SECTION 03 2000 – CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Reinforcement for cast-in-place concrete.
2. Mechanical splices.

B. Extent of cast-in-place concrete Work is shown on the Drawings. Provide all materials, labor, hardware, equipment, transportation, and services required to fabricate and place all reinforcement for cast-in-place concrete.

C. Cooperation with Work of other Sections:

1. Review Contract Drawings and Specifications for requirements of other sections which affect the installation of reinforcement.
2. Examine the Drawings and Specifications for all Contracts to determine nature of proposed construction. Perform work in a manner which will not interfere or delay work of other Contractors. Cooperate with other trades regarding installation of embedded items. Templates and instructions will be provided for setting items placed in forms.
3. Inform those performing Work of other Sections, in writing or by schedules, of requirements for services, materials, and built-in terms prepared or supplied by other Sections which affect Work of this Section.

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

1. Division 01 Section “Submittal Procedures” for submittal requirements.
2. Division 01 Section "Quality Requirements" for testing requirements.
3. Division 03 Section "Cast-in-Place Concrete."

1.3 SUBMITTALS

A. Shop Drawings - Submit shop drawings and product data to include all information necessary for fabrication and placement of reinforcement as follows:

1. Detail and placement Drawings shall be prepared in accordance with CRSI Standards to define and establish the location, size, spacing, length, and shape of reinforcing and all other pertinent information required. Indicate grades of reinforcing steel. Detail wall reinforcing on wall elevations. Clearly indicate the

splice length for every size and type of bar used. Include all other project requirements affecting reinforcing details and placing, such as openings, curbs, and depressions.

2. Drawings indicating the type, size, and location of all accessories required for the proper assembly, placement, and support of the reinforcement.
3. Clearly indicate additional reinforcement added at joints.

B. Mill Test Reports:

1. Submit certified copies of mill test reports for reinforcing steel, including statement of compliance with specified ASTM Standards.

C. Samples:

1. Submit duplicate samples of accessories for reinforcement prior to actual use in the product.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the latest editions of the following:

1. ASTM International (ASTM) A 36: Standard Specification for Carbon Structural Steel.
2. ASTM A 82: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
3. ASTM A 496: Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
4. ASTM A 497: Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
5. ASTM A 576: Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
6. ASTM A 615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
7. ASTM A 820: Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
8. ASTM A 1064: Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
9. ASTM C 1116: Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
10. ASTM C 1399: Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete.
11. American Concrete Institute (ACI) 117: Specifications for Tolerances for Concrete Construction and Materials and Commentary.
12. ACI 301: Specifications for Structural Concrete.
13. ACI 315: Standard Practice for Detailing Reinforced Concrete Structures.
14. ACI 318: Building Code Requirements for Structural Concrete and Commentary.
15. American Welding Society (AWS) D 1.4: Structural Welding Code – Reinforcing Steel.

16. Concrete Reinforcing Steel Institute (CRSI): Manual of Standard Practice.
17. CRSI: Placing Reinforcement Bars.

B. In case of conflict between specified codes and standards, the most stringent requirements shall govern. In case of conflict between specified codes and standards and project specifications, project specifications shall govern.

C. Preconstruction Conference: The Reinforcing-Placing subcontractor shall attend the Preconstruction Conference conducted by the Concrete Contractor as described in Division 03 Section “Cast-in-Place Concrete.”

1.5 DELIVERY, STORAGE AND HANDLING

A. Bundle reinforcement and tag with suitable identification to facilitate sorting and placing.

B. Sequence the shipments of material to the site to minimize field handling and storage.

C. Store the reinforcing steel on premises in a neat and orderly manner under cover and off ground. Protect the reinforcement from damage, dirt, and corrosion. Provide proper drainage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recycled Content of Steel Reinforcement Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is 60 percent.

B. Regional Materials: Provide products that have been produced within 500 miles of Project Site.

C. Bar Reinforcement - Newly-rolled billet steel conforming to the following:
1. All Reinforcing Bars: ASTM A 615-Grade 60 unless otherwise noted on the Drawings.

D. Welded Wire Reinforcement: ASTM A 1064 with a yield strength of 65,000 PSI. Deliver in sheets, not rolls.

E. Reinforcement Accessories:

1. Provide all spacers, chairs, ties, slab bolsters, clips, chair bars, and other devices for properly assembling, placing, spacing, supporting, and fastening the reinforcement.
2. Use annealed tie wire of not less than #18 gauge. Use epoxy-coated tie wire with epoxy coated reinforcing bars.
3. Use individual and continuous slab bolsters and chairs of a type to suit the various conditions encountered. The chairs and bolsters must be capable of supporting a 300-lb concentrated load without measurable permanent

deformation of the reinforcement or supports or indentation of the supporting surface.

4. Use accessories which conform to CRSI Bar Support Specifications, Class 1 or Class 2, in contact with surfaces exposed to view in the finished work.
5. Support reinforcement for slabs on ground on plastic or steel supports designed for the purpose or precast concrete bricks of a type acceptable to the Architect/Engineer. Use sand plates or other means to support chairs at proper elevation on base material. Wood blocks, stones, brick chips, etc., are not acceptable.

PART 3 - EXECUTION

3.1 DETAILING OF REINFORCING STEEL

A. Detail reinforcing bars in accordance with the requirements of ACI 315.

B. Avoid splicing reinforcement at points of maximum stress.

C. Detail reinforcing to allow clearance for intersecting reinforcing bar layers with minimum specified cover.

3.2 FABRICATION OF REINFORCEMENT

A. Do not commence fabrication until the shop drawings, details, and schedules have been reviewed by the Architect/Engineer.

B. Accurately fabricate reinforcement to dimensions on the reviewed shop drawings, details, and schedules.

C. Cold bend all reinforcement. Do not heat reinforcing for any purpose.

D. Do not fabricate bars in a manner injurious to the bars. Bars with kinks or bends not shown on the Drawings and bars reduced in section will be rejected.

3.3 INSTALLATION OF REINFORCEMENT

A. Install reinforcing only from Shop Drawings which have been reviewed by the Architect/Engineer.

B. Accurately place and rigidly secure reinforcing in position in accordance with the requirements of Chapter 8, Recommended Industry Practice for Placing Reinforcing Bars, of CRSI Manual of Standard Practice, requirements specified herein, and on the Drawings.

C. Tie reinforcing with specified tie wire and bend all wire back beyond general plane of reinforcing.

D. Provide continuous welded wire reinforcement where shown in slabs with joints lapped at least one full mesh or two full mesh at construction joints, but not less than 6 inches. Tie securely and support reinforcement at the proper elevation by accessories.

Stagger laps of sheets to avoid a continuous lap in either direction. Provide supports to maintain the reinforcement in its proper position during placement of the concrete.

