically shown on the drawings or not.

1.3 Submittals
Submit for approval product literature and samples of all materials proposed for use. Colors to be approved in the field by the Architect to match adjacent construction color.

2.0 - PRODUCTS

2.1 Sealant
A. Exterior sealant shall be a gun grade one part silicone compound. Materials shall be Tremco Spectrem 1, Dow Corning No. 790 or Pecora No. 890, color as selected.

B. Primer, if required, for the silicone sealant shall be a quick drying clean primer as recommended by the manufacturer of the material used.

2.2 Caulking
A. Interior caulking compound shall be a paintable, one part, gun grade butyl rubber base material equal to Tremco Tremflex 834 Acrylic, Pecora BC-158 or DAP Butyl Flex or acrylic latex base caulking compound equal to Pecora AC-20 or DAP Latex Caulk.

B. Floor Caulking compound shall be a tintable, semi-self leveling polyurethane base equal to Tremco THC900/901. Colors shall be selected by Architect from manufacturers entire line of colors.

2.3 Compressible Joint Sealant
Sealant shall be compressible polyurethane foam impregnated with polybutylene, Polytite as manufactured by Polytite Manufacturing Corporation, or other material as approved.

2.4 Filler
Filler shall be polyethylene foam, polyurethane foam, untreated jute, pointing mortar or other oil-free materials subject to approval of the manufacturer of the caulking or sealant compound.

2.5 Accessories
A. Bond breaker shall be polyethylene tape.

B. Solvents, cleaning agents, and other accessory materials shall be as recommended by the sealant manufacturer.

3.0 - EXECUTION

3.1 Joint Preparation

A. Joints deeper than 1/2" shall be built up to a depth of 3/8" below adjacent surfaces with approved filler material prior to applying sealant. All surfaces must be clean and dry. Any protective coating or foreign matter such as oil, dust, grease, dirt, or frost on building materials that will impair bond shall be removed. Masonry and concrete surfaces shall be sound. If required by manufacturer's instructions, apply brush coat of primer to surfaces and allow to dry before applying sealant.

B. At the option of the applicator, the surfaces next to the joints may be masked to obtain a clean neat line. Remove tape immediately after tooling the sealant.

3.2 Application

A. Caulking or sealant shall be used from manufacturer's original cartridge in a standard open type, hand operated caulking gun. Nozzle shall be cut to proper size to obtain a neat, smooth and uniform bead. When handling bulk material, manufacturer's instructions shall be followed.

B. A full bead of caulking or sealant shall be applied into joint under sufficient pressure, drawing nozzle across caulking or sealant to leave a slightly concave surface. Tool with a caulking tool or soft bristled brush moistened with solvent within 10 minutes after exposure. All sealed joints shall be watertight.

C. Joints shall be caulked before painting adjacent work. Do not paint over silicone sealant compound.

3.3 Clean-up

On non-porous surfaces, excess uncured caulking shall be immediately removed with a solvent moistened cloth. On porous surfaces, excess caulking should be allowed to cure overnight, then remove by lightly wire brushing or sanding. All adjacent surfaces shall be clean and free from stains.

END OF SECTION

1.0 - GENERAL

1.1 Scope

Furnish and install all hollow metal doors and frames including view windows, as indicated on the drawings and herein specified.

1.2 Submittals

A. Submit shop drawings for approval.

B. Drawings shall show a schedule of openings using architectural opening numbers, all dimensions, jamb and head conditions, construction details, preparations for hardware, gauges, and finish.

1.3 Templates

A. Manufacturer shall obtain templates of all applicable hardware from the Finish Hardware Contractor and make proper provision for the installation of this hardware.

B. Unless otherwise specified in the hardware section of the specifications, hardware locations shall be in accordance with the recommendations of The National Builder's Hardware Association.

1.4 Marking and Storage

Mark each frame for intended location. Store frames off the ground and in a manner to protect them from damage.

1.5 Storage

A. Doors shall be stored in a dry, secure location to prevent exposure to weather and/or moisture.

B. Frames shall be stored off the ground and protected from weather until in place.

2.0 - PRODUCTS

2.1 Door Construction

A. Exterior Doors: Formed up sheets not less than 16 U.S. gauge rigidly connected and reinforced inside with continuous interlocking 20-gauge hat stiffeners, spaced a maximum of 6" apart. Interior Doors: Formed up sheets not less than 18 U.S. gauge rigidly connected and reinforced inside with continuous interlocking 20-gauge hat stiffeners, spaced a maximum of 6" apart. Sound deadening material of rock wool batts, insulites or other standard recognized available sound deadening materials shall be placed between all stiffeners and plates. Honeycomb doors are not acceptable. Suitable provision shall be made to receive glass panels or louvers. Edge seams are to be continuously welded and ground smooth. Bondo seams are not acceptable.

B. Doors and frames shall be equal to Steelcraft, Curries, Republic or approved equal.

C. Doors shall be coordinated with thresholds specified under FINISH HARDWARE - SECTION 08710 to meet A.D.A. requirements. Doors shall be extended as required to seal against threshold.

D. Non-full height doors such as Toilet Stall Doors shall be provided with an inverted

filler cap channel at head to maintain smooth uniformity at top of door surface.

F. Hollow metal doors shall be provided with beveled hinge and lock edges. Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm).

E. Exterior door face sheets shall be galvannealed steel, level A60 (ASTM A653).

F. Hardware preparation for hollow metal doors: hinge reinforcements shall be minimum 7-gauge x 9" length.

G. Hardware Reinforcements:

1. Hinge reinforcements for full mortise hinges: minimum 7 gage [0.180" (4.7mm)].

2. Lock reinforcements : minimum 16 gage [0.053" (1.3mm)].

3. Closer reinforcements : minimum 14 gage [0.067" (1.7mm)], 20" long.

4. Galvannealed doors: include Galvannealed hardware reinforcements. Include Galvannealed components and internal reinforcements with Galvannealed doors. Close tops of exterior swing-out doors to eliminate moisture penetration. Galvannealed steel top caps are permitted.

5. Projection welded hinge and lock reinforcements to the edge of the door.

6. Provided adequate reinforcements for other hardware as required.

H. Glass moldings and stops (both labeled and non-labeled doors):

1. Fabricate glass trim from 24 gage [.6mm] steel conforming to:
   a. Interior openings ASTM designation A 366 cold rolled steel.

   b. Exterior openings ASTM designation A 924 Zinc-Iron Alloy-Coated Galvannealed steel with a zinc coating of 0.06 ounces per square foot (A60) for exterior openings.

      1) Install trim into the door as a four-sided welded assembly with mitered, reinforced and welded corners.

      2) Trim: identical on both sides of the door.

      3) Exposed fasteners are not permitted. Labeled and non-labeled doors: use the same trim.

      4) Acceptable mounting methods:
         a) Fit into a formed area of the door face, not extending beyond the door face, and interlocking into the recessed area.
         b) Cap the cutout not extend more than 1/16" [1.6mm] from the door face.

I. Electrical Requirements for Doors:

General: Coordinate electrical requirements for doors and frames. Make provisions for installation of electrical items arranged so that wiring can be readily removed and replaced.

i. Doors with Electric Hinges:

1. General: Furnish conduit raceway to permit wiring from electric door hardware.

2. Hinge Locations: Provide electric hinge at intermediate or center location. Top or bottom electric hinge locations are not acceptable.

3. Refer to 08710 for electrified hardware items.

2.2 Frame Construction

A. Frames shall be of sizes as indicated, completely assembled, buck and frame formed from 14-gauge exterior, 16-gauge interior, steel with 2" face unless otherwise indicated and 5/8", minimum, integral stop. Exterior frames and interior frames at cafeteria, kitchen, locker room and shower areas shall be Galvannealed A60 (ASTM A653).

B. Corners of frames to be mitered and continuously welded. Joints shall be pulled up tight, welded, and ground smooth with faces in correct alignment.

C. Provide adjustable "T" type anchors, three to each jamb; welded angle clips at bottom of frames for anchorage to floor construction; detachable type metal spreaders. Jamb anchors shall be T-shaped and of the same thickness as the metal of the frames. Where "T" anchors are not feasible, provide anchors as required and/or recommended.

D. Machine frames for attachment of hardware, including special reinforcing for extra heavy duty use, drilling, and tapping. Provide mortar tight metal dust boxes in back of lock location.

E. Frames for sidelights shall be integral with door frames; borrowed light window frames and other openings shall be as detailed.

F. Prepare frames for rubber silencers, three for single swing door and two for each pair of doors.

G. Frames not extending to the floor surface shall have a closed welded jamb bottom.

H. Electrical Requirements for Frames:

1. General: Coordination all electrical requirements for doors and frames. Make provisions for installation of electrical items arranged so that wiring can be readily removed and replaced.

a. Provide cutouts and reinforcements required for metal door frame to accept electric components.

b. Frame with Electrical Hinges: Weld UL listed grout guard cover box welded over center hinge reinforcing. Top or bottom hinge locations are not permitted. Contractor to reference 3.01.E, for continuous hinges.

c. Provide cutouts and reinforcements required to accept security system components.

d. Refer to 08710 for electrified hardware items.

2. Provide mortar box, welded in head of door frame at exterior frames for future door contact switch provided by Owner. Size, type, location and conduit requirements to be provided by Owner.

2.3 Labeled Assemblies

A. All openings shall be protected by assemblies which include doors, frames, hardware, closing devices, anchorage, sills, etc. installed in accordance with NFPA Standard "FIRE DOORS and WINDOWS, NFPA 80," as per Standard Building Code.

B. To further clarify the basic requirements and/or the correct method of labeling that will be acceptable; the labels will include, but not be limited to, the following:

1. **Labeling of Fire Doors and Frames**
All door openings in fire resistive walls and partitions requiring a rating shall be protected by assemblies which include doors, frames, hardware, closing devices, anchorage, sills, etc., installed in accordance with the National Fire Protection Association (NFPA) 80, Standard for "Fire Doors and Fire Windows" and the State Building Code.

To further clarify the basic requirements and the correct method of labeling that will be acceptable to the Division of Construction Management, the labels shall include the following:

a. Accessibility: Each component shall bear a label located to be accessible after installation.

b. Permanence: Each component shall bear a label of a type of material and be so attached that the life of the label and the attachment thereof can reasonably be expected to equal the life of the component to which it is attached. Labels shall be raised or embossed on metal labels or stamped into metal frames. Plastic or paper labels are unacceptable.

c. Legibility: The label design shall be such that it can always be visible and legible and must be clean of any paint or other coverage making the label illegible.

d. Fire Resistance: All approved labels on doors and on frames shall include thereon the fire resistance rating in hours and minutes for which the door or frame is labeled. Labels on frames with transoms or sidelights must identify that the opening assembly includes same.

e. Other Requirements: The labels or stamps applied to frames must be provided by a manufacturer that has been approved by a laboratory or organization to provide testing and follow-up services for fire-rated opening assemblies.

2. Other Requirements - As directed by the approved laboratory or organization providing testing and follow-up services and labeling.

2.4 Finish

A. Metal doors and frames shall be thoroughly cleaned of dirt, grease, and impurities and shall be bonderized and finished with one coat of baked-on primer ready to receive finish paint.

B. Primer shall be manufacturer's standard in accordance with ASTM B117. **Do not prime paint labels**.

C. Final painting as specified and applied under Painting Section.

3.0 - EXECUTION

3.1 Installation

A. **BITUMINOUS COATING IS TO BE FIELD APPLIED TO THE INSIDE OF FRAMES THAT ARE TO BE INSTALLED IN MASONRY, OR TO BE GROUTED, PRIOR TO INSTALLATION.**

B. Install frames plumb, rigid, and in true alignment; properly brace until built in. Set spreader and attached jambs to floor through floor anchors.

C. In masonry openings, where required, install a second spreader at the mid-height of the door opening, and do not remove until the masonry jambs are in place. Spreader shall be notched wood of approximate jamb width and 1" minimum thickness. Install a minimum of three anchors per jamb to be imbedded in masonry joint as the wall is laid up.

D. Frames shall be grouted solid.

E. Doors shall be rigidly secured in frames, hardware applied, and adjusted to achieve smooth operation without forcing or binding. Doors shall be capable of maintaining any degree of opening.

3.2 Protection

After installation, doors and frames shall be protected from damage during subsequent construction activities. Damaged doors and frames shall be replaced.

END OF SECTION

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 Section Includes

A. Flush Wood doors

B. Positive Pressure Fire Rated Wood Doors

C. Factory Glazing for Fire Rated Doors

1.3 Related Sections

A. Section 08110 – Hollow Metal Doors and Frames

B. Section 08710 – Finish Hardware

C. Section 08810 – Glass and Glazing

1.4 Requirements Of Regulatory Agencies

A. Wood Doors and installation shall comply with provisions and standards listed. The latest published edition of each standard applies.

B. ASTM - American Society for Testing and Materials

1. ASTM E 90-09 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements. (All doors tested shall be fully operable.)
2. ASTM E 413-10 - Classification for Rating Sound Insulation.
3. ASTM F 476 Section 18 - Security Test of Swinging Door Assemblies - Door Impact Test

C. ANSI - American National Standards Institute

1. ANSI/DHI A156.115W - Specifications for Hardware Preparation in Wood Doors and Frames.
2. ANSI/DHI A115.IG - Installation Guide for Doors and Hardware.
3. ANSI A156.7 - Hinge Template Dimensions.
4. ANSI/HPVA HP-1 Standards for Hardwood and Decorative Plywood
5. ANSI A208.1-Particleboard
6. ANSI A208.2-Medium Density Fiberboard (MDF)
7. ANSI-ASA S12.60 - Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools
8. ANSI/A117.1 – Accessible and Useable Buildings and Facilities

D. ANSI/WDMA – Window and Door Manufacturers Association

1. WDMA I.S. 1A-13, Industrial Standards for Architectural Flush Doors

   a. J-1 – Job Site Information "How to Store, Handle, Finish, Install, and Maintain Wood Doors"
   b. P-1 – Performance Standards for Architectural Wood Flush Doors
   c. T-1 – Test for Telegraphing
   d. T-2 – Test for Warp
   e. T-3 – Test for Squareness

2. WDMA Test Methods - Provide documentation showing compliance to WDMA performance duty level.

   a. Adhesive Bonding Durability: WDMA TM-6
   b. Cycle Slam: WDMA TM-7
   c. Hinge Loading: WDMA TM-8
   d. Screw Holding: WDMA TM-10

E. Building Code references

1. IBC – 2021 International Building Code
2. NFPA 80 - Standard for Fire Doors and Other Opening Protective's.
3. NFPA 101 – Life Safety Code
4. NFPA 105 - Standard for the Installation of Smoke Door Assemblies and Other Opening Protective's
5. NFPA 252 – Standard Method of Fire Tests of Door Assemblies
6. ANSI/UL 10C - Standard for Safety for Positive Pressure Fire Tests of Door Assemblies
7. UL 1784 - Air Leakage Tests of Door Assemblies
8. Underwriters Laboratories (UL) - ULI0C Positive Pressure Fire Test of Door Assemblies
9. ITS/WH Certification - Certification Listings for Fire Doors
10. Consumer Products Safety Commission (CPSC) 16 CFR 1201 – Standard for Architectural Glazing
11. US Green Building Council (USGBC)

1.5 Supplier Qualifications

A. The Wood Door Supplier shall maintain at the location which will be managing the project, a credentialed Architectural Hardware Consultant (AHC) or Certified Door Consultant (CDC) as a full-time employee and member in good standing of DHI - Door Security + Safety Professionals.

B. The Architectural Hardware Consultant (AHC) or Certified Door Consultant (CDC) shall supervise other individuals employed by the Wood Door Supplier who work on the project and be available throughout the project to meet with the Contractor, Architect or Owner as needed.

C. Supplier shall be experienced and have completed projects with material, design and scope similar to that specified for this project. If requested by the Owner or Architect, submit a list of projects completed in the last five (5) years with the project name, location, Owner, Architect and Contractor.

D. As a requirement, the Wood Door Supplier shall maintain an office and warehouse complete with a wood door inventory within a one hundred (100) mile radius of the

jobsite. The Supplier shall further have a qualified field service staff available to service the project.

E. After delivery of wood doors and prior to installation, the Hardware or Door Consultant shall meet with the Contractor to review templates, installation instructions, final hardware schedule, coordination with other trades and preview samples.

F. Failure to meet the above requirements will disqualify the bidder.

G. The Owner may visit the location of the Distributor's office and warehouse to observe if the intent of the requirements set forth in the specifications have been met.

1.6 Submittals

A. Submit complete copies of the wood door shop drawings covering complete details of items required for the project. Complete copies of technical data sheets and other pertinent data are required to indicate compliance with the specification.

1. Shop Drawings: Submit door and frame schedule using reference designations indicated on Drawings. Include opening size(s), handing of doors, details of each frame type, elevations of door design types, location, hardware group numbers, fire label requirements, including fire rating time duration, maximum temperature rise requirements, hardware mounting locations, glass beads/moldings, glass kits, internal blocking, vertical edge details, top and bottom rail details, undercuts, beveling and other pertinent data.