E. Bending, tack welding, cutting or substituting reinforcement in the field, other than that shown on the Drawings is prohibited unless specific approval for each case is given by the Architect/Engineer.

F. Remove excessive rust, scale, or other foreign substances from the reinforcement which might destroy or reduce bond prior to placing concrete.

G. Avoid exposure of reinforcement to the weather for any considerable length of time before placing of concrete. Where this is unavoidable, paint reinforcement with a heavy coat of cement grout. Protect the exposed concrete and any other materials against staining from exposed reinforcement.

H. Before the concrete is cast, check all reinforcement after it is placed to insure that reinforcement conforms to Contract Drawings, shop detail drawings, and Specification requirements. Use only qualified experienced personnel to check. Notify the Architect/Engineer at least 36 hours (excluding weekends and holidays) prior to the concrete placement to give the opportunity to observe the completed reinforcement and formwork before concrete placement.

I. Remove and replace damaged bars.

J. Splice the reinforcing only as shown on the Drawings or as approved by the Architect/Engineer. All lap splices shall be contact lap splices.

K. Do not tack welded wire reinforcement around structural steel members to be encased in concrete. Use tie wires and lap to securely hold in position.

L. Mechanical, Electrical, and Plumbing Requirements:

1. Refer to mechanical, electrical, and plumbing drawings for formed concrete requiring reinforcement steel.

3.4 FIELD QUALITY CONTROL

A. Owner’s Testing Agency: Refer to Division 03 Section “Cast-in-Place Concrete” for reinforcement inspection and test requirements.

END OF SECTION 03 2000

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Cast-in-place concrete, including the following:

a. Foundations.
b. Slabs on ground.

2. Testing and inspections for cast-in-place concrete.
3. Curing compound.
4. Sealer.
5. Hardeners.
6. Vapor retarder.

B. Extent of cast-in-place concrete Work is shown on the drawings. Provide all materials, labor, services, equipment, transportation, and hardware required for all cast-in-place concrete. Include additional concrete required to compensate for deflection of support framing by other trades.

C. Cooperation with Work of other Sections:

1. Review Contract Drawings and Specifications for requirements of other Sections which affect the placement of cast-in-place concrete.
2. Perform work in a manner which will not interfere or delay work of other Contractors. Cooperate with other trades regarding installation of embedded items. Templates and instructions will be provided for setting items placed in forms.
3. Inform those performing Work of other Sections, in writing or by schedules, of requirements for services, materials, or other items prepared by or supplied by other Sections which affect Work of this Section.

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

1. Division 01 Section “Submittal Procedures” for submittal requirements.
2. Division 01 Section "Quality Requirements" for testing requirements.
3. Division 03 sections for related concrete formwork and reinforcing.

4. Division 03 Section “Cast-In-Place Architectural Concrete” for architecturally exposed concrete.
5. Division 07 sections for related insulation and waterproofing systems.
6. Division 09 sections for restrictions on concrete finishing and curing to assure compatibility with finish materials.
7. All Divisions for sleeves, anchors, inserts, etc., that will be furnished by others and installed under this Section.
8. Division 31 sections for concrete work related to sitework.

E. Responsibility of the Contractor: The design, strength, safety and adequacy of all methods of construction, and the strength, slump, consistency, finish and general quality of concrete are the responsibility of the Contractor. No action by the Architect/Engineer will eliminate, lessen or restrict this responsibility in any manner.

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 the requirements.

1.4 SUBMITTALS

A. Manufacturer's Data: For standard factory-manufactured materials, including specifications for application and installation of proprietary items and materials such as bonding agents, admixtures, curing and sealing compounds, patching compounds, hardeners, epoxies, and dryshake finish materials.

B. Evidence that concrete supplier is certified by the National Ready Mixed Concrete Association.

C. Concrete design mixes and backup data on the attached form: Refer to Part 2 Article “Concrete Mix Design” in this Section for requirements. Include test reports on the following:

1. Gradation analysis and soundness tests for coarse and fine aggregate. Identify sources of aggregate.
2. Mill test reports on cement, including brand, type and source of supply.
3. Compression tests on trial cylinders.
4. Slump and air content of trial batches.
5. Admixture certification, including chloride ion content.

D. Complete test reports on splitting tensile strength (F_{CT}) of lightweight concrete.

E. Samples to Testing Agency: Concrete constituents including admixtures.

F. Shop drawings showing locations of all sleeves, depressions, and curbs.

G. Materials and methods for curing concrete.

H. Methods proposed for hot weather and cold weather curing and protection of concrete; submit prior to commencement of any concrete work.

I. Method of developing bond at joints.

1. Qualification Data: For concrete installer and surveyor.

J. Field quality-control reports.

1. Owner's Testing Agency Reports: Submit directly to the Architect/Engineer, with copies to the Contractor and others as indicated. Document all of the certifications, tests, and inspections specified.
2. Field quality-control reports shall clearly indicate all pertinent data, including but not limited to the following: date; time; weather conditions; name and qualifications of inspector; certifications, tests, and/or inspections performed; equipment used; location of structural member or assembly within the building; whether or not the test results indicate compliance with the Contract Documents; etc.

K. Survey report for anchor rods and reinforcing steel dowels.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the latest editions of the following:

1. ASTM International (ASTM) C 33: Standard Specification for Concrete Aggregates.
2. ASTM C 39: Test Method for Compressive Strength of Cylindrical Concrete Specimens.
3. ASTM C 94: Specification for Ready Mixed Concrete.
4. ASTM C 150: Specification for Portland Cement.
5. ASTM C 157: Test Method for Length Changes of Hardened Hydraulic – Cement Mortar and Concrete.
6. ASTM C 171: Standard Specification for Sheet Materials for Curing Concrete.
7. ASTM C 192: Practice for Making and Curing Concrete Test Specimens in the Laboratory.
8. ASTM C 227: Standard Test Method for Potential Alkali Reactivity of Cement Aggregate Combinations (Mortar Bar Method)
9. ASTM C 295: Standard Guide for Petrographic Examination of Aggregates for Concrete.
10. ASTM C 260: Specification for Air-Entraining Admixtures for Concrete.
11. ASTM C 330: Standard Specification for Lightweight Aggregates for Structural Concrete.
12. ASTM C 494: Standard Specification for Chemical Admixtures for Concrete.
13. ASTM C 595: Standard Specification for Blended Hydraulic Cements.
14. ASTM C 618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete."
15. ASTM C 881: Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

16. ASTM C 989: Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
17. ASTM C 1059: Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
18. ASTM C 1116: Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
19. ASTM C 1218: Test Method for Water-Soluble Chloride in Mortar and Concrete.
20. ASTM C 1240: Standard Specification for Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar, and Grout.
21. ASTM C 1315: Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
22. ASTM C 1602: Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
23. ASTM D 1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
24. ASTM D 1752: Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
25. ASTM D 2240: Test Method for Rubber Property – Durometer Hardness.
26. ASTM D 4397: Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
27. ASTM D 6817: Standard Specification for Rigid, Cellular Polystyrene Geofoam.
28. ASTM E 154: Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Wall, or as Ground Cover.
29. ASTM E 1155: Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System.
30. ASTM E 1643: Standard Practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs.
31. ASTM E 1745: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
32. American Concrete Institute (ACI) 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
33. ACI 211.2: Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
34. ACI 214R: Guide to Evaluation of Strength Test Results of Concrete.
35. ACI 301: Specifications for Structural Concrete.
36. ACI 302.1R: Guide for Concrete Floor and Slab Construction.
37. ACI 304R: Guide for Measuring, Mixing, Transporting, and Placing Concrete.
38. ACI 305.1: Specification for Hot Weather Concreting.
39. ACI 305R: Guide to Hot Weather Concreting.
40. ACI 306.1: Standard Specification for Cold Weather Concreting.
41. ACI 306R: Guide for Cold Weather Concreting.
42. ACI 309R: Guide for Consolidation of Concrete.
43. ACI 318: Building Code Requirements for Structural Concrete.
44. American Welding Standard (AWS) D1.4: Structural Welding Code – Reinforcing Steel.
45. National Ready Mixed Concrete Association (NRMCA): Concrete Plant Standards and Truck Mixer and Agitator Standards.
46. Concrete Reinforcing Steel Institute (CRSI): Manual of Standard Practice.
47. CRSI: Placing Reinforcement Bars.

B. In case of conflict between specified codes and standards, the most stringent requirements shall govern. In case of conflict between specified codes and standards and project Specifications, project Specifications shall govern. In case of conflicts between Contract Documents, immediately notify Architect/Engineer for resolution.

C. Preinstallation Conference:

1. At least 30 days prior to submitting the concrete mix designs for approval, conduct a meeting to review the detailed requirements for preparing the concrete mix designs and to determine the procedures for producing proper concrete construction within the specified tolerances and required quality.
2. Responsible representatives from all concerned parties are required to attend the conference including, but not limited to, the following:

    a. Owner’s representative.
    b. Construction Manager’s superintendent.
    c. Contractor's superintendent.
    d. Architect/Engineer.
    e. Laboratory responsible for concrete mix designs.
    f. Owner's Testing Agency.
    g. Concrete subcontractor.
    h. Formwork subcontractor.
    i. Reinforcement-placement subcontractor.
    j. Ready-mix concrete supplier.
    k. Admixture manufacturer(s).
    l. Concrete pumping equipment operator.

3. Review requirements for submittals, status of coordinating work, and availability of materials.
4. Establish proposed work progress schedule and testing procedures.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with ACI 301 and with ACI 304.

1.7 QUALIFICATIONS

A. Installer Qualifications: The concrete Installer shall have a minimum of five years of experience with installation of concrete similar in material, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful-service performance.

B. Supplier Qualifications: The concrete Supplier shall have a minimum of five years of experience in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment. The supplier must be certified according to the National Ready Mixed Concrete Association’s Certification of Ready Mixed Concrete Production Facilities.

C. Inspection and Testing of the Work: Materials and installed work may require testing and retesting, as directed by the Architect/Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically

indicated to be done at the Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense. See "Field Quality Control" section of the Specifications.

1. Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents.

D. Acceptance Criteria for Concrete Strength: The strength level of an individual class of concrete shall be considered satisfactory if the following requirements are met:

1. The average of all sets of three consecutive strength tests equals or exceeds the required compressive strength (f'c).
2. No individual strength test falls below the required compressive strength (f'c) by more than 10 percent of the concrete compressive strength or 500 psi, whichever is greater.
3. A strength test shall be defined as the average strength of two cylinder breaks tested at the strength age indicated on the drawings for that class of concrete.

E. Responsibility for Selection and Use of Concrete Admixtures and Chemical Treatments: The Contractor is responsible for selecting admixtures and surface treatments that are compatible with the intended use of the concrete including all final surface treatments called for within the Contract Documents. The Contractor is responsible for following the manufacturer's instructions for the use of their products including abiding by any limitations placed by the manufacturer on the use of any of its products.

PART 2 - PRODUCTS

2.1 GENERAL

A. Use materials from the same source from the start to the finish of the project, unless a change is accepted in writing by the Architect/Engineer.

2.2 CONCRETE MIX MATERIALS

A. Portland Cement: American-made Portland Cement, ASTM C 150 Type I or III. For concrete exposed to salt air or salt water, provide Type II or Type V cement.

1. Do not exceed an alkali content of 0.6% unless the manufacturer certifies that no alkali reactivity is produced with the proposed combination of materials when tested in accordance with ASTM C 227.

B. Fine aggregate (normal weight): Washed, inert, non-reactive natural sand conforming to ASTM C 33. Fineness modulus of 2.3 to 3.1. For pumped concrete, 15 to 30 percent passing Number 50 sieve and 5 to 10 percent passing a Number 100 sieve. Comply with the following:

Sieve size	Percent passing
3/8 inch	100
No. 4	95-100

No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	5-30
No. 100	0-10

C. Coarse aggregate (normal weight): Washed, non-reactive, well-graded, crushed stone or gravel conforming to ASTM C 33. Refer to Part 2 paragraph “Concrete Mix Designs" for additional requirements.

D. Lightweight fine and coarse aggregates: Rotary kiln expanded clay, slate, or shale conforming to ASTM C 330. Use lightweight fines only as necessary to attain specified unit weight concrete. Subject to compliance with requirements, the following are acceptable:

1. Norlite.
2. Solite.
3. Haydite.

E. Water: ASTM C 1602; potable, clean and free from deleterious substances.

F. Air Entraining Agent: Comply with ASTM C 260. Agent shall be fully compatible with all other concrete mix materials. Subject to compliance with project requirements, the following are acceptable:

1. Darex AEA or Daravair by W.R. Grace Co.
2. Euclid AEA 92 by The Euclid Chemical Co.
3. Sika AER by Sika Corp.
4. MB AE90 or Microair by BASF Construction Chemicals, LLC.

G. Water reducing and plasticizing admixtures: Comply with ASTM C 494, Type A. Subject to compliance with project requirements, the following are acceptable:

1. Eucon WR-75 by The Euclid Chemical Co.
2. WRDA with Hycol by W.R. Grace Co.
3. Pozzolith 322N or 200N by BASF Construction Chemicals, LLC.
4. Plastocrete 161 by Sika Corp.