B. As part of the Shop Drawing submittal, provide copy of WDMA J1, Job Site Information, "How to store, handle, finish, install and maintain wood doors."

C. Data submitted shall be job specific and shall include product data and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents.

D. Provide door construction details/drawings of vertical edges, top rail and SWE details for all doors.

E. Indicate location of cutouts for hardware and blocking to ensure doors are properly prepared and coordinated to receive hardware.

F. Shop drawings, product data, and samples: Contractor to stamp Shop Drawings verifying they have been coordinated and reviewed for completeness and compliance with the contract documents.

G. Shop drawings submitted without the above documentation will be considered incomplete, will not be reviewed, and returned directly to the Contractor.

H. Follow the same procedures for re-submittal as the initial submittal with the appropriate revised dates noted in the shop drawings.

1.7 Quality Assurance

A. Comply with the requirements of the referenced standards. Submit test reports upon request by the Owner or Architect.

B. Underwriters' Laboratories or Intertek Testing Services / Warnock Hersey, Positive Pressure - Category A labeled fire wood doors:

1. Label fire doors listed in accordance with Underwriters Laboratories standard UL10C, Positive Pressure Fire Tests of Door Assemblies and Air Leakage Tests of Door Assemblies - UL 1784.
2. Construct and install doors in accordance with the standards of NFPA 80.
3. Manufacture fire rated doors under the UL or ITS/WH factory inspection program providing the degree of fire protection capability indicated by the door schedule drawings.
4. Provide metal labels permanently fastened on each fire door at an authorized and licensed facility as evidence of compliance with procedures of the labeling agency.
5. No field modifications shall be made to the fire door assembly that would void the label. Field modifications to a fire door shall be in accordance with NFPA80. Work shall be done by a licensed labeling service approved by the manufacturer.
6. Labels are not to be removed, defaced or made illegible while the door is in service per NFPA 80. Fire labels are not to be painted or pre-finished.
7. Fire doors with continuous hinges shall have the physical label located on the top rail of the door.
8. Conform to applicable codes for fire ratings. It is the intent of this specification that wood doors comply or exceed the standards for labeled openings. In case of conflict between door types required for fire protection, furnish the type required by NFPA and UL.
9. Validate the Smoke and Draft Control ("S") Label for hardware sets that include Category H smoke and draft control seals.
10. All Category G seals required will be concealed in the door or applied to the top rail. No Category G seals will be allowed on the door frame.

C. Door Supplier shall provide one (1) extra door with 6" top rail and exit device blocking. The Contractor, Door Supplier and the Owner to observe and inspect destructive sampling for proper internal construction.

1.8 Warranty

A. Provide Manufacturer's standard warranty form, signed by manufacturer, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship for the life of the original installation of the door.

1.9 Samples

A. Sample Submittal

1. Color samples for factory pre-finishing shall consist of four (4) sets of three (3) finish samples per set. Samples to be minimum 5" x 8" size on specified veneer species. The sample should reasonably represent the color range of the veneer species expected in the finished work.

B. Fire Rated Wood Doors

1. Provide three (3) 10" x 10" cut away corner samples demonstrating door construction with provisions for vertical stiles and top rails as specified.

C. Non-Fire Rated Wood Doors

1. Provide three (3) construction samples demonstrating door construction with provisions for vertical stiles and top rails as specified herein.

1.10 Delivery, Storage, And Handling

A. Provide protective measures throughout the construction period to safeguard doors from damage or deterioration from the time of acceptance.

B. Store and protect doors in accordance with manufacturer's recommendations and Section J-1 of WDMA I.S. 1A-13 - "How to Store, Handle, Finish, Install and Maintain Wood Doors"

1. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse and allow for air circulation.
2. Protect all doors from exposure to direct sunlight and artificial light after delivery.
3. Do not subject interior doors to extremes of either heat or humidity. HVAC systems must be operational and balanced, providing a temperature range of 50 to 80 degrees Fahrenheit and 30% to 60% relative humidity.
4. When handling doors, lift and carry when moving. Do not drag across other doors or surfaces. Handle with clean, dry hands or while wearing clean dry gloves.
5. Manufacturer shall mark each door on the top rail and top hinge pocket with the door opening number. In addition, mark the top rail with manufacture's name, factory order number, and other additional markings to properly identify the door.

1.11 Coordination

A. Coordinate work with other sections involving manufacture or fabrication of internal cutouts and internal blocking for door hardware, electrified and mortised items. Provide necessary blocking in mineral core doors to prevent door failure from surface applied hardware.

B. The Contractor shall field verify existing door opening conditions, where existing doors or frames are to remain or be replaced in part, for coordination with the specified hardware and notify the Architect of conflicts prior to proceeding. Failure to notify the Architect of conflicts that result in additional work or material is the responsibility of the Contractor, with no cost to the Owner.

C. The supplier shall be responsible for proper coordination, templating, dimensions and all details required for doors, frames and hardware application.

PART 2 - PRODUCTS

2.1 Manufacturers

A. Acceptable manufacturers for wood doors specified are listed below. Only the products of the listed manufacturers will be accepted. No alternates will be

accepted. The manufacturers listed are acceptable providing they adhere to the quality standards as noted herein.

1. Eggers Industries
2. Marshfield-Algoma
3. V.T. Industries

B. **The manufacturers listed herein are capable of providing products that meet or exceed the specified requirements. Products that do not comply with the specified requirements and construction will be rejected.**

C. If doors are rejected, replacement doors shall be furnished expeditiously, at no cost to the Owner.

2.2 Doors

A. Quality Assurance Requirements: Flush Wood Doors: Comply with the ANSI/WDMA I.S. 1A–13 Industry Standard for Architectural Wood Flush Doors.

B. Non-Fire Rated Wood Doors - All solid core flush wood doors shall meet WDMA Door Grade and WDMA Performance Duty Level specified.

1. Grade-Custom Grade Construction and Face Grade.
2. WDMA Performance Duty Level-Extra Heavy Duty. All doors shall meet specified WDMA Performance Duty Level, including face screw holding requirement. Surface applied hardware shall be installed in accordance with Section 08710.
3. Door Type - PC-5 - Bonded Wood Based Particle Core, Stiles and rails securely bonded to the core and entire unit abrasively planed prior to application of faces to assure uniform thickness of all components.

C. Fire Rated Wood Doors: Where fire-resistance classifications are shown or scheduled, provide doors that comply with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Label Certification: Doors requiring fire-rating shall carry either UL or ITS (Warnock Hersey) label.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 250 degrees F (121 degrees C)] above ambient after 30 minutes of standard fire-test exposure.
3. Construction: Category A - intumescent included in door construction where required.
4. Cores: Provide wood fiber or mineral fire-resistant composite core required to provide fire-protection rating indicated.
5. Blocking: Provide composite blocking approved in doors of fire-protection ratings as indicated.

D. Electrical Requirements:

1. General: Make provisions for installation of electrical items specified in Section 08710.

a. Provide all cutouts and blocking required for wood doors to accept electrical door hardware and security system components.

E. Veneer and Veneer Matching

1. Veneer Species and Cut: Architect to specify veneer and cut.

   a. Veneer Face Grade WDMA: Grade "A" as described in WDMA I.S. 1A and HPVA Door Veneer tables ANSI/HPVA-1.

2. Matching Between Leaves: Book Match
3. Veneer match: Assembly of Spliced Veneer: Running Match
4. Pair match all pairs and set of pairs separated only by mullions.
5. Set match all groups of pairs and/or individual doors indicated on the door schedule or plans.
6. Veneer Cut: Plain Sliced.
7. Veneer Species: Select White Birch.

F. Non- Fire Rated Door

1. Provide wood based particleboard core. Core to be securely bonded to the stiles and rails with Type I Adhesive.
2. Crossbands

   a. Shall be a minimum thickness of 1/16".
   b. Extend the full width of the door and have no seams.
   c. Composite crossbands of either MDF or particleboard are only permitted provided they meet or exceed the following minimum requirements:

      1) Minimum properties for composite crossband must meet physical and mechanical properties of thin MDF - Grade 230 as described in ANSI 208.2
      2) Internal bond minimum strength of 150 psi.
      3) Linear expansion minimum of < 0.3 % measured between 50% and 80% relative humidity.

3. Vertical Edges

   a. Vertical Edges to be same species as face veneer, constructed of two ply laminate hardwood outer layer (outer stile) and hardwood lumber or SCL inner layer (inner stile). Outer ply to be minimum thickness of 1/2" after trim, same species lumber as face. Veneer or lumber less than 1/2" is not acceptable. The net stile width to be minimum 1" after trimming. Veneer edge banding is not acceptable.
   b. Provide detail/cross section drawing of door edge construction.

4. Horizontal Edges

   a. Rails must be present on all doors.
   b. Rails are solid hardwood lumber, with grain running perpendicular to stiles. SCL is allowed for rails. Minimum rail after trim to be 7/8". MDF is unacceptable.

5. Side Panels

a. Fabricate matching panels with same construction as the door. Side panels will be pair matched to the associated door and receive the same finish.

G. Fire-Rated Doors: Provide Positive Pressure Label Doors.

1. Positive Pressure labeled doors to be Category A

a. Validate the Smoke and Draft Control ("S") Label for hardware sets that include Category H smoke and draft control seals.

2. Core material shall be dictated by manufacturer's fire door approvals.

a. Provide 20 and 45-minute fire doors with wood based particleboard core construction where allowed by manufacturers procedure. Mineral core construction is acceptable when requirements exceed particleboard core label procedures.

3. Stiles (Vertical Edges) - Provide manufacturer's standard solid or laminated edge construction approved for each fire protection level with improved screw holding capability of 550 lbs. in accordance with WDMA TM-10, Extra Heavy Duty.

a. Outer stile to be minimum thickness of ¼" after trim, same species lumber as the face. Veneer or lumber less than ¼" is not acceptable. Veneer edge banding is not acceptable. Provide detail/cross section drawing of door edge construction.

4. Rails (Horizontal Edges) - Rails are solid lumber or other material contained in manufacturer's fire door approvals.
5. Blocking for fire doors must meet WDMA-EMD face screw pull values for surface hardware.

a. All fire doors shall have a 6-inch minimum top rail after trim. 45-minute wood fire doors are not required to have a 6" combined blocking top rail provided assembly meets heavy duty level.

6. Pairs: Provide fire rated pairs with manufacturers approved stiles which match face veneer constructed as Category A. Veneered edges allowed where required to match face veneer. Exposed intumescent at door meeting edges or applied to frames is not acceptable.

2.3 Door Fabrication

A. Factory pre-fit and pre-machine doors to receive hardware as specified under Section 08710.

1. All doors shall be machined in accordance with manufacturer's procedures in order to maintain manufacturer's warranty and to avoid any machining conflicts.
2. Doors are to be beveled at both hinge and lock edges.
3. Factory pre-drill all hinge screw pilot holes for full mortise hinges.
4. Doors shall have a 3/8" undercut.
5. Coordinate door undercuts per architect's details and hardware specified under Section 08710.

6. All fire doors shall be in accordance with NFPA 80 for clearances and undercutting requirements.

B. Factory preparation for light openings:

1. Factory preparation for new wood doors glazing materials in vision panels shall be installed in labeled glass light kits or in accordance with the fire door listing and shall be installed in accordance with inspection service procedure and under label service per NFPA 80, 4.4.3.1.
2. Glass in new wood doors must be installed by the door manufacturer or in a licensed door shop.
3. Fire protection glazing and fire resistance glazing shall meet all applicable impact safety standards.
4. Provide metal vision kits at all fire labeled doors. Vision kits shall be Anemostat LoPro, 20 gage, with tamperproof screws and beige baked enamel finish. Install tamperproof screw heads on secure side of door. Vision kits shall have UL or W/H classification markings visible for inspection.
5. Wood beads for light opening in non-fire rated wood doors:

a. Provide manufacturer's standard solid wood straight beads flush design, matching veneer species of door faces. Include finish nails for removable stops in accordance with manufacturers recommendations.

2.4 Factory Finishing

A. All doors, including light beads and moldings, to be factory finished where indicated in schedules or on drawings as factory finished.

B. Finish Requirements.

C. Manufacturer's standard UV Cured Acrylated Polyester/Urethanes, equal to WDMA TR-8.

1. Grade-Premium

2. Coating-Clear

3. Satin Gloss (Gloss range 30-40)

D. Package factory finished doors with manufacturers standard packaging to protect doors from damage during shipment.

PART 3 - EXECUTION

3.1 Installation

A. Install all wood doors in accordance with door manufacturer's instructions and all tolerances outlined in ANSI/WDMA I.S. 1A-13.

B. Install label doors in accordance with NFPA-80. Labels are not to be removed, defaced or made illegible while the door is in service.

C. Inspect doors prior to installation for any damage, manufacturing defects or pre-finish inconsistency.

D. Remove and replace doors that are damaged, warped, twisted or unacceptable to the Architect or Owner.

E. Should there be any door issues do not proceed with installation. Contact door supplier to correct unsatisfactory conditions and proceed with installation only after corrections have been made.

3.2 Adjusting

A. Final Adjustments: Adjust doors and hardware prior to final inspection and acceptance by the Architect and Owner. Replace defective items, including doors that are damaged or unacceptable to the Architect or Owner.

B. Fire Door Assembly Inspection and Testing: Upon completion of the installation, provide functional testing and inspection of each fire door assembly on the project to confirm proper operation and that it meets all criteria of a fire door assembly as per NFPA 80, 5.2 - Inspection and Testing 2013 edition. Inspections shall be performed by individuals with knowledge and understanding of the operating components of the door being subjected to testing and who are certified by Intertek as a Fire Door Assembly Inspector (FDAI) or a credentialed Architectural Hardware Consultant (AHC). A written report using reporting forms provided by the Door and Hardware Institute shall be maintained and transmitted to the Owner, Contractor, Architect and made available to the Authority Having Jurisdiction (AHJ). The report shall list each fire door throughout the project, and include each door number, location, hardware set used and summary of deficiencies.

1. Schedule fire door assembly inspection within 90 days of Substantial Completion of the Project. Coordinate inspection with the Contractor and Owner.
2. Contractor shall correct all deficiencies and schedule a re-inspection of fire door assemblies which were noted as deficient on the inspection report. All deficiencies must be repaired without delay.
3. Inspector shall re-inspect fire door assemblies after repairs are made.
4. Additional re-inspections which are required due to incomplete repairs will be performed by the inspector at the expense of the Contractor.

3.3 Protection

A. Provide protective measures required throughout the construction period to ensure that doors will be without damage or deterioration at time of acceptance.

End of Section

SECTION 08420 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

1.0 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: Kawneer Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

1. Types of Kawneer Aluminum Storefront Systems include:
   a. Trifab™ VG 451 Framing System – 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension; Non-Thermal; Front, Center, Back, Multi-Plane, Structural Silicone or Weatherseal Glazed (Type B); Screw Spline, Shear Block, Stick or Punched Opening Fabrication.
   b. Trifab™ VG 451T Framing System – 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension; Thermal; Front, Center, Back, Multi-Plane, Structural Silicone or Weatherseal Glazed (Type B); Screw Spline, Shear Block, Stick or Punched Opening Fabrication.
   c. Trifab™ VG 451T Framing System – Impact Glazing and Blast Mitigation.

B. Related Sections:

1. 072700 "Air Barriers"
2. 079200 "Joint Sealants"
3. 083213 "Sliding Aluminum-Framed Glass Doors"
4. 084113 "Aluminum-Framed Entrances and Storefronts"
5. 084329 "Sliding Storefronts"
6. 084433 "Sloped Glazing Assemblies"
7. 085113 "Aluminum Windows"
8. 088000 "Glazing"
9. 122600 "Interior Daylighting Devices"

1.3 Definitions

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 Performance Requirements

A. Storefront System Performance Requirements:

1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures of +34.8 lbs./sq. ft. inward and 38 lbs./sq. ft. outward. The design pressures are based on the Iternational Building Code; 2021 Edition.
2. Air Leakage: The test specimen shall be tested in accordance with ASTM E 283. Air Leakage rate shall not exceed 0.06 cfm/ft2 (0.3 l/s · m2) at a static air pressure differential of 6.2 psf (300 Pa) with interior seal, or, rate shall not exceed 0.06 cfm/ft2 (0.3 l/s · m2) at a static air pressure differential of 1.6 psf (75 Pa) without interior seal. CSA A440 Fixed Rating.
3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.