H. Mid-range water reducing admixture: Comply with ASTM C 494, Type A or F. Subject to compliance with project requirements, the following are acceptable:

1. Eucon MR by The Euclid Chemical Co.
2. Daracem 55 by W.R. Grace Co.
3. Polyheed 997 or 1025 by BASF Construction Chemicals, LLC.

I. High-range water reducing (HRWR) admixture (superplasticizer): Comply with ASTM C 494, Type F or G. Subject to compliance with project requirements, the following are acceptable:

1. Daracem 100 by W.R. Grace Co.
2. Eucon 37 by The Euclid Chemical Co.

3. Rheobuild 1000 by BASF Construction Chemicals, LLC.
4. Sikament 300 by Sika Corp.

J. Accelerating Agent: Non-corrosive, containing no chloride; conform to ASTM C 494, Type C or E. Subject to compliance with project requirements, the following are acceptable:

1. Accelguard 80 by The Euclid Chemical Co.
2. Polarset by W.R. Grace Co.
3. Pozzutec 20+ or Pozzolith NC534 by BASF Construction Chemicals, LLC
4. Plastocrete 161FL by Sika Corp.

K. Retarding admixtures: For use in hot weather concreting. Comply with ASTM C 494, Type D water-reducing and retarding. Subject to compliance with project requirements, the following are acceptable:

1. Plastiment by Sika Chemical Corp.
2. Pozzolith 100XR by BASF Construction Chemicals, LLC
3. Eucon Retarder-75 by The Euclid Chemical Co.

L. Fly Ash: ASTM C 618, Type C or F. Maximum 3 percent loss on ignition with no soda ash content allowed. Use only with prior review and acceptance of Architect/Engineer. Fly ash shall not exceed 20% of the total cementitious materials by weight nor 150 pounds per cubic yard. Do not use fly ash in conjunction with ground granulated blast furnace slag.

M. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120. Use only with prior review and acceptance of Architect/Engineer. Ground granulate blast-furnace slag shall not exceed 30% of the total cementitious materials by weight. Do not use ground granulated blast furnace slag in conjunction with fly ash.

N. Calcium Nitrite corrosion inhibitor: Comply with ASTM C 494 Type C. Dosage rate 2 to 6 gallons per cubic yard. Subject to compliance with project requirements, the following are acceptable:

1. DCI by W.R. Grace & Co
2. Eucon CIA by The Euclid Chemical Co.
3. Rheocrete CNI by BASF Construction Chemicals, LLC.

O. Calcium Chloride and Chloride Ion Content:

1. Calcium chloride or admixtures containing more than 0.5% chloride ions by weight of the admixture are not permitted.
2. The maximum water soluble chloride ion concentration in hardened concrete at ages from 28 to 42 days contributed from all ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the limits specified below. Water-soluble chloride ion tests shall conform to ASTM C 1218.

Construction type	Chloride limit, % by mass
Prestressed concrete	0.06
Reinforced concrete, wet in service	0.08

Reinforced Concrete, dry in service 0.15

3. The Concrete Supplier shall certify that the chloride ion content in all concrete mix designs used on the project will not exceed limits stated above.

2.3 VAPOR RETARDERS

A. Plastic Vapor Retarder: Comply with ASTM E 1745, Class A. Subject to compliance with project requirements, the following are acceptable:

1. Moistop Ultra 15 by Fortifiber Building Systems Group.
2. VaporBlock VB15 by Raven Industries Inc.
3. Griffolyn 15 Mil by Griffolyn, A Division of Reef Industries, Inc.
4. Stego Wrap 15-Mil by Stego Industries, LLC.

2.4 CURING MATERIALS

A. Concrete Curing Materials: Use where moist curing is indicated on Contract Documents. Use where bonded toppings, overlays, applied surface treatments or other applied finishes are incompatible with liquid membrane forming curing compounds.

1. Waterproof Paper: ASTM C 171.
2. Polyethylene Film: ASTM C 171.
3. Burlap: Federal Spec CC-C-467A.

B. Concrete Curing and Sealing Compound (Water Based): Liquid-membrane-forming type conforming to ASTM C 1315. Clear non-yellowing acrylic; minimum solid content of 30%; moisture vapor transmission rate less than 0.40 kg/sq.m for 72 hours when applied at coverage of 300 sq. ft. per gallon. Manufacturer's certification required. Sodium silicate compounds and rubber-based products are prohibited. Verify that material used is compatible with any finish material subsequently applied to the concrete surface. Subject to compliance with project requirements, the following are acceptable:

1. Dress & Seal WB30 by L & M Construction Chemicals.
2. Super Diamond Clear VOX by The Euclid Chemical Company.
3. Cure & Seal 1315 EF by Dayton Superior.

2.5 MISCELLANEOUS RELATED MATERIALS

A. Epoxy Joint Filler: Moisture insensitive, flexible epoxy resin material. Minimum Shore A hardness of 80 where measured in accordance with ASTM D 2240. Use in control and construction joints for areas indicated on Contract Documents. Acceptable products are:

1. Euco 700 by The Euclid Chemical Co.
2. Sikadur 51 SL by Sika Corporation.
3. MM80 by Metzer-McGuire.
4. Epoflex SL by L&M Construction Chemicals, Inc.

B. Non-Reemulsifiable Latex: Not less than 48 percent solids. Subject to compliance with project requirements, the following are acceptable:

1. SBR Latex by The Euclid Chemical Co.
2. Sikalatex by Sika Corp.
3. Everbond by L & M Construction Chemicals.

C. Epoxy Resin Bonding Agent: ASTM C 881 two-component 100 percent solids mineral filled epoxy-polysulfide polymer. Subject to compliance with project requirements, the following are acceptable:

1. Sikadur 32 Hi-Mod by Sika Corporation.
2. Euco Epoxy No. 452MV by The Euclid Chemical Company.
3. Epobond by L&M Construction Chemicals, Inc.
4. Concresive 1090 by BASF Construction Chemicals, LLC.

D. Non-shrink patching mixture: Specially-formulated, high-bond package mixture. Subject to compliance with project requirements, the following are acceptable:

1. Euco-Speed by The Euclid Chemical Co.
2. Durapatch by L & M Construction Chemicals.
3. Sika Set Roadway Patch 2000 by Sika Corp.

E. Polymer Patching Mortar: Free-flowing, polymer-modified cementitious mortar. Subject to compliance with project requirements, the following are acceptable:

1. Sikatop 121 Plus or 122 Plus (horizontal repairs); Sikatop 123 Plus (vertical and overhead repairs) by Sika Corporation.
2. Thin-Top Supreme or Concrete-Top Supreme (horizontal repairs); Verticoat or Verticoat Supreme (vertical and overhead repairs) by The Euclid Chemical Company.