4. Uniform Load: A static air design load of 35 psf (1680 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
5. Seismic: When tested to AAMA 501.4, system must meet design displacement of 0.010 x the story height and ultimate displacement of 1.5 x the design displacement.
6. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
   a. Temperature Change (Range): 0 deg F (-18 deg C); 180 deg F (82 deg C).
   b. Test Interior Ambient-Air Temperature: [75 deg F (24 deg C)] .
   c. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5 for a minimum 3 cycles.
7. Energy Efficiency:
   a. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:
      1) Glass to Exterior – 0.47 (low-e) or 0.61 (clear) or Project Specific .59 BTU/hr/ft2/°F.
      2) Glass to Center – 0.44 (low-e) or 0.61 (clear) or Project Specific .59 BTU/hr/ft2/°F.
      3) Glass to Interior – 0.41 (low-e) or 0.56 (clear) or Project Specific .59 BTU/hr/ft²/°F.
8. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:
   a. Glass to Exterior – 70_{frame} and 69_{glass} (low-e) or 69_{frame} and 58_{glass} (clear).
   b. Glass to Center – 62_{frame} and 68_{glass} (low-e) or 63_{frame} and 56_{glass} (clear).
   c. Glass to Interior – 56_{frame} and 67_{glass} (low-e) or 54_{frame} and 58_{glass} (clear).

2.0 PRODUCTS

2.1 Manufacturers

A. Basis-of-Design Product:
   1. Kawneer Company Inc.
   2. Trifab™ VG 451 (Non-Thermal) or Trifab™ 451T (Thermal) Framing System
   3. System Dimensions: 2" x 4-1/2" (50.8 mm x 114.3 mm)
   4. Glass: Center, Exterior or Interior

B. Substitutions: Refer to Substitutions Section for procedures and submission requirements
   1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
   2. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid storefront installation and construction delays.

3. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
4. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for storefront system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum storefronts for a period of not less than ten (10) years. (Company Name)
5. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
6. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

C. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 Materials

A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8 mm) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum framing members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

G. Red List Free: All parts and materials comply with the Living Building Challenge/DECLARE Red List and the Cradle-to-Cradle (C2C) Banned List.
1. PVC free
2. Neoprene free

OR

H. Red List Free: Product does not contain PVC or Neoprene.

2.3 Storefront Framing System

A. Thermal Barrier (Trifab™ VG 451T):
1. Kawneer IsoLock™ Thermal Break with a 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane,

which is mechanically and adhesively joined to aluminum storefront sections.

a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action

E. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

F. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

2.4 Glazing Systems

A. Glazing: As specified in Division 08810 Section "Glass and Glazing".

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
   a. Color: Black
2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
   a. Color: Matching structural sealant.

2.5 Entrance Door Systems

A. Entrance Doors: As specified in Division 084113 Section "Aluminum-Framed Entrances and Storefronts".

B. Entrance Door Hardware: As specified in Division 084113 Section "Door Hardware".

2.6 Fabrication

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fit joints; make joints flush, hairline and weatherproof.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   6. Provisions for field replacement of glazing.
   7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

C. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

D. Storefront Framing: Fabricate components for assembly using manufacturer's standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 Aluminum Finishes

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:
   1. Kawneer Permanodic™ AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating Color to be selected by the Architect, from standard colors.
   2. Kawneer Permanodic™ AA-M10C21A41 / AA-M45C22A41, AAMA 611, Architectural Class I Clear Anodic Coating Color #14 Clear) (Optional).
   3. Kawneer Permanodic™ AA-M10C21A31, AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear) (Standard).
   4. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating Color to be selected by the Architect, from standard colors.
   5. Kawneer Permadize™ (50% PVDF), AAMA 2604, Fluoropolymer Coating Color to be selected by the Architect, from standard colors.
   6. Kawneer Permacoat™ AAMA 2604, Powder Coating Color Color to be selected by the Architect, from standard colors.

3.0 EXECUTION

3.1 Examination

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system installation.
   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.

2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed storefront system, accessories, and other components.

B. Install aluminum-framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install aluminum-framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 Field Quality Control

A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, whichever is greater.
b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.2 psf (300 Pa).

B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 Adjusting, Cleaning, and Protection

A. Clean aluminum surfaces immediately after installing aluminum-framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

ALUMINUM VERTICAL SLIDING PASS-THROUGH WINDOW - SECTION 08580

1.0 GENERAL

1.1 Summary

A. This section includes:
   1. Exterior aluminum sliding vertical pass-through windows as indicated in drawings and in sections.

B. The publication below forms a part of this specification:
   1. UNDERWRITERS LABORATORY UL 752 9th Edition Standard for Bullet Resisting Equipment dated Jan. 27, 1995.

1.2 Submittals

A. Product Data: Submit Manufacturer's technical product data substantiating that product complies.

B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.

C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.3 Delivery, Storage, And Handling

A. Deliver windows crated to provide protection during transit and job storage

B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.

C. Store windows at building site under cover in dry location.

1.4 Project Conditions

A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.5 Warranty

All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

2.0 PRODUCTS

2.1 Acceptable Manufacturer's

A. Basis of design: Design is based on aluminum exterior sliding transaction windows, manufactured by C.R. Laurence Co., Inc. Vertical Sliding - SWB1014K through window as indicated on drawings.

2.2 Materials

A. Frames: 4" Aluminum frame modules shall be to the standards established by U.L. 752 Protection Level 1. Frames are to be constructed of 6063-T5 extruded aluminum lined with U.L. Shapes and sizes are to be in accordance with the contract drawings.

B. Finish: All aluminum to be Kynar (K) painted bone white or as selected by Architect.

C. Glazing: The glazing must be in accordance with U.L. 752 testing standards 1/4" tempered, laminated or tinted.1/2" or 5/8" insulating.

D. Keyed lock, burglar bar, counter mounted security clip, full bottom track, half bottom track (no track under sliding panel), shelf/tray. and voice transmission.

1. Shelf: Provide a shelf not less than 2" thick. The shelf is to be the full width of the window and a minimum of 12" deep centered under the glazing. (Shelf Options include: 18" deep shelf, 16 ga. stainless steel #4 finish.)

3.0 – EXECUTION

3.1 Installation

A. Install frames and glazing in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.2 Cleaning

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.3 Protection

A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION

1.0 - GENERAL

1.1 Scope
The work under this section consists of all Aluminum Sliding Glass Display Door work.

1.2 Type and Quality
For purposes of designating type and quality for work of this section, Drawings and Specifications are based on products of Kawneer Company, Inc. Whenever substitute products are to be considered, supporting technical literature, samples and drawings must be submitted for approval.

1.3 Work Required
Shall be Series 990 Sliding Door System as furnished by Kawneer Company or approved equal to match storefront. This contractor shall furnish all necessary material, labor and equipment for the complete installation.

1.4 Work Not Included
The General Contractor shall provide adequate footings to prevent vertical movement of the base track. Ceiling shall be substantial to prevent deflection beyond adjustment limits of this product, and shall provide adequate anchorage surface for all portions of the head track. Rough openings prepared by the General Contractor shall be per approved shop drawings, and within specified tolerances.

1.5 Submittals
Shop drawings and finishes for approval.

2.0 - PRODUCTS

2.1 Materials
A. Units shall be constructed of aluminum extruded from 6063-T5 alloy.

B. Sliding panels shall roll on 22 gauge, roll-formed stainless steel tracks.

C. All fastenings and fastening devices shall be of aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with aluminum.

2.2 Construction
A. Entire vertical weight of the unit shall be carried by the base tracks.

B. Sliding panels shall be equipped with two center pivoted, spring loaded, tandem wheel assemblies, each having a minimum adjustment of 1/2". Each assembly shall be capable of supporting a minimum moving weight of 200 pounds and shall be equipped with two self-contained, steel ball bearing rollers. Sliding panels shall not be removable when in a locked position.

C. Dimensional control of all members shall be maintained to provide proper fit of all frame and panel components.

2.3 Glazing
Fixed and sliding panels shall be factory glazed with 1/4" tempered glass and continuous vinyl channels with surface striations to prevent separation of glass and panel. The vinyl channels to accommodate specified thickness glazing.

2.4 Hardware

Hardware shall be of the "Flush Face Pull" type. Adams Rite 1850-A-505 M.S. Hook Bolt Cylinder Lock or equal. Key to Master System.

3.0 - EXECUTION

3.1 Installation

Doors shall be securely anchored to a straight, plumb and level condition without distortion of frame or panel components and in strict accordance with the manufacturer's installation details and instruction.

3.2 Finish

Finish shall be selected by the Architect from Manufacturer's Standard Finishes.

3.3 Protection

This contractor shall protect all portions of this product from damage during installation.

3.4 Cleaning and Adjusting

The General Contractor shall be responsible for removal of protective materials and cleaning of the aluminum. All aluminum shall be thoroughly cleaned with plain water, or water with soap or household detergent. Provide final adjustments for easy, smooth operation.

END OF SECTION

1.0 - GENERAL

1.1 Related Documents

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

1.2 Summary

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following:
1. Architectural Hinges
2. Continuous Hinges
3. Key Control System, Cylinders and Cores.
4. Locksets, Latchsets and Deadbolts
5. Panic Devices and Fire Rated Exit Devices
6. Closers and Door Control Devices
7. Overhead Door Stops and Holders
8. Floor and Wall Stops
9. Door Bolts and Coordinators
10. Door Pulls, Push/Pull Plates and Push/Pull Sets
11. Protective Plates
12. Door Seals, Gasketing and Weatherstripping
13. Thresholds
14. Miscellaneous Door Control Devices
15. Electromechanical Hardware
16. Miscellaneous Access Control Components and Security Equipment

C. Related Sections: The following Sections contain requirements that relate to the following sections.
1. Section 08110: Hollow Metal Doors and Frames
2. Section 08215: Wood Doors
3. Section 08420: Aluminum-Framed Entrances and Storefronts
4. Section 08300: Tornado Resistant Opening Systems
5. Division 16: Electrical
6. Division 28: Electronic Safety and Security

D. Products furnished but not installed under this Section to include:
1. Cylinders for locks on entrance doors.
2. Final replacement cores and keys to be installed by Owner.

1.3 References

A. Standards of the following as referenced:
1. American National Standards Institute (ANSI)
2. Door and Hardware Institute (DHI)
3. Factory Mutual (FM)
4. National Fire Protection Association (NFPA)
5. Underwriters' Laboratories, Inc. (UL)
6. UL 10C - Fire Tests Door Assemblies
7. Warnock Hersey

B. Regulatory standards of the following as referenced:
1. Department of Justice, Office of the Attorney General, *Americans with Disabilities*

Act, Public Law 101-336 (ADA).

2. CABO/ANSI A117.1: *Providing Accessibility and Usability for Physically Handicapped People*, 2010 edition.

1.4 Submittals

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. 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. For items other than those scheduled in the "Headings" of Section 3, provide catalog information for the specified items and for those submitted.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into vertical format "hardware sets" indicating complete designations of every item required for each door or opening. Use specification heading numbers with any variations suffixed a, b, etc. Include the following information:
   a. Type, style, function, size, and finish of each hardware item.
   b. Name and manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
   e. Explanation of all abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for hardware.
   g. Door and frame sizes and materials.
   h. Keying information.
   i. Cross-reference numbers used within schedule deviating from those specified.
   j. Column 1: State specified item and manufacturer.
   k. Column 2: State prior approved substituted item and its manufacturer.
2. Furnish complete wiring diagrams, riser diagrams, elevation drawings and operational descriptions of electrical components and systems, listed by opening in the hardware submittals. Elevation drawings shall identify locations of the system components with respect to their placement in the door opening. Operational descriptions shall fully detail how each electrical component will function within the opening, including all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval. Supply a copy with delivery of hardware to the jobsite and another copy to the Owner at the time of project completion.
3. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
4. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Provide samples if requested of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after

final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

F. Contract closeout submittals:
   1. Operation and maintenance data: Complete information for installed door hardware.
   2. Warranty: Completed and executed warranty forms.

1.5 Quality Assurance

A. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer.
   1. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Architectural Hardware Consultant (AHC) who is available for consultation to Owner, Architect, and Contractor, at reasonable times during the course of the Work.

B. Coordination Meetings:
   1. Contractor to set up and attend the following:
      a. Lock distributor to meet with the Owner to finalize lock functions and keying requirements and to obtain final instructions in writing.
      b. Lock distributor and lock, closer and exit device manufacturer to meet with the installer prior to beginning of installation of door hardware. Instruct installer on proper installation of specified products.
   2. General Contractor to set up and attend the following:
   3. Meet with the Owner, General Contractor, Supplier, electrical and security contractors to coordinate all electrical hardware items. Supplier to provide riser diagrams, elevation drawings, wiring diagrams and operational descriptions as required by the General and sub-contractors.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 requirements of authorities having jurisdiction.
   1. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not. All hardware to comply with State and local codes and UL 10C.
   2. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

D. All hardware is to comply with Federal and State Handicap laws.

E. Substitutions: Request for substitutions of items of hardware other than those listed as "acceptable and approved" shall be made to the architect in writing no later than fourteen (14) days prior to bid opening. Approval of substitutions will only be given in writing or by Addenda. Requests for substitutions shall be accompanied by samples and/or detailed information for each manufacturer of each product showing design, functions, material

thickness and any other pertinent information needed to compare your product with that specified. Lack of this information will result in a refusal.

F. Pre-Installation Coordination:
   1. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 3 years' experience in successful completion of projects similar in size and scope.
   2. Schedule a hardware pre-installation meeting on site to review and discuss the installation of continuous hinges, locksets, door closers, exit devices, overhead stops, and electromechanical door hardware.
   3. Meeting attendees shall be notified 7 days in advance and shall include: Architect, Contractor, Door Hardware Installers (including low voltage hardware), Manufacturers representatives for above hardware items, and any other effected subcontractors or suppliers.
   4. All attendees shall be prepared to distribute installation manuals, hardware schedules, templates, and physical hardware samples.

1.6 Product Handling

A. Tag each item or package separately with identification related to final hardware schedule and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.7 Warranty

A. Special warranties:
   1. Cylindrical Locks and Cylinders: Ten period Year Period
   2. Door Closers: Thirty Year Period
   3. Exit Devices: Ten Year Period
   4. Electrified Exit Devices: Two Year Period

1.8 Maintenance

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions that are packed in hardware items for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Parts kits: Furnish manufacturers' standard parts kits for locksets, exit devices, and door closers.

2.0 - PRODUCTS

2.1 Manufactured Units

A. Hinges:
   1. Acceptable manufacturers:
      a. Ives*
      b. Bommer
      c. McKinney
   2. Characteristics:
      a. Templates: Provide only template-produced units.
      b. Screws: Provide Phillips flat-head screws complying with the following requirements:
         1) For metal doors and frames install machine screws into drilled and tapped holes.
         2) For wood doors and frames install threaded-to-the-head wood screws.
         3) For fire-rated wood doors install #12 x 1-1/4 inch, threaded-to-the-head steel wood screws.
         4) Finish screw heads to match surface of hinges or pivots.
      c. Hinge pins: Except as otherwise indicated, provide hinge pins as follows:
         1) Out-Swing Exterior Doors: Non-removable pins.
         2) Out-Swing Corridor Doors with Locks: Non-removable pins.
         3) Interior Doors: Non-rising pins.
         4) Tips: Flat button and matching plug. Finished to match leafs.
      d. Size: Size hinges in accordance with specified manufacturer's published recommendations.
      e. Quantity: Furnish one pair of hinges for all doors up to 5'-0" high. Furnish one hinge for each additional 2-1/2 feet or fraction thereof, unless otherwise specified in Hardware Headings.

B. Geared Continuous Hinges:
   1. Acceptable manufacturers:
      a. Ives*
      b. Select Products
      c. Markar
   2. Characteristics:
      a. Continuous gear hinges to be manufactured of extruded 6063-T6 aluminum alloy with anodized finish, or factory painted finish as scheduled.
      b. All hinges are to be manufactured to template. Uncut hinges to be non-handed and to be a pinless assembly of three interlocking extrusions applied to the full height of the door and frame without mortising.
      c. Vertical door loads to be carried on chemically lubricated polyacetal thrust bearings. The door and frame leaves to be continually geared together for the entire hinge length and secured with a full cover channel. Hinge to operate to a full 180°.
      d. Hinges to be milled, anodized and assembled in matching pairs. Fasteners supplied to be steel self-drilling, self-tapping 12-24 x ¾" screws.
      e. Provide UL listed continuous hinges at fire doors. Continuous hinges at fire doors (suffix -FR) to meet the required ratings without the use of auxiliary fused pins or studs.

C. Cylinders and Keying:
   1. Acceptable manufacturers:
      a. Match existing Schlage Everest keying system.
   2. Characteristics:
      a. New Keying System: Except as otherwise indicated, provide new master

key system for project.

b. Equip locksets with Full Size Interchangeable Cores (FSIC) featuring patented, restricted keys (Schlage Everest 29T) and auxiliary locking pin. Patented key and cylinder design to be valid until 2029.

c. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

d. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

e. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE".

f. Key Material: Provide keys of nickel silver only.

g. Furnish the following Key Quantities:
   1) Three (3) change keys for each lock.
   2) Five (5) master keys for each master system.
   3) Five (5) grandmaster keys for each grandmaster system.
   4) Ten (10) construction master keys.
   5) Two (2) construction Control Keys.
   6) One (1) extra blank for each lock.

h. Furnish construction master keys to General Contractor.
   1) Deliver keys to Owner.

i. Key Control Software: Schlage Sitemaster 200 for Windows or equivalent, supplied with factory bitting, and keyset symbols.

D. Mortise Locksets and Latchsets: Acceptable manufacturers:
   a. Schlage L9000 Series

2. Required Features:
   a. Chassis: Cold-rolled steel, handing field-changeable without disassembly.
   b. Latchbolts: 3/4-inch throw stainless steel anti-friction type.
   c. Lever Trim: Through-bolted, accessible design, cast or solid rod lever as scheduled. Spindles: Independent break-away.
   d. Thumbturns: Accessible design not requiring pinching or twisting motions to operate.
   e. Deadbolts: Stainless steel 1-inch throw.
   f. Strikes: 16 gage curved stainless steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
   g. Scheduled Lock Series and Design: Schlage L9000 Series 07N Design.
   h. Certifications:
      1) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
      2) ANSI/ASTM F476-84 Grade 30 UL Listed.

E. Deadbolts: as scheduled.

1. Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of 1/4" dia. steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike with 1/8" thick strike reinforcement and two 3" long screws. ANSI A156.5, 1992 Grade 1 certified.

F. Exit Devices:

1. Acceptable manufacturers:
   a. Von Duprin 98 Series*

2. Characteristics:
   a. Exit devices to be UL Listed for life safety. Exit devices for fire rated

openings to have "UL" labels for "Fire Exit Hardware."

b. Exit devices mounted on labeled wood doors to be mounted on the door per the door manufacturer's requirements.
c. All trim to be thru bolted to the lock stile case.
d. Lever trim to be solid case material with a break-away feature to limit damage to the unit from vandalism. Lever design to match locksets.
e. All exit devices to be made of brass, bronze, stainless steel, or aluminum material, powder coated, anodized, or plated to the standard architectural finishes to match the balance of the door hardware.
f. Provide glass bead conversion kits to shim exit devices on doors with raised glass beads.
g. All exit devices to be one manufacturer. No deviation will be considered.
h. All series exit devices to incorporate a fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation. All exit devices to be non-handed. Touchpad to extend a minimum of 1/2 of the door width and to extend to the height of the cross rail housing for a "no pinch" operation. Plastic touchpads are not acceptable. All latchbolts to be the deadlocking type. Latchbolts to have a self-lubricating coating to reduce wear. Plated or plastic coated latchbolts are not acceptable. Plastic linkage and "dogging" components are not acceptable.
i. Surface vertical rod devices to be UL labeled for fire door applications without the use of bottom rod assemblies. Where bottom rods are required for security applications, the devices to be UL labeled for fire doors applications with rod and latch guards by the device manufacturer.
j. Exit devices to include impact resistant, flush mounted end cap design to avoid damage due to carts and other heavy objects passing through an opening. End cap to be of heavy-duty metal alloy construction and provide horizontal adjustment to provide alignment with device cover plate. When exit device end cap is installed, no raised edges will protrude.
k. Exit devices used at ICC-500 rated door and frame assemblies are to be tested and approved for use with materials specified in Section 083490-Tornado Resistant Assemblies.

G. Closers and Door Control Devices:
1. Acceptable manufacturers:
a. LCN Closers 4010 Series*
2. Characteristics:
a. Door closers to have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder.
b. All closers to utilize a stable fluid withstanding temperature range of 120°F to -30°F without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors to be provided with temperature stabilizing fluid that complies with standards UBC 7-2 (1997) and UL 10C.
c. Spring power to be continuously adjustable over the full range of closer sizes and allow for reduced opening force for the physically handicapped. Spring power adjustment (LCN Fast ™ Power Adjust) allows for quick and accurate power adjustment and visually shows closer power size settings by way of dial adjustment gauge located on closer spring tube. Hydraulic regulation to be by tamper-proof, non-critical valves. Closers to have separate adjustment for latch speed, general speed and back check.
d. All closers to have solid forged steel main arms (and forearms for parallel

arm closers) and where specified to have a cast-in solid stop on the closer shoe ("CUSH"). All parallel arm mounted closers to have "EDA" type arms or, where door travel on out-swing doors must be limited, use "CUSH" or "SCUSH" type closers. Auxiliary stops are not required when "CUSH" type closers are used. Provide drop plates where top rail of door is not sufficient for closer mounting. Provide "cush shoe supports" and "blade stop spacers" where dictated by frame details.

e. Overhead concealed closers to have spring power adjustable for 50% increase in closing power and fully mortised door tracks.

f. All surface closers to be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. All closers (overhead, surface and concealed) to be of one manufacturer and carry manufacturer's ten-year warranty (electric closers to have two year warranty).

g. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped provide adjustable units complying with ADA and ANSI A-117.1 provisions for door opening force.

h. Closers to be installed to allow door swing as shown on plans. Doors swinging into exit corridors to provide for corridor clear width as required by code. Where possible, mount closers inside rooms.

i. Powder coating finish to be certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.

H. Overhead Door Holders:

1. Acceptable manufacturers:
   a. Glynn Johnson*
   b. Rixson Firemark
2. Characteristics:
   a. Provide heavy duty concealed door holders of stainless steel.
   b. Provide heavy duty surface mounted door holders of stainless steel.
   c. Concealed holders to be installed with the jamb bracket mortised flush with the bottom of the jamb. The arm and channel to be mortised into the door.
   d. Surface holders to be installed with the jamb bracket mounted on the stop.

I. Floor Stops and Wall Bumpers:

1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics: Refer to Hardware Headings.

J. Door Bolts/Coordinators:

1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics:
   a. Flush bolts to be forged brass 6-3/4" x 1", with 1/2" diameter bolts. Plunger to be supplied with milled surface one side that fits into a matching guide.
   b. Automatic flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass

components.

c. Self-latching flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass components.

d. Automatic flush bolts and self-latching flush bolts to be UL listed for fire door application without bottom bolts (LBB).

e. Furnish dust proof bottom strikes.

f. Coordinator to be soffit mounted non-handed fully automatic UL listed coordinating device for sequential closing of paired doors with or without astragals.

g. Provide filler piece to close the header. Provide brackets as required for mounting of soffit applied hardware.

K. Push Plates:

1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics:
   a. Exposed Fasteners: Provide manufacturers standard exposed fasteners.
   b. Material to be forged stainless steel, per the Hardware Headings.
   c. Provide plates sized as shown in Hardware Headings.

L. Door Pulls & Pull Plates:

1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics:
   a. Provide concealed thru-bolted trim on back-to-back mounted pulls, but not for single units.
   b. Material to be forged stainless steel.
   c. Provide units sized as shown in Hardware Headings.

M. Push Pull Sets:

1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics:
   a. Provide mounting systems as shown in hardware sets.
   b. Material to be tubular stainless steel.
   c. Provide Push/Pull sets sized as shown in Hardware Headings.

N. Protective Plates:

1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics:
   a. Provide manufacturers standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
   b. Materials:
   c. Metal Plates: Stainless Steel, .050 inch (U.S. 18 gage).
   d. Fabricate protection plates not more than 2 inches less than door width

on push side and not more than 1 inch less than door width on pull side.

e. Sizes:
   1) Refer to hardware headings for specific sizes.
   2) Kick plates to be 8 inches in height.
   3) Mop plates to be 6 inches in height.
   4) Kick plates and Mop plates to be 1" less that bottom rail height where applicable.
   5) Armor plates to be 34 inches in height. Armor plates on fire doors to comply with NFPA 80.

O. Thresholds:
   1. Acceptable manufacturers:
      a. Zero Weatherstripping Co., Inc.*
      b. Pemko
      c. Reese Industries
   2. Types: Indicated in Hardware Headings.

P. Door Seals/Gasketing:
   1. Acceptable manufacturers:
      a. Zero Weatherstripping Co., Inc.*
      b. Pemko
      c. Reese Industries
   2. Types: Indicated in Hardware Headings.

Q. Silencers:
   1. Acceptable manufacturers:
      a. Ives*
      b. Hager
      c. Rockwood Manufacturing
   2. Provide three for each single door; two for each pair of doors.

R. Knox Box: (AS REQUIRED)
   1. Acceptable manufacturers:
      a. Knox Box 3200 Series.
   2. Provide one surface mount Knox Box 3200 Series.
   3. Provide unit compatible with the local Fire Department Knox key system.
   4. General contractor shall install in location provided by architect.

2.2 Materials and Fabrication

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
   1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
   1. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

2. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.
4. Use thru-bolts for installation of all exit devices, closers, and surface-mounted overhead stops. Coordinate with wood doors and metal doors and frames. Where thru-bolts are used, provide sleeves for each thru-bolt as a means of reinforcing the work, or provide sex nuts and bolts.

2.3 Hardware Finishes

A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

B. Provide finishes that match those established by ANSI or, if none established, match the Architect's sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

E. The designations used to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

F. All hardware to be 626 (US26D), 652 (US26D) Satin Chrome Finish, with the following exceptions:
1. Continuous Hinges: 628 (US28) Clear Anodized Aluminum
2. Door Closers: 689 Powder Coat Aluminum
3. Push Plates: 630 (US32D) Satin Stainless Steel
4. Pull Plates: 630 (US32D) Satin Stainless Steel
5. Protective Plates: 630 (US32D) Satin Stainless Steel
6. Overhead Holders: 630 Satin Stainless Steel

3.0 - EXECUTION

3.1 Installation:

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal,

storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers".

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 Adjusting, Cleaning, and Demonstrating

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to function properly with final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Door Hardware Supplier's Field Service:

1. Inspect door hardware items for correct installation and adjustment after complete installation of door hardware.
2. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
3. File written report of this inspection to Architect.

3.3 Hardware Schedule

HARDWARE SET: A01
EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	REMOVABLE MULLION	KR4954 STAB	VON
1	PANIC HARDWARE	CDSI-98-DT-SNB	VON
1	PANIC HARDWARE	CDSI-98-NL-SNB	VON
1	RIM CYLINDER	20-057 ICX	SCH
3	MORTISE CYLINDER	20-061 ICX	SCH
4	FSIC CORE	23-030	SCH
2	SURFACE CLOSER	4111 SCUSH MC TBWMS	LCN
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MULLION SEAL	139N PSA	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655A-223	ZER

HARDWARE SET: A02
EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	REMOVABLE MULLION	KR4954 STAB	VON
1	PANIC HARDWARE	CDSI-98-DT-SNB	VON
1	PANIC HARDWARE	CDSI-98-NL-SNB	VON
1	RIM CYLINDER	20-057 ICX	SCH
3	MORTISE CYLINDER	20-061 ICX	SCH
4	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4111 EDA MC TBWMS	LCN
1	SURFACE CLOSER	4111 SCUSH MC TBWMS	LCN
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	FLOOR STOP	FS18S	IVE
1	MULLION SEAL	139N PSA	ZER
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655A-223	ZER

HARDWARE SET: A03
EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	PANIC HARDWARE	CDSI-98-NL-SNB	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	MORTISE CYLINDER	20-061 ICX	SCH
2	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4111 EDA MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	FLOOR STOP	FS18S	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8192AA	ZER
1	THRESHOLD	655A-223	ZER

HARDWARE SET: A04
EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
1	OH STOP	100S	GLY
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8192AA	ZER
1	THRESHOLD	65A	ZER

HARDWARE SET: A05
EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	CORRIDOR LOCK	L9456T L583-363	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4111 SCUSH MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A	ZER

HARDWARE SET: A06
EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	CLASSROOM DEAD LOCK	L463T	SCH
1	FSIC CORE	23-030	SCH
1	PUSH PLATE	8200 8" X 16"	IVE
1	PULL PLATE	8303 10" 6" X 16"	IVE
1	SURFACE CLOSER	4111 SCUSH MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A	ZER

HARDWARE SET: A07
EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	PANIC HARDWARE	LD-98-NL-SNB	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4111 SCUSH MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8192AA	ZER
1	THRESHOLD	655A-223	ZER

HARDWARE SET: A08
EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	CONST LATCHING BOLT	FB51P (HMD)	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
2	FLOOR STOP	FS441	IVE
2	MEETING STILE	328AA-S (PAIR)	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8192AA	ZER
2	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655A-223	ZER

HARDWARE SET: A09
EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	CONST LATCHING BOLT	FB51P (HMD)	IVE
1	CYLINDER DEAD LOCK	L464T	SCH
1	FSIC CORE	23-030	SCH
2	DOOR PULL, 1" ROUND	PR 8103EZHD 12" N	IVE
2	OH STOP & HOLDER	100H	GLY
2	SURFACE CLOSER	4011 MC ST-1544 TBWMS (4011X100S)	LCN
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
2	MEETING STILE	328AA-S (PAIR)	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8192AA	ZER
2	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655A-223	ZER

HARDWARE SET: B01
EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
1	PANIC HARDWARE	CDSI-98-NL-SNB	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	MORTISE CYLINDER	20-061 ICX	SCH
2	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4111 EDA MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: B02
EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	REMOVABLE MULLION	KR4954 STAB	VON
1	PANIC HARDWARE	CDSI-98-DT-SNB	VON
1	PANIC HARDWARE	CDSI-98-NL-SNB	VON
1	RIM CYLINDER	20-057 ICX	SCH
3	MORTISE CYLINDER	20-061 ICX	SCH
4	FSIC CORE	23-030	SCH
2	SURFACE CLOSER	4111 SHCUSH MC TBWMS	LCN
2	ARMOR PLATE	8400 34" X 2" LDW B-CS	IVE
1	MULLION SEAL	139N PSA	ZER

HARDWARE SET: C01
EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	CLASSROOM DEAD LOCK	L463T	SCH
1	FSIC CORE	23-030	SCH
1	PUSH PLATE	8200 8" X 16"	IVE
1	PULL PLATE	8303 10" 6" X 16"	IVE
1	SURFACE CLOSER	4011 MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: C02
EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	CLASSROOM DEAD LOCK	L463T	SCH
1	FSIC CORE	23-030	SCH
1	PUSH PLATE	8200 8" X 16"	IVE
1	PULL PLATE	8303 10" 6" X 16"	IVE
1	SURFACE CLOSER	4111 EDA MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: D01
EACH TO HAVE:

1	HINGE	3CB1 4.5 X 4.5	IVE
2	SPRING HINGE	3SP1 4.5 X 4.5	IVE
1	DEAD LOCK	L460T L583-363 OS-OCC	SCH
1	FSIC CORE	23-030	SCH
1	DOOR PULL, 1" ROUND	PR 8103EZHD 8" N	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: D02
EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	PRIVACY LOCK	L9440 17A L583-363 OS-OCC	SCH
1	SURFACE CLOSER	4011 MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: E01
EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	OFFICE LOCK	L9050T 17A L583-363	SCH
1	FSIC CORE	23-030	SCH
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: E02
EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	OFFICE	L9050T 17A L583-363	SCH
1	OH STOP	100S	GLY
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: F01
EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCK	L9080T 17A	SCH
1	FSIC CORE	23-030	SCH
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: F02
EACH TO HAVE:

6	HINGE	5BB1 4.5 X 4.5	IVE
1	CONST LATCHING BOLT	FB51P (HMD)	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
2	FLOOR STOP	FS441	IVE

HARDWARE SET: F03
EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4011 MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

END OF SECTION

1.0 - GENERAL

1.1 Scope

The work under this section consists of all glass and glazing.

1.2 Quality

A. Glazing shall be provided to comply with Table 5.3.1 Building Envelope Requirements - Climate Zone 1 of the Alabama Building Energy Conservation Code, and the 2021 International Building Code.

B. Glazing for Fire-Rated Door and Window Assemblies: Glazing tested per NFPA 252 and NFPA 257, as applicable, for assemblies complying with NFPA 80 and listed and labeled per requirements of authorities having jurisdiction.

C. Safety Glazing Products: Comply with size, glazing type, location, and testing requirements of 16 CFR 1201 for Category I and II glazing products, and requirements of authorities having jurisdiction.

D. Glazing Industry Publications: Comply with glass product manufacturers' recommendations and the following:
   1. GANA Publications: GANA Laminated Division's 'Laminated Glass Design Guide' and GANA's 'Glazing Manual.'
   2. IGMA Publication for Insulating Glass: IGMA TM-3000, 'Glazing Guidelines for Sealed Insulating Glass Units.'

E. Insulating-Glass Certification Program: Indicate compliance with requirements of Insulating Glass Certification Council on applicable glazing products.

1.3 Samples

Submit for approval samples of each kind of glass required. Each sample shall bear a label indicating the kind and quality of the glass and the manufacturer. **Only 1 sample each is required.**

1.4 Warranty

A. Warranty for Coated-Glass Products: Manufacturer's standard form, signed by coated-glass product primary manufacturer or manufacturer/fabricator, as applicable, agreeing to replace coated-glass units that display peeling, cracking, and other deterioration in metallic coating under normal use, within 10 years of date of Substantial Completion.

B. Warranty for Insulating Glass: Manufacturer's standard form, signed by insulating-glass product manufacturer/fabricator, agreeing to replace insulating-glass units that exhibit failure of hermetic seal under normal use evidenced by the obstruction of vision by dust, moisture, or film on interior surfaces of glass, within 10 years of date of Substantial Completion.