2.6 CONCRETE MIX DESIGN

A. Engage a Technical Agency familiar with local construction conditions and materials to design concrete mixes.

B. Prior to the formulation of design mixes, review with the Technical Agency the concrete mix requirements relative to strength, slump, air content, seasonal adjustments required due to temperatures and anticipated job use, and placement conditions.

C. Provide separate design mixes for each anticipated and/or actual changes in type of mix materials including changes in admixtures, in proportion of basic materials, in slump limits and in placement methods, especially pumping. Identify the proposed use for each mix.

D. Prepare the mix designs with sufficient lead time to allow testing and adjustment of the mix. Establish the concrete mix design proportions to provide the required average strength using the procedures defined in Chapter 5 of ACI 318. Whenever possible, use appropriate field test data (30 consecutive tests) to establish a standard deviation for the mixes. When an acceptable record of field test results is not available, establish

the concrete proportions based on 3 point curves from laboratory trial batch mixtures. When a standard deviation cannot be properly established for the mix design, proportion concrete to provide an average strength of f'c plus 1200 psi. For concrete strengths above 5,000 psi, proportion concrete to provide an average strength of 1.1*f'c plus 700 psi.

E. Submit the complete proposed design mix on the attached form along with the appropriate test data and technical data to the Architect/Engineer for review at least 15 days prior to use. For each mix design, identify the cement type; proportions of each constituent; water-cement ratio; and brand, type, and proportion of each admixture. Include the measured slump, air content, unit weight, and compressive strength test results for each mix design.

F. Concrete mix design submittals that are incomplete, that are not on the attached submittal form, or do not satisfy the requirements of the Specifications will be rejected. Additional testing and/or revisions to the mix design may be required to achieve compliance. Do not place any concrete until design mix submittal(s) have been reviewed and accepted by the Architect/Engineer. Keep a copy of the reviewed mix designs on file in the field office.

G. For slabs on ground, formulate the concrete mix design to minimize the amount of cement and water necessary to produce the required slump and workability. Utilize properly graded aggregates to minimize water and cement demand.

H. In addition to the concrete mix design requirements listed above, limit the water/cement ratio to the following maximums in accordance with the following:

1. 0.40 for reinforced concrete exposed to deicing salts, brackish water, or salt spray.
2. 0.45 for concrete required to be watertight and/or subject to cycles of freezing and thawing (including basement walls).
3. 0.50 for all concrete not otherwise specified.
4. For interior slabs on ground, limit the cement content to a maximum of 540 pounds per cubic yard.

I. Provide air entrainment for all lightweight concrete, and for all exterior concrete or concrete otherwise exposed to cycles of freezing and thawing. Comply with air content percentages listed below for amount of air entrainment in concrete at point of deposit. Adjust admixture dosages as necessary to account for climatic conditions, method of placement and other constituents of mix. Do not use air entraining admixtures for interior normal weight concrete flatwork requiring a smooth troweled finish.

Nominal max. aggregate size	Air content percentage
3/8 inch	7.5 +/- 1.5
1/2 inch	7 +/- 1.5
3/4 inch	6 +/- 1.5
1 inch	6 +/- 1.5
1-1/2 inch	5.5 +/- 1.5
2 inch	5 +/- 1.5
3 inch	4.5 +/- 1.5

J. Provide a water reducing (plasticizer) or high-range water-reducing (superplasticizer) admixture for all structural concrete.

K. All concrete containing a high-range water reducing admixture (superplasticizer) shall have a maximum slump of 9 inches unless otherwise approved by the Architect/Engineer. Proportion design mixes of all other concrete to result in concrete with the following slumps measured at the point of placement:

1. Slabs on ground: 4 inches +/- 1 inch.
2. Footings, massive sections: 3 inches +/- 1 inch.
3. Reinforced slabs and beams: 3 inches +/- 1 inch.
4. Reinforced walls and columns: 4 inches +/- 1 inch.
5. Lightweight concrete slabs: 3 inches +/- 1 inch.
6. All other concrete: 3 inches +/- 1 inch.

L. Use the following maximum coarse aggregate sizes, per ASTM C 33:

1. Size 67 for all concrete not otherwise specified.
2. Size 57 for beams, slabs and walls.
3. Size 7 for tight pours and thin sections.
4. Size 467 for standard slabs on ground and foundations.
5. Industrial Slabs on Ground: Blend fine and coarse aggregates to achieve a smooth gradation of aggregate sizes. A minimum of 8 percent and a maximum of 18 percent of the total aggregate weight is to be retained on each sieve below 1-1/2 inch and above the No. 100 sieve size.

M. Maintain an air-dry unit weight for lightweight concrete between 100 pcf and 115 pcf. Adjust the proportion of lightweight coarse aggregate and/or substitute lightweight fines for sand as necessary to obtain the proper unit weight. Determine the air-dry unit weight of the concrete in accordance with ASTM C 567. Limit drying shrinkage at 28 days to 0.03 percent.

N. Specifically identify those concrete mixes which are intended to be placed by pumping. Indicate the modifications made to the basic mix to aid in pumping, including changes in slump, air content, fly ash content, cement paste vs. aggregate content, and admixtures such as superplasticizers. Pre-soak all lightweight aggregates in pumped concrete per the lightweight aggregate manufacturer's recommendations. Carefully control the gradation of the coarse and fine aggregates, keeping the grading as close to the middle of the ASTM C 33 or C 330 range as possible. Review pumping techniques with the Architect/Engineer prior to placement.

1. Make one test of each concrete design mix to verify that the total chloride ion(Cl-) content is less than 0.10% of the weight of the cement, that the total sulfate (as SO_3) content of the mix is less than 0.05% of the weight of the mix, per ASTM C 114, and that the thiocyanate ion (as SCN-) content is less than 0.15% of the weight of the cement.

O. Adjust mix designs that do not prove to be satisfactory in use, subject to the Architect/Engineer's review. Concrete that does not consistently exhibit the specified control characteristics will be considered unsatisfactory. Any additional costs incurred due to changes required in the mix design shall be borne by the Contractor.

P. Provide additional mix designs and appropriate test data for any revisions to the approved concrete mix designs requested by the Contractor during the course of work. Do not use the revised mix until reviewed and accepted by the Architect/Engineer.

2.7 MIXING AND DELIVERY OF CONCRETE

A. Supply all concrete from a ready-mix plant acceptable to the Architect/Engineer. Batch all constituents, including admixtures, at the central batch plant, except for HRWRs which may be added at the job site.

B. Comply with ACI 304 recommendations. Accurately weigh all materials. Mix, dispense, and use admixtures in accordance with the specific manufacturer's written instructions.