C. Installer's Warranty: Form acceptable to Owner, signed by glass product Installer, agreeing to replace glass products that deteriorate, or that exhibit damage or deterioration of glass or glazing products due to faulty installation, within 2 years of date of Substantial Completion.

2.0 - PRODUCTS

2.1 Manufacturer

Glass products shall be as manufactured by Vitro Architectural Glass., Guardian Industries, Inc., or Pre-approved equal. Laminated pattern glass shall be as manufactured by North American Glass Fabrication. Fire-rated, safety-rated wired glass shall be manufactured by Technical Glass Products, Pilkington or SaftFirst.

2.2 Materials

Glass shall be as defined in, and in accordance with Code of Federal Regulations 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

A. Compound for face glazing, or where shown or indicated as compound shall be an oleo-resinous knife grade elastic glazing compound such as Tremco's Trem-glaze, Pecora's M-242, or Dap-1012.

B. Sealant where shown or indicated shall be Tremco "Mono," Dow Corning 780, or GE's construction sealant.

C. Tape where shown or indicated shall be Tremco's 440 Tape, Curtis 606 Tape, or Warflex's "Sealing Tape."

D. Neoprene setting blocks as approved by glass manufacturer Shore "A" Hardness approximately 70 to 90.

E. Neoprene spacer shims as approved by glass manufacturer Shore "A" Hardness approximately 40 to 60.

F. Neoprene glazing beads as approved for aluminum store front and doors.

G. Color of compound, sealant, tape, etc. shall be as selected.

H. Glare reducing glass shall be 1/4" thick Solargray, Solargreen, or Solarbronze as selected.

I. Glare reducing Tempered Safety glass shall be 1/4" thick Solargray, Solargreen, or Solarbronze as selected. When multiple small glass panes are used in the same door or sidelight, provide one (1) only Decal and furnish certificate verifying the use of Safety Glass in other panels.

J. Interior Tempered Safety Glass shall meet 16CFR1201 Test Requirements, Cat. 1 and/or Cat. 2 as applicable. Etch label and furnish certificate verifying the use of Tempered Safety Glass.

K. Fire safety glass shall be 5/16" thick clear laminated fire rated and impact safety rated glass. Approved equal to Pilkington Fire-Lite Plus or SaftiFirst SuperLite and shall meet impact safety rating 16CFR1201 (Cat.1) if less than 9 sq. ft. and (Cat. 2) if greater than 9 sq. ft. Provide with label at all rated doors and frames..

L. 1" insulating Glass - Pre-assembly Low-E unit consisting of 1/4" float glass exterior lite, 1/2" dehydrated air space and clear 1/4" float glass with Low-E interior lite meeting performance requirement for Class A or Class B Accelerated Test as specified in ASTM E744 with no visible fog. Match color on metal spacer to glazing frame. As selected by Architect. Provide minimum SHGC of .25.

1. Solarban 70 Solar Gray + Clear

2. Solarban 60 Solar Gray + Clear
3. Solarban 70 Solar Bronze + Clear

(See corresponding SHGC and U-Value below when used with metal frame)

M. Spandrel Glass - 1/4" thick, float glass with the opacifying coating on the number 2 (inboard) face. Temper or heat strengthen in accordance with the current Glass Tempering Association, Engineered Standard Manual. Opacifying coating shall be Opaci-Coat-300 Coating shall be Silicone water based glastomer with a min/max wet thickness of 8 mils. (0.008") and a protective coating of silicone rubber a minimum wet thickness of 13 mils (0.0013"). Color as selected by Architect. Provide minimum SHGC of .25.

1.	Solarban 70 Solar Gray + Clear	3-1870 "Solar Moon"
2.	Solarban 60 Solar Gray + Clear	3-1371 "West Lake"
3.	Solarban 70 Solar Bronze + Clear	4-2100 "Beach Bronze"

(See corresponding SHGC and U-Value below when used with metal frame)

"CENTER OF GLASS"

	SHGC	U-VALUE
1.	0.20	0.28
2.	0.25	0.29
3.	0.21	0.28

3.0 - EXECUTION

3.1 Preparation

A. Immediately prior to glazing, all surfaces shall be wiped clean and free of protective coatings, moisture, and dust. All glazing shall be done when the temperature is 35° F or above.

B. All sash shall be checked prior to glazing to make certain that the opening is square, plumb, and secured in order that uniform face and edge clearances are maintained. Inspect all butt and miter joints. If these joints are open, they shall be sealed with sealant prior to glazing. All ventilators shall be properly adjusted. Maintain 1/8" minimum bed clearance between glass and sash on both sides.

C. All glass indicated in non-rated doors shall be tempered with etched label.

D. All glass indicated in rated doors shall be fire safety glass with etched label.

3.2 Setting

A. Glazing preparation and procedures shall be as outlined in the Glazing Manual of the Flat Glass Jobbers Association.

B. Glass shall be set without springing, and with an equal bearing the entire width and length of each piece.

C. The actual sizes required shall be determined by measuring the frames to receive the glass. All glass shall be factory labeled.

D. Glass shall be properly cut and set in accordance with the best practice of the trade.

E. Center glass in glazing rabbet to maintain recommended clearances at perimeter for expansion and contraction, each face of glass.

3.3 Protection

Immediately after installation, a marker letter shall be placed upon each pane of glass for protection against careless breakage. All broken, cracked, scratched, or otherwise damaged glass shall be replaced.

3.4 Cleaning

A. Upon completion of the project, all glass shall have paint, dirt, and other stains removed; glass shall then be washed clean and polished.

B. Labels on glass shall not be removed until final approval is obtained, and glass is ready for cleaning.

END OF SECTION

1.0 – GENERAL REQUIREMENTS

1.1 Summary

A. Section Includes: A fire resistance rated metal stud and gypsum board system for the enclosure of vertical and horizontal assemblies as indicated complete with all accessory materials for the system to meet the indicated rating.

B. Related Sections:
1. Section 07910 – Caulking and Sealants
2. Section 09250 - Gypsum Drywall and Light Gauge Framing System

1.2 References

A. Underwriters Laboratories (UL)

B. American Society for Testing and Materials (ASTM):
1. C 36, Specification for Gypsum Wallboard.
2. C 79, Test Method for Gypsum Sheathing Board.
3. C 442, Specification for Gypsum Backing Board and Coreboard.
4. C 630, Specification for Water-Resistant Gypsum Backing Board.
5. C 645, Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
6. C 754, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
7. C 840, Specification for Application and Finishing of Gypsum Board.
8. C 954, Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.33 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
9. C 1002, Specification for Steel Drill Screws for the Application of Gypsum Board orMetal Plaster Bases.
10. C 1047, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
11. C 1396, Specification for Gypsum Board.
12. D 3273, Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

1.3 Submittals

A. Product Data: Manufacturers' specifications and installation instructions for each product specified.

1.4 Delivery, Storage, And Handling

A. Packaging and Shipping: Have materials shipped in manufacturer's original packages showing manufacturer's name and product brand name.

B. Storage and Protection: Store materials inside and protected from damage by the elements. Protect ends, edges, and faces of gypsum boards from damage. Protect steel studs and accessories from bending.

1.5 Project Conditions

A. Environmental Requirements: Establish and maintain application and finishing environment in accordance with ASTM C 840.

2.0 - PRODUCTS

2.1 Manufacturers

For the purpose of estimating a standard of quality, manufacturers shall be approved equal to the following:

A. National Gypsum Company:
   1. Gypsum Board:
      a. Fire-Rated Shaftliner Board: Gold Bond Brand Fire-Shield Shaftliner.

   2. Joint Treatment:
      a. Tape: ProForm Brand Joint Tape.
      b. Compound: ProForm Brand All Purpose Joint Compound.

2.2 Materials

A. Metal Framing:
Provide metal framing based on project requirements and spans in accordance with manufacturer's recommendations for a self supported vertical or horizontal shaftwall system where indicated.

   1. 25 Ga. Studs: 2-1/2 in. and 4 in. I shaped studs, weighing 490 lbs. and 615 lbs. per 1000 lin. ft. with min. base steel of 0.020 in., galvanized, and complying with ASTM C 645.

   2. 20. Ga. Studs: 2-1/2 in., 4 in. and 6 in. I shaped studs, weighing 835 lbs., 1050 lbs. and 1353 lbs. per 1000 lin. ft. with min. base steel of 0.0329 in., galvanized, and complying with ASTM C 645.

   3. 25 Ga. Track: 2-1/2 in. and 4 in. J shaped track with 2-1/4 in. leg, weighing 390 lbs. and 490 lbs. per 1000 lin. ft., 25 ga., galvanized and complying with ASTM C 645.

B. Gypsum Board:
   1. Fire-Rated Shaftliner Board: A gypsum core shaftwall panel with additives to enhance fire resistance of the core and surfaced with water repellant paper on front, back, and long edges and complying with ASTM C 442 and C 1396, Type X (Gold Bond Brand Fire-Shield Shaftliner).
      a. Thickness: 1 in.
      b. Width: 2 ft.
      c. Length: 7 ft. through 14 ft.
      d. Edges: Beveled.

C. Joint Treatment:
   1. Tape: 2-1/16 in. wide paper reinforcing tape (ProForm Brand Joint Tape).
   2. Compound: Drying type pre-mixed compound (ProForm Brand All Purpose Joint Compound, regular grade and machine grade, ProForm Brand XP Joint Compound, Proform Brand Multi-Use Joint Compound, ProForm Brand Lite Joint Compound, ProForm Brand Ultra Joint Compound).

2.3 Accessories

A. Angle: Rolled steel angle, 2 in. by 2 in. by 20 ga.

B. Corner Bead: Formed galvanized steel angle, min. base steel 0.014 in. thick, and complying with ASTM C 1047.

C. Control Joint: Bent zinc sheet formed with V shaped slot, covered with plastic tape, with perforated flanges and Complying with ASTM C 1047.

D. Screws: ASTM C 954 or ASTM C 1002 or both with heads, threads, points, and finish as recommended by the manufacturer.

3.0 - EXECUTION

3.1 Installation

A. Install shaft wall system without gaps or voids as required for a consistent and thorough component of the associated fire rated separation envelope.

B. Horizontal shaft wall system shall be provided as a self supported system. Size all framing members according to manufacturer's printed span tables and recommendations for horizontal applications as indicated.

C. Installation shall be in accordance with the following ASTM Standards and manufacturer's recommendations:
   1. ASTM Standards:
      a. Metal Framing: C 754.
      b. Gypsum Board and Joint Treatment: C 840.

D. Seal all penetrations.

3.2 Protection

A. Protect gypsum board installations from damage and deterioration until the date of Substantial Completion.

END OF SECTION

GYPSUM DRYWALL & LIGHT GAUGE METAL STUD SYSTEM - SECTION 09260

1.0 - GENERAL

1.1 Scope
The work of this section consists of the furnishing and erection of all metal studs and gypsum wall board, finished ready for field decoration.

1.2 Submittals
A. Submit manufacturer data, samples and shop drawings.

1.3 Applicable Standards
Current editions or revisions of Federal and ASTM standards shall apply unless specifically noted otherwise.

1.4 Delivery and Storage
All materials shall be delivered to the job in original unopened containers or bundles and stored in a place protected from the elements and damage.

2.0 - PRODUCTS

2.1 Materials

A. Interior wall metal studs shall be cold rolled "Cee" design 25-gauge steel, prepared to receive self-drill, self-tapping screw fasteners. Metal studs web shall be punched to facilitate work of other crafts. At interior wall with plumbing, provide metal stud framing wide enough to fully conceal plumbing work.

B. Exterior wall metal studs shall be 3-5/8" 20-gauge metal studs and runners, welded system, unless noted otherwise. At all areas to receive masonry veneer, use 18-gauge metal studs and runners.

C. Track shall be of proper dimension to receive metal studs and provide a close friction fit.

D. Metal studs and track shall be hot-dipped galvanized.

E. Wall board shall be a mill fabricated gypsum board consisting of a core of processed gypsum rock encased in a heavy mineral finished paper on the face side and a strong liner paper on the back side. The face paper shall be folded around the long edges to reinforce and protect the core and the ends shall be square cut and smooth finish. Thickness shall be as indicated on the Drawings but not less than 5/8".

F. Fire resistant wall board shall be a board having a specifically formulated core which shall meet Underwriter's Laboratory tests for a one-hour fire resistant rating. Material shall be equal to USG Sheetrock® Brand Ultralight Panels Fire code® X as manufactured by U.S. Gypsum, Fire-Shield® LITE® as manufactured by National Gypsum, Fireguard® by Georgia-Pacific.

G. Moisture- and Mold-resistant, Fire-resistant Gypsum Core shall be 5/8" thick Fire code equal to SHEETROCK® brand MOLD TOUGH™ FIRECODE® .

Provide at all walls subject to moisture and/or at walls behind drinking fountains, sinks, lavatories, urinals, water closets, and all other plumbing fixtures where drywall is indicated.

H. For High Impact Areas as indicated provide USG Sheetrock® Brand Mold Tough® VHI Firecode® X Panels or pre-approved equal that meets testing requirements for High Impact. The main ASTM standard for abuse classification is **ASTM C1629** which specifies the levels of performance. Annex A1 describes test methods for testing products for Hard Body Impact Resistance.

> **ASTM C1629** makes reference to three other test methods for abuse resistance: **ASTM E695** for Soft Body Impact, **ASTM D4977** for Abrasion resistance, **ASTM D 5420** for Indentation Resistance.

I. Runner channels shall be hot-rolled or cold-rolled steel and shall be galvanized or given a coat of rust-inhibitive paint. Runner channels shall be one and one-half inches (1-1/2") with flange approximately one-half inch (1/2") deep, spaced not over forty-eight inches (48") on centers. Hot Rolled Channel shall weigh not less than 850 pounds per 1,000 lineal feet; cold rolled channel shall weigh not less than 475 pounds per 1,000 feet.

J. Fasteners shall be flat, countersunk head drywall screws, USG Type S or as approved, or annular nails for use with nailer bars or for wood.

K. Trim shall be hot dip galvanized steel, corner bead, casing, and expansion strips.

L. Joint tape shall be a heavy perforated cross fibered reinforced paper.

M. Joint cement shall be a bedding and finishing cement especially prepared for use with reinforcing joint tape.

N. Metal accessories shall be provided at all exterior corners, where a horizontal surface abuts a vertical surface or where an exposed edge of the wallboard abuts metal. Material shall be as manufactured by or as recommended by the manufacturer of the wall board used.

O. Control joints shall be provided at all corners, intersections, ceilings, etc., subject to movement. Install control joints in areas as recommended by manufacturer and/or as indicated on drawings.

2.2 Auxiliary Materials

A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

3.0 - EXECUTION

3.1 A. Floor and ceiling tracks aligned accurately according to partitions layout and anchored securely into structural floor and overhead structure at maximum of 16" o.c. All walls shall extend to underside of deck above.

B. Studs spaced not greater than 16" o.c. for gypsum board, anchored securely to floor and ceiling tracks. Set studs approximately 2" from abutting partitions or walls at corners, openings and ends of partitions. Anchor door bucks to adjacent studs.

C. Partitions shall be rigid, sound and plumb with all necessary metal trim, clips and accessories for a complete installation.

D. Gypsum board shall be applied in single layer or multiple layers as indicated on the Drawings by screw application to metal studs with joints taped and filled with manufacturer's recommended joint compound.

E. Application of gypsum board and joint finishing shall not begin under cold or damp conditions. The temperature shall be a minimum of 35^0 before work is begun and shall be maintained at this level or above until the joint cement is set dry and hard. Adequate ventilation shall be provided at all times.

F. Installation shall be in full accord with the recommendations of the manufacturer. Workmanship shall be by competent workmen experienced in the installation of wall board and all work shall be done in accordance with the best practices of the trade to give a smooth, straight, aligned surface which is ready for the finish.

G. Apply metal trim at exposed edges.

H. Neatly cut all openings so that they may be covered by plates and escutcheons.

I. Vertical Furring - All vertical furring in ceiling shall be of 5/8" fire rated gypsum board on metal framing. DO NOT furr with acoustical panels.

3.2 Drywall Finish

A. Temperature and Humidity Conditions
Do not install joint treatment compounds unless installation areas comply with the minimum temperature and ventilation requirements recommended by the manufacturer and conditions are acceptable to the installer.

B. Finish exposed drywall surfaces with joints, corners, and exposed edges reinforced or trimmed as specified, and with all joints, fastener heads, trim accessory flanges and surface defects filled with joint compound in accordance with manufacturer's recommendation for a smooth, flush surface. Drywall finishing work will not be considered acceptable if corners or edges do not form true, level or plumb lines, or if joints, fastener heads, flanges of trim accessories or defects are visible after application of field-applied decoration.
1. Refer to ASTM 6840 for guidelines for acceptable levels of finish.
   a. Finish Level shall be no less than Level 3 for all exposed Gypsum Board.

C. Joint and Corner Reinforcing
1. Use joint tape to reinforce joints formed by tapered edges or butt ends of drywall units and at interior corners and angles. Set tape in joint compound then apply skim coat over tape in one application.

2. Where open spaces of more than 1/16" width occur between abutting drywall units (except at control joints), prefill joints with joint compound and allow prefill to dry before application of joint tape.

3. Provide control joints as recommended by manufacturer.

D. Reinforce external corners of drywall work with specified type of corner bead.

Securely fasten metal corner beads as recommended by the manufacturer. Do not use fasteners which cannot be fully concealed by joint compound fill applied over flanges.

E. Edge Trimming
Provide specified type of metal casing bead trim. Install in single unjointed lengths unless run exceeds longest available stock length. Miter corners of semi-finished type trim. Coordinate installation of trim continuously with drywall installation.

F. Application of Joint Compounds
Use only compatible compounds from one manufacturer. After mixing, do not use joint compounds if recommended pot-life time has expired. Allow drying time between applications of joint compound in accordance with manufacturer's recommendations for the relative humidity and temperature levels at the time of application. In no case, allow less than 24 hours drying time between application to joint compound. Apply not less than 3 separate coats of joint compound over joints, fastener heads, and metal flanges. Joint compound treatment is not required at non-fire rated walls above suspended ceiling where partitions/walls are shown or specified to extend to structural deck or ceiling above suspended ceiling.

G. LEVELS OF FINISH. The following levels of finish are established as a guide for specific final decoration. The minimum requirements for each level shall be as described herein

1. Level 4:
All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Note: It is recommended that the prepared surface be coated with a drywall primer prior to the application of final finishes. See painting/wallcovering specification in this regard.

END OF SECTION

1.0 - GENERAL

1.1 Summary

A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.

B. Section Includes:
1. Porcelain Tile
2. Ceramic Tile
3. Quarry Tile
4. Glass Tile
5. Specialty Tile
6. Installation Products; adhesives, mortars, grouts and sealants
7. Waterproof membranes
8. Crack Isolation membranes
9. Thresholds, trim, cementitious backer units and other accessories specified herein.
10. Tile and grout care and maintenance recommendations.

1.2 References

A. American National Standards Institute (ANSI):
1. A108.1 - Installation of Ceramic Tile in a Mortar Bed
2. A108.5 - Installation of Ceramic tile with Dry-Set Portland Cement or Latex-Portland Cement
3. A108.10 - Installation of Grout in Tile work
4. A108.13 - Installation of Membranes for Thin-Set Ceramic Tile
5. A118.3 - Chemical Resistant, Water-Cleanable, Tile-Setting and-Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive
6. A118.4 - Latex-Portland Cement Mortar
7. A 118.5 - Chemical-Resistant Furan Mortar and Grout.
8. A118.6 - Ceramic Tile Grouts
9. A118.7 - Polymer Mortified Cement Grouts
10. A118.10 – Load-Bearing, Bonded Waterproofing Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations
11. A136.1 - Organic Adhesives for Installation of Ceramic Tile
12. A137.1 - Ceramic Tile

B. American Society for Testing and Materials (ASTM):
1. C 136 - Sieve Analysis of Fine and Coarse Aggregates
2. C 144 - Aggregate for Masonry Mortar
3. C 150 - Portland Cement
4. C 207 - Hydrated Lime for Masonry Purposes
5. C 373 - Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
6. C 503 - Marble Dimensional Stone (Exterior)
7. C 623 – Young's Modulus, Shear Modulus, and Poisson's Ratio for Glass and Glass-Ceramics by Resonance
8. C 627 – Robinson Floor Test for Tile Service Level
9. C 847-95 Metal Lath
10. C 933-96a Welded Wire Lath
11. C 1028 - Static Coefficient of Friction of Ceramic Tile and Other like Surfaces by the Horizontal Dynamometer Pull-Meter Method

12. D 87 - Melting Point of Petroleum Wax (Cooling Curve)
13. D 226 - Asphalt Saturated Organic Felt Used in Roofing and Waterproofing
14. D 4397 - Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
15. E-90 and E-413 for STC (Sound Transmission Class), E-492 and E-989 for IIC (Impact Insulation Class) – Sound Deadening Underlayments

C. TCA Handbook for Ceramic Tile Installation by Tile Council of America, latest edition

1.3 Submittals

A. Submit shop drawings, product data, and samples under provisions of Section 01350.

B. Shop Drawings:
1. Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
2. Locate and detail expansion and control joints.

C. Submit product data, specifications, and instructions for using mortars, adhesives and grouts.

D. Samples:
1. Submit color samples illustrating full color range of each type tile.
2. Grout: Submit manufacturer's full range of standard and designated color samples for each type for Architect's selection.

E. Submit following Informational Submittals:
1. Certifications specified in Quality Assurance article.
2. Qualification Data: Manufacturer's and installer's qualification data.
3. Manufacturer's instructions.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.4 Quality Assurance

A. Single Source Responsibility:
1. Obtain each type and color tile material required from single source.
2. Obtain setting and grouting materials from one manufacturer to ensure compatibility.
3. Furnish a 10 year guarantee from installation material manufacturer. The guarantee is inclusive of installation materials, finish product, and labor.
4. Obtain prefabricated edge protection and transition and movement profiles from one manufacturer to ensure compatibility.
5. Obtain membrane from same manufacturer as setting material or from manufacturer approved by setting material manufacturer to ensure compatibility.

B. Manufacturer Qualifications:
1. Tile: Minimum 5 years experience in manufacture of tile products.
2. Setting Materials: Minimum 10 years experience in manufacture of setting and grout materials specified.

C. Installer Qualifications: Specializing in tile work having minimum of 5 years successful documented experience with work comparable to that required for this Project.

D. Certifications:
1. Maintain one copy each of all Referenced standards and specifications on site. Include the TCA Handbook, ANSI A108 Series, ANSI A118 Series ANCI A136.1 and ANSI A137.1 and others as specified under paragraph References.
2. Submit manufacturer's certifications that mortars, adhesives, and grouts are suitable for intended use.

E. Conform to ANSI- Recommended Standard Specifications for Ceramic Tile - A137.1.

F. Conform to TCA Ceramic Tile: The Installation Handbook.

1.5 Delivery, Storage, and Handling

A. Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type, and grade.

B. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.

C. Broken, cracked, chipped, stained, or damaged tile will be rejected, whether built-in or not.

D. Protect mortar and grout materials against moisture, soiling, or staining.

1.6 Environmental Requirements

A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.

B. Do not begin installation until building is completely enclosed and HVAC system is operating and maintaining temperature and humidity conditions consistent with "after occupancy" conditions for a minimum of 2 weeks.

C. Maintain continuous and uniform building temperatures of not less than 50 degrees F during installation nor more than 100 degrees F.

D. Ventilate spaces receiving tile in accordance with material manufacturers' instructions.

1.7 Warranty

A. Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace tile that fails in materials or workmanship within the specified warranty period.
1. Warranty Period: 1 year after date of Substantial Completion.

1.8 Extra Materials

A. At completion of project, deliver to Owner extra stock of materials used on project as follows:
   1. Provide 10% of each size, color, and surface finish of tile.
   2. Six lineal feet of each color and type of base.

B. Store in location as directed by Owner.

C. Ensure materials are boxed and identified by manufacturer, type, and color.

1.9 Maintenance Data

A. Submit maintenance data under provisions of Section 01910.

B. Include cleaning methods, cleaning solutions recommended, stain removal methods, and polishes and waxes recommended.

2.0 - PRODUCTS

2.1 Manufacturers

A. Acceptable Manufacturer: Daltile Corporation or pre-approved equal.

B. Requests for substitutions will be considered in accordance with provisions of Section 01360 received 10 days prior to bid.

2.2 Products

A. Ceramic Wall Tile
   1. Manufacturer: Daltile
   2. Product: See Finish Schedule
   3. Color: See Finish Schedule
   4. Size: See Finish Schedule
   5. Edge:
   6. Finish:
   7. Pattern: As indicated on drawings.
   8. Trim Units: Matching bead, bullnose, cove and base shapes in sizes coordinated with field tile.

B. Porcelain Floor Tile
   1. Manufacturer: Daltile
   2. Product: See Finish Schedule
   3. Color: See Finish Schedule
   4. Size: See Finish Schedule
   5. Edge:
   6. Finish:
   7. Pattern: As indicated on drawings.
   8. Trim Units: Matching bead, bullnose, cove and base shapes in sized coordinated with field tile.

2.3 Setting Materials

A. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.

B. Epoxy Adhesive: ANSI A118.3, thinset bond type.

C. Mortar Bed Materials:
   1. Portland cement: ASTM C150, type 1, gray or white.
   2. Hydrated Lime: ASTM C207, Type S.
   3. Sand: ASTM C144, fine.
   4. Latex additive: As approved.
   5. Water: Clean and potable.

D. Mortar Bond Coat Materials:
   1. Dry-Set Portland Cement type: ANSI A118.1.
   2. Latex-Portland Cement type: ANSI A118.4.
   3. Epoxy: ANSI A118.3, 100 percent solids.

E. Epoxy Grout: ANSI A118.8, 100 percent solids epoxy grout; color to be selected.

F. Waterproofing Membrane at Floors: Membrane in accordance with ANSI A118.10.

G. Membrane at Walls: No. 15 (6.9 kg) asphalt saturated felt, ASTM D226, Type

H. Membrane at Walls: 4 mil (0.1 mm) thick polyethylene film, ASTM D4397.

I. Membrane at Walls: Reinforced asphalt paper.

J. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced with 2 inch (50 mm) wide coated glass fiber tape for joints and corners:
   1. Thickness: 1/2 inch (13 mm).

2.4 Miscellaneous Materials

A. Temporary Protective Coating: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout, is compatible with tile and mortar/grout products, and is easily removable after grouting is completed without damaging grout or tile.

   1. Petroleum paraffin wax, fully refined, tasteless, odorless, containing at least 0.5 percent oil with a melting point of 120-degree F to 140-degree F per ASTM D 87.
   2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

2.5 Finishing Edge Protection Profiles

A. Manufacturer - Schluter Systems or pre-approved equal. Comply with Section 01360 - Product Substitution and submit at least 10 days prior to Bid. All other approved products shall be notified in writing via addendum.

B. Products:
   1. Schluter: Deco Radius
   2. Corners provide matching outside corners as required.
   3. Material and Finish: Satin anodized aluminum.
   4. Height as required
   5. Location as noted on drawings

2.6 Mixing Mortar and Grout

Mix mortars and grouts in accordance with manufacturer's instructions.

3.0 - EXECUTION

3.1 Examination

A. Verify that all wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and float within tolerances specified in ANSI A137.1.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 Preparation

A. Clean substrates.

B. Wet down or wash dry, dusty surfaces and remove excess water immediately prior to application of tiles.

C. Prepare surfaces in strict accordance with instructions of manufacturer whose setting materials or additives are being used.

D. Acid Based Cleaners: Use not permitted.

E. Scarify concrete substrates with blast track equipment if necessary to completely remove curing compounds or other substances that would interfere with proper bond of setting materials. Clean and maintain substrate in condition required by setting material manufacturer.

F. Do not seal substrate unless required by manufacturer.

G. Prime substrate when required by manufacturer.

H. Membrane
1. Flash membrane up adjacent walls and restraining surfaces.
2. Use preformed cove, corners, and expansion joint flashing.
3. Allow membrane to cure as prior to setting tile.
4. Do not allow construction traffic on membrane.

I. Apply primer-sealer to wood and plywood subfloors when recommended by setting materials manufacturer.

J. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in

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.

K. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:
   1. Petroleum paraffin wax or grout release.

3.3 Installation

A. Cement Board Substrate
   1. Place rough side out and fasten with galvanized or resin coated gypsum board screws at 8 inches on center in field of panel and at 6 inches on center at edges.
   2. Provide 1/4 inch gap above floor or fixture lip for flexible calking.
   3. Maintain manufacturer's required space between board edges.
   4. Fill joints by applying tile setting material and joint reinforcement.

B. Vapor Retarder:
   1. Extend vapor retarder to extremities of areas indicated to be protected from vapor transmission.
   2. Secure in place with mechanical fasteners or adhesives.
   3. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose mineral-fiber insulation.
   4. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs.
   5. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners no greater than 16 inches apart.
   6. Seal joints in vapor retarders caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with vapor retarder tape.
   7. Repair tears and punctures in vapor retarder immediately before concealing it with the installation of cementitious backer units.

C. Membrane:
   1. Install membrane with products or methods approved in writing by membrane manufacturer when joining, sealing, fastening, or adhering sheet membranes.
   2. Flash membrane to cure prior to setting tile.
   3. Do not allow construction traffic on membrane.

D. Crack Isolation Membrane
   1. Install crack isolation membrane over cracks of up to 1/8 inch or greater in substrates. Apply a 12 inch wide strip centered on crack. Install in accordance with manufacturer's recommendations.
   2. Install membrane with products or methods approved in writing by membrane manufacturer when joining, sealing, fastening, or adhering sheet membranes.

E. Waterproofing
   1. Install waterproofing in strict compliance with manufacturer's instructions.

2. Flash waterproofing up adjacent walls in accordance to manufacturer's details, to a height of 4 inches.
3. Flood test waterproof membranes after fully cured.
4. Field Quality Control water test when required.

F. Tile Installation, General
1. Install tile materials in accordance with ANSI A137.1, other referenced ANSI and TCA specifications, and TCA "Handbook for Ceramic Tile Installation", except for more stringent requirements of manufacturer or these Specifications.
2. Cut and fit tile tight to protrusions and vertical interruptions and treat with a compatible sealant as specified in Section 07900
3. Form corners and bases neatly.
4. Work tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joint watertight, without voids, cracks, excess mortar, or grout.
5. Prepare surface, fit, set, bond, grout and clean in accordance with applicable requirements of ANSI standards and Tile Council of America.

G. Layout
1. Lay out work to pattern indicated so that full tile or joint is centered on each wall and no tile of less than half width need be used. Do not interrupt pattern through openings. Lay out tile to minimize cutting and to avoid tile less than half size.
2. For heights stated in feet and inches, use courses of full tile to produce nearest attainable heights without cutting tile.
3. No staggered joints will be permitted.
4. Align joints in tile in both directions.
5. Align joints between floor and base tile.
6. Make joints between sheets of tile exactly same width as joints within sheet.
7. File edges of cut tile smooth and even.
8. Cut and fit tile at penetrations through tile. Do not damage visible surfaces. Carefully grind edges of tile abutting built-in items. Fit tile at outlets, piping and other penetrations so that plates, collars, or covers overlap tile.
9. Extend tile work into recesses and under or behind equipment and fixtures, to form complete covering without interruptions, except as otherwise indicated. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
10. Accurately form intersections and returns.
11. Form internal angles coved and external angles bullnosed.

H. Thin Set Method, Floors and Walls
1. Apply mortar or adhesive with notched trowel using scraping motion to work material into good contact with surface to be covered. Maintain 90 percent coverage on back of tile and fully bed all corners.
2. Apply only as much mortar or adhesive as can be covered within allowable windows as recommended by mortar or adhesive manufacturer or while surface is still tacky.
3. When installing large tiles, ceramics or mosaics, trowel small quantity of mortar or adhesive onto back of each tile or sheet of tiles.
4. Set tiles in place and rub or beat with small beating block.
5. Beat or rap tile to ensure proper bond and also to level surface of tile.
6. Align tile to show uniform joints and allow to set until firm.

7. Clean excess mortar or adhesive from surface of tile with wet cheese cloth (not a sponge) while mortar is fresh.
8. Allow face mounted tile to set until firm before removing paper and before grouting.
9. Sound tile after setting. Replace hollow sounding tiles.

I. Thick Bed Method, Horizontal Surfaces
1. Apply slurry bond coat approximately 1/16 inch thick to substrate surface using flat trowel.
2. Place thick bed mortar, 1-1/4 inch thick nominally onto slurry bond coat while coat is still wet and tacky.
3. Spread prepared mortar approximately one-half desired bed thickness and then lay reinforcing mesh.
4. Lap wire 3 inches and place additional mortar on top of wire to bring bed to required thickness.
5. Rod and compact mortar with steel trowel.
6. Before placing tiles on green or wet screed bed, apply slurry bond coat approximately 1/16 inch thick to mortar using flat trowel.
7. Apply mortar skim coat to back of each tile or sheet of tile immediately prior to placing on bed.
8. Place tiles in wet slurry coat before surface dries maintaining uniform joints.
9. After each tile or sheet of tiles is laid, beat tile with wooden block or rubber mallet to level surface and embed tiles.
10. Perform beating before mortar takes initial set.
11. Pitch surface to drain where required.
12. On hardened screed or mortar bed, install tiles by thin bed method.
13. Sound tiles after setting. Replace hollow sounding tiles.
14. Clean excess mortar or adhesive from surface of tile with wet cheese cloth (not a sponge) while mortar is fresh.

J. Grouting
1. Allow tiles to set a minimum of 48 hours before grouting.
2. If bonding materials are rapid setting, follow manufacturer's recommendations.
3. Install in accordance with grout manufacturer's recommendations and ANSI A108.10.
4. Pack joints full and free before mortar takes initial set.
5. Clean excess grout from surface with wet cheesecloth as work progresses. Do not use hydrosponges.
6. Cure after grouting by covering with Kraft or construction paper for 72 hours. Install sealant in vertical wall joints at interior corners.