C. Conform with Truck Mixer and Agitator Standard of the Truck Mixer Manufacturer's Bureau of the National Ready-Mixed Concrete Association, as well as ASTM C 94. Do not load trucks in excess of NRMCA ratings for normal-weight aggregate concrete.

D. For lightweight aggregate concrete, do not load trucks to more than 75 percent of their capacity. (This requirement is intended to reduce possibility of segregation of constituents.)

E. Water may be added initially to concrete which arrives at the site with a slump below the specified slump if, after the addition of water, neither the maximum permissible water/cement ratio nor the maximum slump is exceeded. Provide thorough additional mixing. The Owner's Testing Agency will observe the adding of water and mixing. Retempering after initial slump adjustment is not permitted. Redosage with the specified super-plasticizer may be done with the prior approval of the Architect/Engineer.

F. Discharge of Materials: Discharge concrete without segregation of the ingredients. Incorporate all concrete in the work in its final shape and location within 90 minutes after the introduction of water to the mix or within a shorter time period as the Testing Agency may direct during hot weather. Immediately remove all concrete materials from the construction site not incorporated into the Work within the specified time limits.

G. Cold Weather Requirements: Comply with ACI 306 whenever ambient air temperatures are below 40 F. Heat the mixing water and, if necessary, the aggregates to produce concrete at the temperature listed below when placed. If the mixing water is heated, do not exceed a temperature of 140 F at the time it is added to the cement and aggregates.

Least dimension of section	Minimum temperature of concrete
Less than 12 inches	55 Deg. F.
12 inches to less than 36 inches	50 Deg. F.
36 to 72 inches	45 Deg. F.
Greater than 72 inches	40 Deg. F.

H. Hot Weather Requirements: Comply with ACI 305 whenever conditions of high air temperature, low relative humidity and/or wind exist. Provide crushed ice in lieu of

equal weight of mixing water if necessary to provide concrete of the proper temperature. Ice must be completely dissolved before placing concrete.

PART 3 - EXECUTION

3.1 INSTALLATION OF EMBEDDED ITEMS AND COORDINATION WITH OTHER TRADES

A. Install all embedded items to conform to the requirements of ACI 318, Chapter 6, Paragraph 6.3, "Conduits and Pipes Embedded in Concrete," and as specified below. Do not install any accessories until their type and location have been verified by the affected trades.

B. Coordinate the installation of all inserts required by other trades prior to the placing of reinforcing steel.

C. Install anchor rods, etc., furnished by other Sections. Accurately locate anchor rods and secure with templates to prevent displacement during concreting operations.

D. Provide steel sleeves for pipes passing through concrete.

E. Non-aluminum electrical conduit is the only piping which may be embedded in structural concrete. Place conduit by the following guidelines:

1. Do not cut or displace any reinforcement.
2. Do not place conduit between concrete surfaces and reinforcement.
3. Solid slabs - restrict outside diameter of conduit to 1/3 of slab thickness. Keep within the middle half of that thickness.
4. Conduit in slabs on metal deck: Restrict outside diameter of conduit to 1/3 of the thickness of the concrete above the metal deck flute. Where conduit runs perpendicular to span of metal deck, place conduit directly on top of metal deck. Where conduit runs parallel to span of metal deck, place conduit in low flute of metal deck, with one conduit maximum permitted per flute. Where conduit runs parallel to shear connectors, maintain 18-inches minimum spacing between conduit and closest shear connector.
5. Place conduit larger than 1/6 of the slab thickness approximately parallel to or at right angles to the slab reinforcing, not diagonally.
6. Place nearly parallel conduits apart at least 6 times the outside diameter of conduit being used.
7. Do not embed conduit in concrete beams or concrete ribs unless specifically shown on the Structural Drawings.

3.2 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Ensure there is no moisture entrapment by vapor retarder due to rainfall or ground water intrusion.

C. Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.

D. Install vapor retarders in largest practical widths.

E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape by splicing and extending vapor retarder to top of concrete floor slab.

F. Extend vapor retarder to top of concrete floor slab at perimeter of foundation walls and seal to concrete with a compatible mastic or double sided mastic tape as recommended by the manufacturer. Lap joints 6 inches and seal with pressure-sensitive tape.

G. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities. Repair damaged areas with vapor retarder material patches and overlapping damaged area 6 inches and taping all four sides with pressure sensitive tape.

3.3 PLACING CONCRETE

A. Comply with ACI 301, Section 5 - Handling, Placing, and Constructing, and as modified below.

B. Do not place concrete until the Owner’s Testing Agency has reviewed and approved the work and all reported deficiencies have been corrected. Concrete placed prior to approval is subject to removal.

C. Transport concrete mixes to place of final deposit as rapidly as practical by methods which prevent segregation of the ingredients and displacement of reinforcement. Avoid rehandling. Do not deposit any partially-hardened concrete. Provide a baffle plate or spout at the discharge end of the chute to prevent segregation. Use a downpipe, elephant trunk, spout, or other appropriate method to prevent concrete from falling freely through a height of more than 3 feet. When the operation is intermittent, discharge the chute into a hopper. Do not allow concrete to flow horizontally within forms over a distance exceeding 5 feet. Do not move concrete horizontally with vibrators. Provide runways to allow wheeled equipment to move over reinforcement. Do not support runways on reinforcement.

D. Protect exposed-to-view walls and columns from concrete spatter when placing slabs.

E. Do not place any concrete into any form or excavation containing trash, free water, frost, ice or frozen ground.

F. Provide adequate protection against frost action during freezing weather.

G. Do not place concrete flatwork in the rain. Protect exposed concrete surfaces from rain until final set occurs.

H. Do not use calcium chloride in any concrete.

I. Deposit concrete continuously in layers of a thickness that will prevent new concrete from being deposited on partially-hardened concrete. Limit height of vertical lifts to 24-inches. Do not allow formation of seams and planes of weakness within the section. Vibrate through successive lifts to avoid pour lines, stone pockets, honeycombing and segregation. Immediately notify the Architect/Engineer, if due to emergency conditions, a section cannot be placed continuously between planned construction joints. If approved, create a field joint and provide additional reinforcement as necessary to preserve the structural continuity of the member.

J. Thoroughly compact concrete by means of internal mechanical vibrators to produce required quality of finish. Use experienced operators under close supervision to produce homogeneity and optimum consolidation in the concrete without permitting segregation of the constituents. Comply with ACI 309.

K. When placing exposed concrete vertical surfaces, strike corners of forms rapidly and repeatedly from the outside along the full height while depositing concrete and vibrating.

L. Thoroughly clean chutes, hoppers, spouts, adjacent work, etc., before and after each run. Discharge the water and debris outside the form.

M. Finish all structural slabs and slabs on ground to the elevations shown on the Contract Documents. Provide additional concrete as necessary to compensate for all settlements and deflection due to the weight of the wet concrete.