K. Marble Threshold
1. Provide thresholds at wall or framed openings to other building areas not receiving tile.
2. Set one piece threshold in adhesive without voids, full width of door opening.
3. Point threshold base flush with adjoining tile floors.
4. Cope ends to fit door frame profile.

L. Control Joints and Other Sealant Usage
1. Install control joints where tile abuts retaining surfaces such as perimeter walls, curbs, columns, wall corners and directly over cold joints and control joints in structural surfaces conforming to architectural details.

2. Install control joint in floors at spacings as indicated in TCA Installation Handbook, unless noted otherwise.
3. Rake or cut control joints through setting bed to supporting slab or structure. Keep joints free of mortar.
4. Install in accordance with TCA Installation Handbook.
5. Fill joints with self-leveling polyurethane sealant and backing material specified in Section 07910.
6. Fill joints around toilet fixtures with white silicone sanitary sealant. Refer to Section 07910.

M. Expansion Joints:
1. Keep expansion joints free of mortar and grout.
2. Use manufacturer's expansion joint flashing when covering expansion joints with waterproof or crack isolation membranes.
3. Provide expansion joints directly over changes in material, over control and expansion joints in substrate, at juncture of floors and walls, at other restraining surfaces such as curbs, columns, bases, and wall corners, and where recommended by TCA EJ171 Expansion Joint requirements.
4. Install sealant in expansion joints.
5. Provide sealant material at items penetrating tile work, unless otherwise indicated.
6. Provide sealants and related materials in accordance with cited ANSI and TCA requirements.

3.4 Adjusting

Sound tile after setting. Replace hollow sounding units.

3.5 Cleaning

A. Clean excess mortar from surface with water as work progresses. Perform cleaning while mortar is fresh and before it hardens on surfaces.

B. Sponge and wash tile diagonally across joints. Polish with clean dry cloth.

C. Remove grout haze following recommendation of mortar additive manufacturer. Do not use acids for cleaning.

D. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

3.6 Protection

A. Prohibit traffic from floor finish for 72 hours after installation.

B. Where temporary use of new floors is unavoidable, supply large flat boards or plywood panels for walkways over Kraft paper.

C. Protect work so that it will be without any evidence of damage or use at time of acceptance.

END OF SECTION

1.0 - GENERAL

1.1 Related Documents

Drawings and general conditions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this section.

1.2 Summary

A. Section Includes:

1. Acoustical ceiling panels.
2. Exposed grid suspension system.
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:

1. Section 09260 - Gypsum Board
2. Section 09910 - Painting
3. Division 15 Sections - Mechanical Work
4. Division 16 Sections - Electrical Work

C. Substitutions:

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.

2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.
See Section 01360 – Product Substitution for submittal process information and Product Substitution Form.

1.3 References

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
10. ASTM E 1264 Classification for Acoustical Ceiling Products.
11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.4 Submittals

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.5 Quality Assurance

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
   a. Flame Spread: 25 or less
   b. Smoke Developed: 50 or less

2. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which acoustical ceilings function as a fire protective membrane and tested per ASTM E 119.
   a. Protect lighting fixtures and air ducts to comply with requirements indicated for rated assembly.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.6 Delivery, Storage, and Handling

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 Project Conditions

A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to and after installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions within the space or with interfacing construction such as walls or soffits. Abnormal conditions include exposure to chemical fumes, vibrations, moisture, excessive humidity, or excessive dirt or dust buildup.

HumiGuard Plus Ceilings: Installation of the products shall be carried out where the temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry. The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.8 Warranty

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

   1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
   2. Grid System: Rusting and manufacturer's defects
   3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

B. Warranty Period Humiguard:

1. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 Maintenance

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

2.0 - PRODUCTS

2.1 Manufacturers

A. Ceiling Panels:
Armstrong World Industries, Inc. USG or pre-approved equal.

2.2 Acoustical Ceiling Units

A. Acoustical Panels Type L1 (without fire guard): Product:
Fine Fissured, 1728
1. Surface Texture: Medium
2. Composition: Mineral Fiber
3. Color: White
4. Size: 24in X 24in X 5/8in
5. Edge Profile: Square Lay-In for interface with Prelude XL 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.55.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35
8. Emissions Testing: < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1- 2007, "Ventilation for Acceptable Indoor Air Quality"
9. Flame Spread: ASTM E 1264;
10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.85.
11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

B. Acoustical Panels Type ML: Product: Clean Room VL, 868

1. Surface Texture: Smooth
2. Composition: Mineral Fiber
3. Color: White
4. Size: 24in X 24in X 5/8in
5. Edge Profile: Square Lay-In for interface with Prelude Plus XL Fire Guard 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, N/A.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 40
8. Emissions Testing: < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1- 2007, "Ventilation for Acceptable Indoor Air Quality"
9. Flame Spread: ASTM E 1264; Fire Resistive
10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.80.
11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

2.3 Suspension Systems **(WITHOUT FIRE GUARD CEILING TILES)**

A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized aluminum as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized aluminum in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).

1. Structural Classification: ASTM C 635 HD.
2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
3. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

2.4 Suspension System for Use with Clean Room VL, 868

A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized aluminum as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized aluminum in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).

1. Structural Classification: ASTM C 635 HD.
2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
3. Acceptable Product: Prelude Plus XL Fire Guard 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

2.5 Suspension System for Clouds

A. All main beams and cross tees shall be commercial quality hot-dipped galvanized steel as per ASTM A 653. Main beams and cross tees are double-web steel construction with type 15/16 inch exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

1. Structural Classification: ASTM C 635, Heavy Duty.
2. Main Beam, #7301
3. Cross Tee, 2 foot, XL8320
4. Color: To be selected from manufacturer's full RAL color chart.

B. Axiom Classic Edge Trim System for suspended ceiling cloud:

1. Axiom Classic: 4" height, extruded aluminum alloy 6063 trim channel
2. Axiom Classic: Color: To be selected from manufacturer's full RAL color chart.

C. Installation Hardware (included in Kit):
1. Axiom Splices and connection clips
2. StrongBack – Hot dipped galvanized cold rolled steel
3. Cable Hardware – 2-1/16 inch x 1 inch x 3/8 inch quick loop wire rope clamp for 1/16 inch diameter cable
4. Cable – 7x7 aircraft cable, 1/16 inch x 120 inch galvanized with loop at one end.

D. Acceptable Product: Formations Curves Suspension Kit, as manufactured by Armstrong World Industries and recommended for each cloud size.

3.0 - EXECUTION

3.1 Examination of Adjoining Work

Do not proceed with installation until all wet work or work that has become wet such as concrete, CMU, terrazzo, plastering and painting has been completed and thoroughly dried out.

3.2 Preparation

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 Installation

A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

B. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight. Main beams are to be supported with hanger wires within 8" of vertical surface terminations.

C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

D. Vertical Wall or soffit surfaces intended to be paint finished shall receive the first coat of primer or block fill prior to installation of wall moulding.

E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 Adjusting and Cleaning

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.

C. Ceiling Touch-Up Paint, (Item #5760, 8oz. bottles) (Item #5761, quart size cans), "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.

D. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

1.0 - GENERAL

1.1 Scope
The work under this section consists of all rubber floor, ramps, treads & risers.

1.2 Samples
Submit for the approval of the Architect samples of each color and type of material. Mark each sample with the manufacturer's name, type material, color, catalog number, name of contractor, and name of project.

1.3 Delivery and Storage

A. Deliver materials to site in manufacturer's original, unopened containers clearly marked with manufacturer's brand name and color. Care shall be taken to prevent damage.

B. Store materials at site for at least 24 hours before installation.

C. Maintain temperature of spaces where materials are stored and are to be installed at not less than 60° for at least 24 hours before installation. Thereafter, maintain a minimum temperature of 60°F.

2.0 - PRODUCTS

2.1 General

A. Materials shall be continuous from stringer to stringer, uniform in thickness and size with accurately cut edges without joints up to 9'0" in width. No seconds, off-goods, or remnants will be allowed.

B. Plain colors shall be uniform throughout. Selections having variegated colors shall present an overall uniform appearance.

C. Materials within each area shall be from one production run.

2.2 Materials

A. STAIR TREADS & RISERS

1. Rubber stair treads and risers 72" in width or less shall be "Stairtread Norament 936 Arago" manufactured by Nora by Interface. The treads shall be homogeneously constructed of single length without joints, first-quality resilient rubber compound and the color shall extend throughout the thickness of the tread. All treads shall be free from objectionable odors, blisters, cracks and other imperfections which will detract from the serviceability and appearance of the treads. Stair treads shall conform to U.S. Federal Specification RR-T-650C, Composition A, Types 1,2 and 4. They shall have square nosing and a length according to Architectural drawings. The color shall be selected by Architect.

2. Stairways with tread widths greater than 72" to receive Stairtread Norament 936 Arago manufactured by Nora by Interface single lengths without joints, available by special order up to 9'-0" lengths. The color shall be selected by Architect.

3. Stairway with tread widths greater than 9'-0" lengths shall be provided with

minimum joints as directed by the Architect.

B. RAMPS & LANDINGS

1. Rubber ramps and landings shall be "Norament 926 Arago" manufactured by Nora by Interface. Product shall be homogeneously constructed of first-quality resilient rubber compound and the color shall extend throughout the thickness of the tread. All shall be free from objectionable odors, blisters, cracks, and other imperfections which will detract from the serviceability and appearance of the treads. The rubber stair tread shall be flat, R-10 Slip Resistance, Profile Shall be 3/16" (4.5 mm). The color shall be selected by Architect.

C. Adhesives, including primer, shall be as manufactured, or recommended by the manufacturer of the materials used.

D. Cleaner and wax shall be the type and brand recommended by the manufacturer of the resilient flooring.

3.0 - EXECUTION

3.1 Inspection

Surfaces to receive tread and riser material shall meet the minimum requirements established by the manufacturer. Examine surfaces and correct defects before starting applications.

3.2 Precautions During Installations

A. Spaces in which resilient material is being set shall be closed to traffic and to other work until the material is firmly set.

B. Where solvent-based adhesive is used, safety spark proof fans shall be provided and operated when natural ventilation is inadequate. Smoking shall be prohibited.

3.3 Installation

A. Install materials only after all finishing operations have been completed. Moisture content of building, air temperature and relative humidity must be within limits recommended by material manufacturer.

B. Mix and apply adhesive in accordance with the manufacturer's instructions. Cover the area evenly and only to the extent which can be covered with material in the recommended working time of the adhesive.

C. Tread and riser shall be applied in such a manner that the entire under-surface shall be securely bonded in place. Units shall be laid continuous from stringer to stringer and tightly so that each piece is in contact with the adjoining pieces and all joints (if allowed) are in true alignment.

END OF SECTION

1.0 - GENERAL

1.1 Related Documents

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

B. The Construction Waste Management plan prepared by the Construction Manager for coordination of waste material recycling is hereby incorporated by the reference as requirement of this section. Work under this section shall conform to the provisions outlined in the Plan and shall conform with the local recycling Standards to provide a coordinated effort to maximize reuse of waste materials.

1.2 Submittals

A. Submit for the approval of the Architect samples of each color and type of material. Mark each sample with the manufacturer's name, type material, pattern, color, catalog number, thickness, name of contractor, and name of project.

1.3 Delivery and Storage

A. Deliver materials to site in manufacturer's original, unopened containers clearly marked with manufacturer's brand name, color, and pattern numbers, and production run color code. Care shall be taken to prevent damage and freezing during delivery, handling, and storage.

B. Store materials at site for at least 24 hours before installation.

C. Maintain temperature of spaces where materials are stored and are to be installed at not less than 60° for at least 24 hours before installation. Thereafter, maintain a minimum temperature of 60°F.

2.0 - PRODUCTS

2.1 General

A. Materials shall be uniform in thickness and size with accurately cut edges. No seconds, off-goods, or remnants will be allowed.

B. Colors shall be uniform throughout.

C. Materials within each area shall be from one production run as indicated by cartons bearing the same manufacturer's color code.

D. Interior finish materials shall comply with flame spread limitations and smoke production limitations as follows. Tests shall be performed by an independent testing laboratory.

Walls and Ceilings	Flame Spread	25 or less ASTM E-84.
	Smoke Production	350 or less ASTM E-84.
Floors	Flame Spread	75 or less ASTM E-84.
	Smoke Production	350 or less ASTM E-84.

2.2 Manufacturers

A. Rubber Base Manufacturers
   1. Tarkett (Basis of Design)
   2. Roppe

3. Flexco
4. Mannington

B. Transition Material Manufacturers:
1. Tarkett
2. Roppe
3. Flexco
4. Mannington

C. Requests for substitution shall be considered in accordance with provision of Section 01360 and received by Architect at least 10 days prior to bid.

2.3 Wall Base Materials

A. Rubber Base shall be 4" high x running length. Rubber base shall be Johnsonite, Roppe or approved equal. Base type and color as specified on Finish Legend.

B. Provide 1/8" ga., 4 " high Tarkett/Johnsonite Baseworks Thermoset Rubber wall base standard profile conforming to ASTM F1861.
1. Color to be selected by Architect from manufacturer's full range of colors.
2. Refer to manufacturer's written installation instructions for complete installation details.

C. Refer to Section 09560 for Flexco Base Specialty.

D. Adhesives, including primer, shall be as manufactured or recommended by the manufacturer of the materials used.

E. Outside corners are to be mitered. V-cut back of base strip to two thirds of its thickness and fold. Use Tool # 532 cove base groover gunlach or equal. Inside corners are to be mitered.

4' lengths or less and pre-mitered corners are not acceptable

F. Provide caulk to fill in at bullnose corners.

2.4 Floor Transition Materials

A. Provide transition strips tapered to meet abutting materials on drawings.

2.5 Adhesives:

A. Wall Base Adhesives shall be as manufactured or recommended by the manufacturer of the materials used. Provide epoxy at "wet areas".
1. Wall Base Adhesives
a. Tarkett/Johnsonite 960 Wall Base Adhesive for porous surfaces
b. Tarkett/Johnsonite 946 Premium Contact Adhesive for non-porous surfaces
c. Tarkett/Johnsonite 965 Flooring and Tread Adhesive
d. Tarkett/Johnsonite 996 Two-Part Epoxy Adhesive
e. Tarkett/Johnsonite 975 Two-Part Urethane Adhesive
2. Caulk: Color Rite Inc.

B. Floor Transitions: Adhesives shall be as manufactured or recommended by the manufacturer of the materials used.

3.0 - EXECUTION

3.1 Inspection

Surfaces to receive rubber base shall meet the minimum requirements established by the rubber base manufacturer. Examine surfaces and correct defects before starting applications.

3.2 Precautions During Installations

A. Spaces in which rubber base material is being set shall be closed to traffic and to other work until the base is firmly set.

B. Where solvent-based adhesive is used, safety sparkproof fans shall be provided and operated when natural ventilation is inadequate. Smoking shall be prohibited.

3.3 Installation

A. Install rubber base materials only after all finishing operations have been completed. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by rubber base manufacturer.

B. Mix and apply adhesive in accordance with the manufacturer's instructions. Cover the area evenly and only to the extent which can be covered with rubber base material in the recommended working time of the adhesive.

C. Base shall be applied in such a manner that the entire under- surface shall be securely bonded in place. Base shall be laid tightly so that each piece is in contact with the adjoining pieces and all joints are in true alignment.

D. Apply resilient base to permanent walls, cabinets, and fixtures in rooms or areas as specified. Install base in as long lengths as practicable. Press down so that bottom cove edge follows floor. Scribe accurately to abutting materials.

3.4 Adjustments

Inspect and make necessary adjustments after heat is applied continuously in finished areas. Any portion of the rubber base which has not seated in a level plane with surrounding base and all damaged, imperfect, or improperly installed base shall be warmed, carefully removed, and new base of the same color and thickness substituted.

3.5 Cleaning and Waxing

Remove stains from base and clean as required and recommended by manufacturer.

3.6 Surplus Materials

Unused runs and one full carton of materials shall be left at the job and turned over to the Owners.

END OF SECTION

1.0 - GENERAL

1.1 Summary

A. Section Includes: Luxury Vinyl tile floor coverings.

B. Cement Based Finishing Underlayment

C. Related Sections:
   1. Division 5 Section: Miscellaneous Metals

1.2 References

A. ASTM International:
   1. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
   2. ASTM E662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
   3. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   4. ASTM F970 Standard Test Method for Static Load Limit.
   5. ASTM F1700 Standard Specification for Solid Vinyl Floor Tile.

B. National Fire Protection Association (NFPA):
   1. NFPA 253 Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Energy Source.
   2. NFPA 258 Research Test Method for Determining Smoke Generation of Solid Materials.

1.3 System Description

A. Performance Requirements:
   1. Fire Performance:
      a. Critical Radiant Flux (NFPA 253 or ASTM E648): Class 1 (0.45 watts per square centimeter or greater).
      b. Smoke Density (NFPA 258 or ASTM E662): 450 or less.

1.4 Submittals

A. General: Submit listed submittals in accordance with Conditions of the Contract and Section 01360 - Submittals

B. Product Data: Submit product data for specified products.

C. Samples: Submit selection and verification samples of finishes, colors and textures.

1.5 Quality Assurance

A. Installer Qualifications: Firm with minimum five years successful experience completing resilient tile installation similar to that required.

B. Provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.

C. Materials within each area shall be from one production run as indicated by cartons bearing the same manufacturer's color code.

D. Materials shall be uniform in thickness and size with accurately cut edges. No seconds, off-goods, or remnants will be allowed.

E. Provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:

1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

F. Pre-Installation Conference: Conduct meeting at site prior to commencing work related to resilient tile installation.

1. Require attendance of parties directly affecting resilient tile installation.
2. Review site conditions, procedures, and coordination required with related work.

1.6 Delivery, Storage & Handling

A. General: Comply with Division 1 Product Requirements Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

2.0 - PRODUCTS

2.1 Cement Based Finish Underlayment

A. Ardex Feather Finish as approved by Ardex Engineered Cements
1. Self-Drying
2. Waterbased

2.2 Vinyl Tile Floor Covering

A. Manufacturer: Interface

B. Other manufacturers seeking approval must submit product information and comply with Section 01360 - Product Substitution. Information must be received by Architect at least 10 days prior to bid date.

2.3 Materials

A. Level Set Collection LVT: Natural Woodgrains
1. Product No. A002
2. Product Construction: High performance luxury vinyl tile
3. Classification: ASTM F1700, Class III, printed vinyl plank.
4. Wear Layer Thickness: 22 mil
5. Total thickness: 4.5mm

6. Backing Class: Commercial Grade.
7. Finish: Ceramor Coating.
8. Installation Recommendation: Floating Floor with tactiles glue free installation system.
9. Nominal dimensions: 25cm x 1m (9.845in x 39.38in)
10. Installation Methods: Ashlar or Herringbone

2.4 Waterjet Floor Graphic

A. Provide waterjet cut floor design. Size and location located on Architectural drawings. Graphic to be provided by Architect. Waterjet company to provide a dimensioned color rendering for approval prior to production.

B. Cutting of LVT

1. All cutting is to be done with waterjet technology.
2. Orifice size not to exceed 0.005"
3. Waterjet cutting company is to be supplied an electronic file of the design. CAD file is preferred
4. Includes cutting and assembly of the designs, and the field that surrounds.

C. Preparation for Shipping of LVT Tiles

1. Entire project to be checked for accuracy prior to boxing which Includes verifying that each assembled piece fits correctly. Depending on the size of the design ours are laid out and photographed prior to packaging.
2. Tiles to be packaged in the same boxes that they were received in.
3. Each box to always have labels indicating contents of box.
4. First box to be opened will be clearly marked. This would depend on the design and how the installer wishes to proceed; we usually try to determine this prior to cutting.
5. Boxes to be palletized, shrink wrapped and banded to the pallet
6. Waterjet cutting company will be available in case of emergency.
7. Installer to be notified in writing of the importance of having a smooth flat surface.
8. Shipment to be insured by shipper. Shipping and insurance to be provided at customer's expense

D. Installation

1. Installer to dry lay all waterjet designs prior to final installation.
2. Installer to notify waterjet company of any concerns prior to final installation.

3.0 - EXECUTION

3.1 Manufacturer's Instructions

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 Finishing Underlayment

A. Clean and prepare the full extent of the existing concrete floor scheduled to receive flooring under this section.

B. Provide new Ardex feather finish underlayment as recommended by the manufacturer to achieve a uniform, level substrate surface throughout the entire area to receive flooring products specified under this section.

3.3 Examination

A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under this section, are acceptable for product installation in accordance with manufacturer's instructions.

3.4 Preparation

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.5 Protection

A. Protect installed products until completion of project.

B. Repair or replace damaged products prior to Substantial Completion.

END OF SECTION

1.0 – GENERAL

1.1 Related Documents

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

1.2 Summary

A. This section includes the following:

1. Resinous flooring system as shown on the drawings and in schedules.

B. Related sections include the following:

1. Cast-in-Place Concrete, Section 03300

1.3 System Description

A. The work shall consist of preparation of the substrate, the furnishing and application of a seamless flooring system with decorative flake broadcast and chemical resistant topcoat.

B. The system shall have the color and texture as specified by the Owner with a nominal thickness of 60 Mils. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

C. 4 inch Cove base to be applied where noted on plans and per manufacturers standard details unless otherwise noted

1.4 Submittals

A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.

B. Samples: A 6 x 6 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.5 Quality Assurance

A. The Manufacturer shall have a minimum of 10 years' experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.

B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in writing in all phases of surface preparation and application of the product specified. Qualifications of applicator must be submitted to Architect by the General Contractor for approval within 24 hours after acceptance of bid. Architect reserves the right to reject applicator if they do not meet the specified qualifications and/or cannot provide documentation from manufacturer.

C. No requests for substitutions shall be considered that would change the generic type of the specified System.

D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.

E. A pre-installation conference shall be held between Applicator, General Contractor, manufacturer and the Owner for review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.6 Product Delivery, Storage, And Handling

A. Packing and Shipping
All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

B. Storage and Protection

1. The Applicator shall be provided with a dry storage area for all components. The area shall be between 60 F and 85 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Architect or other personnel.

C. Waste Disposal

1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 Project Conditions

A. Site Requirements

1. Application may proceed while air, material and substrate temperatures are between 60 F and 85 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
3. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of new concrete to be coated with specified flooring material.

1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured for 28 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests. Outside of these parameters manufacturer shall be consulted.
2. Concrete shall have a light steel trowel finish (a hard steel trowel finish is neither necessary or desirable).
3. Sealers and curing agents should not be used.

4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

C. Safety Requirements

1. Other trades shall be removed during the application of the product and 72 hours after completion

2.0 – PRODUCTS

2.1 Manufacturers

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. Basis-of-Design Product: Subject to compliance with requirements, provide BPI Spartacote Chip Pure Seamless Floor System. Not all manufacturers produce all categories and types of resinous flooring systems.
   a. Also pre-approved are:
   Sherwin Williams – Aqua Armor Decorative Mosaic Flooring
   Stonhard – Stontec ERF

2. Other Products must be approved prior to Bid and must be submitted in compliance with Section 01360 - Product Substitution.

2.2 Flooring

A. Spartacote Chip Pure Seamless Floor System (60 mil floor system),
   1. System Materials:
      a. Primer: Primer/Scratch Coat 160 sq. ft/gal
      b. Base resin: Pigmented Body Coat 65 sq. ft/gal
      c. Broadcast Aggregate: Broadcast Chips
      (size and quantity determined by selection of architect)
      d. Grout Coat: MVT Tolerant UV Stable Glaze 160 sq. ft/gal
      e. Top Coat: Surface Build Top Coat UV- Finish to be selected by Architect
      f. Color: See Finish Legend

   2. Cove base (4 inch high with 2 inch diameter radius, smooth texture)
      a. Cove resin; Cove Gel, Spartacote Broadcast quartz mixed with resin and troweled in place
      b. Overlay Spartacote Chip Pure Floor System to match floor
      c. Cove termination strip: clear plastic with 1/8" lip

2.3 Product Requirements

Material: Spartacote Resin	2-component epoxy
Density	12.70 lbs./gallon
VOC Content, Mixed	
Volume Solids	59%
Flash Point: Part A Part B	>212°F 170 °F

Mixing Ratio	1:4 by Vol.
Pot Life, Approximate	60 minutes @ 75°F
Open to Foot Traffic	After 16 hrs. at 73°F
Curing Temperature	Minimum 50°F
Full Cure & Max. Resistance	7 days
Hardness, Shore D ASTM-D-2240	70-75
Compressive Strength ASTM-C- 579	6500 psi
Flexural Strength ASTM-C-580	2100 psi
Adhesion To: -New concrete (5 days) -Moist concrete (28 days) -Dry concrete (28 days)	110 psi 550 psi 580 psi

3.0 – EXECUTION

3.1 Examination

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

B. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 Preparation

A. General

1. Existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products
2. Mechanical surface preparation
   a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 3-5 as described by the International Concrete Repair Institute.
   b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
   c. Wherever a free edge will occur, including doorways, wall perimeters, expansion joints, columns, doorways, drains and equipment pads, a ¼ inch deep by 3/16 inch wide keyways shall be cut in.
   d. Cracks and joints (non-moving) greater than 1/4 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.

3. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 Application

A. General
1. The system shall be applied in six distinct steps as listed below:
   a. Substrate preparation
   b. Cove application
   c. Primer Application
   d. Topping/overlay application with flake aggregate broadcast.
   e. Grout coat application
   f. Topcoat application to thickness to reach even texture matching accepted sample
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Cove
1. Cove will be placed with the broadcast flake to match selected color and size at 4 inches in height unless otherwise noted on drawing with a 1 inch radius
2. The cove will be smooth with no texture above mid-radius

C. Topping
1. The topping shall be applied as a self-leveling system as specified. The primer must be applied and will not be a lift coat. The topping shall be applied in one to two lifts with a minimum thickness of 60 mils.
2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means.
4. The topping shall be applied over horizontal surfaces using a pin rake, trowels or other systems approved by the Manufacturer.
5. Flake shall be broadcast into the wet material to excess.
6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

D. Grout coat and Topcoat
1. The grout coat shall be mixed and applied per manufacturer recommended procedure.
2. The grout coat shall be comprised of two components, a resin, hardener.
3. The grout coat will be applied at the rate of 160 sf per gallon.
4. The top coat shall be mixed and applied per manufacturer recommended procedure.
5. The top coat shall be comprised of two components, a resin, hardener.
6. The top coat will be applied at a rate to achieve selected texture.
7. The finish floor will have a uniform texture free of dry or smooth areas that do not match the selected texture. The finished thickness shall be 60 mils.

3.4 Field Quality Control

A. Tests, Inspection

The following tests shall be conducted by the Applicator:

1. Temperature
   Air, substrate temperatures, relative humidity, and, if applicable, dew point.
2. Perform moisture tests on concrete as follows:
   a. Perform calcium chloride moisture tests in accordance with ASTM D1869 a minimum of twice for the first 1000 sq. ft and once for each additional 1000 sq. ft of area to be coated. Provide a written report of these test results including a letter of acceptance from the manufacturer.
   b. Perform PH tests alongside each calcium chloride moisture tests. Provide a written report of these test results including a letter of acceptance from the manufacturer.

B. Coverage Rates
Rates for all layers shall be monitored by checking quantity of material used against the area covered.

C. Provide daily reports including detailed days activities, materials used with batch numbers and environmental conditions

3.5 Cleaning And Protection

A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION

1.0 - GENERAL

1.1 Scope

The work under this Section consists of all carpet, labor, metal strip, and all accessories required to properly install carpet in quality, workmanlike manner.

1.2 Submittals

A. The carpet contractor shall submit to the Architect samples of all materials with complete color specifications specified herein.

B. Carpet subcontractor shall submit to Architect a seam layout for approval before being approved as a subcontractor.

1.3 Manufacturer

Carpet manufacturer shall have been manufacturer of this type carpet continuously for period of five (5) years.

1.4 Test Requirements

Meets FHA requirements as prescribed in "Use of Materials Bulletin" No. 44b, dated April 23, 1969, for HEAVY TRAFFIC.

Certified to pass Flame Spread Rating in accordance with provisions of State Fire Marshall's regulations.

1.5 Guarantees and Warranties

A. Carpet manufacturer and installer must submit certification guaranteeing carpet and installation against defects for a period of two (2) years from date of final acceptance of the Contract, or from occupancy of the building, whichever is earlier.

B. Carpet manufacturer shall guarantee carpet against wear for a period of Fifteen (15) Years minimum from date of final acceptance of the Contract, or from occupancy of the building, whichever is earlier.

C. Carpet manufacturer shall guarantee static generation of no more than 3.5 KV as tested under AATCC-134.

D. Manufacturer must submit certification guaranteeing carpet against edge ravel for a period of Fifteen (15) Years from date of final acceptance of the Contract, or from occupancy of the building, whichever is earlier.

1.6 Maintenance Instruction

The carpet manufacturer shall furnish three (3) copies of a complete Maintenance Manual for Owner's use.

1.7 Manufacturers

CPT – 1 Miliken Remix Remastered Baseline Trimline, Color: See Finish Legend

2.0 - PRODUCTS

2.1 Materials

A. All carpet shall be first quality of American manufacture and all yarn shall be of Domestic origin.

– CPT -

Style Name	Remix Remastered
Style Number	BKB203
Product Type	Modular Tile (39.4 X 39.4)
Construction	Tufted Textured Loop
Fiber Type	Milliken Certified Wear-On, Nylon Type 6,6
Dye Method	DDI (Digital Dye Infusion)
Gauge	1/10
Stitches Per Inch	10.3
Finished Pile Thickness	0.14
Density	7,793
Protective Treatments	Stain Smart
Primary Backing	PVC-Free Wellbac Comfort Plus Cushion
Pattern Repeat	None
Recommended Installation	Monolithic

Performance Specifications

Methenamine Pill Test (DOC FF-1-70)	Pass
Flooring Radiant Panel (ASTM E-648)	Class I
Smoke Density (ASTM E-662)	Less than 450
Static Control (AATCC-134)	Less than 3.5 kV
CRI Green Label Plus	GLP 9968

Warranty Information

Lifetime Antimicrobial Protection
Lifetime Face Fiber Wear
Lifetime Antistatic
Lifetime Floor Compatibility
Lifetime Color Pattern Permanency
Lifetime Floor Release
Lifetime Cushion Resiliency
Lifetime Moisture Resistance
Lifetime Delamination of Backing
Lifetime Staining/Soiling (Stain Smart)
Lifetime Dimensionable Stability
Lifetime Turf Bind
Lifetime Edge Ravel
Lifetime Flammability

3.0 - EXECUTION

3.1 Inspection

A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually

inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.2 Preparation

A. Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects as recommended by the flooring manufacturer.

B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.

C. Perform subfloor moisture testing in accordance with ASTM F 2170, "Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. [Relative humidity shall not exceed 80%.][MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs.] On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.

D. Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.

E. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.3 Installation

A. All materials to be installed by craftsmen with at least 5 years commercial experience and must show evidence of having satisfactorily installed jobs of this size. Installer must be a CFI (Certified Floorcovering Installer) or FCIB (Floor Covering Installation Board) Certified Installer.

B. Direct Glue-Down Method - Direct lamination to the sub-floor with NO PAD. Use primer and cement as recommended by carpet manufacturer.

C. All seams shall receive a coating of latex edge sealer as approved by the manufacturer. All seams must be kept to a minimum and shall be invisible.

D. After installation clean up all dirt, scraps, debris and vacuum. Remove any spots.

E. Installation of carpet shall be delayed until final stages of project construction to insure that goods are not soiled and stained during project completion. Rooms shall be locked immediately after installation of carpet and traffic is not to be

allowed in these areas.

F. Installation of all carpet tile is to be as noted on Finish Legend.

G. Carpet Tile Glue Down Method – shall be done as a "Continuous Spread" method. **"Grid-Set" method is unacceptable**.

H. Dye lots – If more than one dye lot is used, verify customer satisfaction with all lots prior to installing carpet. Make sure to inspect all carpet prior to installation. Carpet from a single dye lot is preferred.

3.4 Damages
Carpet contractor shall be responsible for any damages to structure thru fault of installers.

3.5 Surplus Materials
Carpet remnants shall be packaged and delivered to the Owner.

3.6 Attic Stock
Provide 5% of each style and color of specified products. Store at location as determined by Owner.

END OF SECTION

Reducer/Cleaner --- Aromatic 100, R2K5, or R7K65
Brush – Use natural bristle brushes
Roller – Use a ¼" – 3/8" nap woven or other solvent-resistant cover
Freshly stained or painted surfaces will require cure time before any application of this H&C® High Performance Industrial Clear. Follow manufacturer's instructions and recommendations.

F. Stenciled Wall Identification
Provide one coat red color stencil identification on walls above ceilings of corridor, Smokestop, Horizontal Exit, enclosures and Firewalls. Wording shall be:

1. Wording for fire walls shall indicate the rating and:
   Fire Barrier - Protect All Openings
   Both sides of wall are to be stenciled above the ceiling with one stencil sign to be placed above ceilings on all separate areas and maximum of 20'-0 o.c.
2. Wording for smoke barriers:
   Smoke Barrier - Protect All Openings
   Both sides of wall are to be stenciled above the ceiling with one stencil sign to be placed above ceilings on all separate areas and maximum of 20'-0 o.c.

G. Exterior Ground Mount and Roof Top Mechanical Units, Equipment and Accessories. Painting contractor shall examine the site and all drawings and provide one (1) heavy coat of paint for each unit. Provide also one (1) coat primer for galvanized and/or rust areas.

3.3 Material Application

A. All materials shall be applied in complete accordance with manufacturer's printed instructions.
B. All coats shall be thoroughly dry before the succeeding coat is applied.

END OF SECTION