N. For 2-course pours, clean and thoroughly moisten the base slab prior to placing the concrete fill. Remove any visible water left on the base slab just prior to placing the concrete fill. Use the specified epoxy resin bonding agent.

3.4 FINISHING OF FORMED CONCRETE SURFACES

A. Comply with ACI 301 and as modified below.

B. Finish formed concrete surfaces as follows:

1. Knock off fins and grind if necessary. Provide rough form finish for surfaces not exposed to public view and smooth form finish for all concrete surfaces exposed to public view.
2. Smooth rubbed finish - Where noted on Contract Documents, provide smooth formed finish treatment no later than 1 day after form removal. Moisten concrete surface and rub with carborundum brick to produce uniform color and texture on surface.

3.5 FINISHING FLATWORK

A. Preliminary Slab Finishing: For all slabs regardless of final finish:

1. Rough Finishing: Accurately strike off the top surface of the flatwork to provide a true and level surface within the required tolerances.

2. Use a magnesium darby or highway bull float for lightweight concrete slabs.

B. Floated Finish: After preliminary slab finishing, float the slab immediately at least twice using a wood float to produce uniform smooth granular texture. Use a magnesium float for lightweight concrete. Provide on the following surfaces:

1. Slabs to receive membrane or elastomeric roofing or membrane waterproofing.
2. Slabs to receive sand bed terrazzo.
3. Top surfaces of walls, curbs, or other surfaces not requiring a steel troweled surface.
4. Exterior slabs not specified to receive broom finish.

C. Steel Troweled Finish: Perform additional hand troweling as soon as the surface has hardened sufficiently to produce a ringing sound as the trowel is moved over the surface. Produce a uniform, smooth, glossy surface free of trowel marks or other defects. Grind smooth any defects which would telegraph through the applied floor covering. Equipment pads shall receive a dense, hard, but not burnished surface. Provide steel troweled finish on the following surfaces:

1. Slabs to receive carpeting.
2. Slabs to receive seamless floor finish.
3. Slabs to receive resilient flooring, quarry tile or ceramic tile. Lightly scarify surface with fine broom if finish material is installed with thin set mortar.
4. Roof surfaces scheduled to become future floors.
5. Slabs to be left exposed and not specified to receive another finish.
6. Top surfaces of equipment pads.

D. Sealed Finish: Just prior to the completion of the project, apply a second coat of the specified concrete curing and sealing compound where indicated on the Drawings to the following surfaces:

1. All exposed concrete floors within the building not receiving another finished material and subject only to pedestrian traffic as called for in the Contract Documents.

E. Non-slip aggregate application: Apply to concrete stairs, ramps and to concrete floors where indicated on the Contract Documents.

1. Soak non-slip aggregate in water and allow to drain thoroughly.
2. Finish the floor as for a steel trowel finish except that immediately prior to final troweling, apply the non-slip aggregate uniformly over the surface at the rate of 25 lbs./100 sq. ft. Embed the non-slip aggregate into the concrete surface by the final light troweling operation.
3. After curing, lightly work surface with steel wire brush to expose non-slip aggregate.

F. Mineral aggregate surface hardener application: Apply to concrete floors where indicated on the Contract Documents. Apply mineral aggregate hardener at the rate of 1.2 psf to all slabs in areas noted on the drawings. Apply the hardener in two applications by mechanical spreader. The first shake shall comprise 2/3 of the specified amount of hardener. Make this application after the preliminary slab finishing

operation unless climatic conditions dictate earlier application. Float the hardener in and make the second application. Float the surface again to properly bond the hardener to the base concrete slab. Trowel the surface at least twice to a smooth, dense finish.

G. Broomed Finish: After preliminary slab finishing as specified above, and just prior to final set, broom the entire surface uniformly with a stiff broom to remove all scum, laitance, etc. without muddying the surface. Prepare a sample panel and obtain approval from the Architect before finishing broom finish slabs to be exposed to view. Provide broomed finish on the following surfaces:

1. Slabs to receive floor fill concrete or bonded topping.
2. Exterior walkways.

H. Sawcutting: Begin sawcutting as soon as the saw will not dislodge the aggregate or ravel the edge of the sawcut. If a "Soff-Cut" saw is used, begin immediately after final finishing. If a conventional saw is used, begin no later than 12 hours after the slab is placed. Provide sufficient personnel and equipment to complete sawcutting operations within 18 hours after the slab is placed. Sawcut a minimum of one quarter of the slab depth leaving a clean, sharp edge in the pattern shown on the Contract Documents. If no pattern is shown, space joints a maximum of 15-feet on center in each direction and located to conform to column spacing (half-bays etc.).

I. Semi-rigid epoxy application: Pack the sawcut with backer rod immediately after sawcutting is completed to keep the joint clean and free of debris. Delay the installation of semi-rigid epoxy for as long as is practical - at least 28 days after slabs are cast, preferably 90 days. Remove the backer rod and promptly prepare and fill the sawcut full depth with semi-rigid epoxy according to the manufacturer's printed instructions.

J. Maintaining floor flatness: For slabs on ground that initially meet the specified floor flatness and levelness requirements but become out of tolerance due to curling, grind the surface to adjust flatwork to within tolerance requirements.

3.6 ALLOWABLE TOLERANCES

A. Formed surfaces: Refer to Division 03 Section "Concrete Formwork and Accessories" for tolerances related to formwork, shoring and cambering, including Architectural concrete.

B. Flatwork: Finish concrete flatwork to the following surface profile tolerances when measured in accordance with ASTM E 1155:

1. F_F = Face floor flatness number.
2. F_L = Face floor levelness number.
3. Slabs on ground:

a. All slabs on ground not otherwise specified: overall F_F 25/F_L 20; local F_F 17/F_L 13.

3.7 CURING, PROTECTION AND FORM REMOVAL

A. General:

1. Comply with ACI 301 and as modified below.
2. Protect freshly-placed concrete from premature drying, mechanical damage and excessively cold or hot temperatures and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.
3. Start initial curing as soon as free moisture has disappeared from the concrete surface after placing and finishing.

B. Curing-Moisture Retention: Maintain the concrete in a continually moist condition for a minimum of 7 days. Avoid rapid drying at end of curing period.

1. Formed surfaces - Keep the forms continuously wet by periodic spraying with water. After the forms are removed, continue moist curing by one of the methods described for unformed surfaces.
2. Unformed surfaces - Where moist curing is indicated on the Contract Documents, use only methods a, b, or c below. Retain moisture in the concrete by immediate application of one of the following methods:

    a. Ponding or continuous fog spray (mist) of water; periodic sprinkling is expressly prohibited.
    b. Apply an absorptive cover and keep continuously wet.
    c. Apply continuous waterproof sheets; lap and seal seams and repair any holes or tears.
    d. Apply a specified liquid membrane forming curing and sealing compound at the manufacturer's specified rate and method of application to comply with specified water retention. Apply as soon as possible after final finishing operations are complete. Apply in two (2) directions, the second application perpendicular to the first. Do not use if liquid membrane is incompatible with future applied finishes or if a bonded concrete overlay will be placed over slab.

C. Curing-Temperature: Keep the concrete temperature as uniform as possible and protect from rapid atmospheric temperature changes.

1. Cold Weather Concreting:

    a. Comply with ACI 306R whenever the average daily temperature is less than 40 F.
    b. Heat the formwork, reinforcing and underlying subgrades with live steam or hot air jets to raise the temperature of each well above freezing prior to placing concrete. Heat, insulate, cover, enclose and protect the concrete as necessary to continuously maintain the concrete temperature for the entire curing period as follows:

Least dimension in section	Minimum temperature of concrete
Less than 12 inches	55 Deg. F
12 inches to less than 36 inches	50 Deg. F.
36 inches to less than 72 inches	45 Deg. F.
Greater than 72 inches	40 Deg. F.

c. The maximum gradual temperature drop in the concrete in the first 24 hours after the end of the curing period shall not exceed the following:

Least dimension in section	Maximum temperature drop in concrete
Less than 12 inches	50 Deg. F
12 inches to less than 36 inches	40 Deg. F
36 inches to less than 72 inches	30 Deg. F
Greater than 72 inches	20 Deg. F

d. Regardless of the minimum dimension, the maximum temperature drop in the concrete shall not exceed 5 F in any hour in the first 24 hours after the end of the curing period.

e. Do not allow temporary heaters to exhaust combustion gases into the enclosed space containing the concrete.

f. Only non-corrosive, non-chloride accelerators may be used in cold weather, subject to prior review and acceptance by the Architect/Engineer. Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

2. Hot Weather Concreting:

a. Comply with ACI 305R whenever the atmospheric temperature or the form surface temperature is at or above 90 F, or climatic conditions of wind and/or low humidity will cause premature drying of the concrete.

b. Cool the formwork and underlying subgrades to a maximum of 80 F and keep moist. Cool reinforcing by covering with water-soaked burlap if it is too hot. Cool the temperature of the concrete to 75 F by substituting ice for mixing water or by other methods.

c. Take precautions before placing concrete to prevent rapid moisture loss from the concrete surface. Erect sunshades and windbreaks, provide continuous fog spray of water and/or other protection as necessary to prevent premature drying of the concrete surface.

d. Suitable retarders may be added to the concrete, subject to prior review and acceptance by the Architect/Engineer.

D. Protection of Concrete During Curing Period: Protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water. Protect finished concrete surfaces from damage by subsequent construction operations.

E. Wait a minimum of 48 hours after finishing slab before allowing foot traffic on slab. Do not allow construction traffic or loads to be applied to slab until the concrete is 7 days old.

F. Temperature Records: Maintain a set of record drawings on site on which the progress of work is shown. Indicate the day, time, and ambient temperature at time of placement for each concrete pour. Keep a permanent log showing the date and the outside and concrete temperatures during all concreting operations (including curing). Take thermometer readings at the start of work in the morning, at noon, and again late in the afternoon. Record the locations of all concrete placed and cured during these

periods, in a manner which will show any effect the temperature may have had on the construction.

G. Removal of Forms: Refer to Division 03 Section "Concrete Forms and Accessories."

3.8 REPAIR OF DEFECTIVE CONCRETE SURFACES

A. Comply with ACI 301 and as modified below.

B. Identify those areas requiring repair, and review locations with Architect/Engineer and Owner's Testing Agency on a case by case basis. Refer to Section "Corrective Work" where it is determined by the Architect/Engineer that the load-carrying capacity of the concrete may be jeopardized. If it is determined that only surface repairs are necessary, submit a proposed repair procedure, outlining a description of materials, sequencing, preparation, etc. for review.

1. Exercise care to avoid damaging virgin skin of surrounding parent concrete.
2. Cut out defective concrete down to sound concrete leaving neat, square-cut edges.
3. Where reinforcement is exposed by removal of defective concrete, cut around reinforcement to provide a clear space not less than 3/8 inch wide on all sides of the bar.
4. If so directed by the Architect/Engineer, provide 2 by 2 inch stainless steel mesh reinforcement securely attached to existing reinforcement with stainless steel wire.
5. Thoroughly saturate the concrete surface to receive the patch for several hours prior to application of patching materials. Remove excess water to obtain saturated, surface dry substrate. Apply primer or scrubcoat of bonding agent according to the manufacturer's instructions.
6. Use the specified polymer patching mortar where a color match to the adjacent concrete is not required.
7. Do not mix more patching mortar than can be placed in 20 minutes. Apply in layers according to the manufacturer's instructions. Leave all layers except the final layer in a rough condition to receive the succeeding layer.
8. Finish the final layer to match the existing concrete surface in color and texture. Where the concrete surface is to be visible in finished work, add colored aggregates and/or cements as required to provide a mixture which will exactly match the color of the parent concrete after hardening and curing. Provide test patches in an inconspicuous location to verify the color and texture match before proceeding with remainder of patching. If necessary, rub the surface lightly with a fine Carborundum stone at 1 to 5 days age.

C. Provide repairs with the strength, elasticity and durability equal to the parent material being repaired. Remove and replace patches which become crazed, cracked, sound hollow upon tapping, or, which in the opinion of the Architect/ Engineer do not exactly match the surrounding concrete surfaces or otherwise do not satisfy the requirements of the Contract Documents.

D. When flatness and levelness testing indicates concrete flatwork that does not comply with the specified tolerances:

1. Grind the surface to adjust flatwork to within tolerance requirements. Perform grinding as soon as possible after the concrete is strong enough to prevent dislodging of the coarse aggregate, preferably within three (3) days.
2. Patch the surface to adjust flatwork to within tolerance requirements.

E. All patching and repairs shall be performed at the Contractor's expense.

3.9 CORRECTIVE WORK

A. Concrete in place will be considered defective and may be rejected if cylinder strength test results do not meet the requirements of ACI 318 Section 5.6. Additional causes for rejecting concrete include, but are not limited to, the following:

1. Excessive slump
2. Insufficient air content.
3. Beyond specified time limits.
4. Unauthorized retempering.
5. Without proper supervision or inspection.
6. Improper curing or protection.
7. If there is visible evidence of scaling, cracking, voids or excessive deflection.
8. If the finished concrete surface does not meet the specified flatness and/or levelness requirements.

B. If, in the Architect/Engineer's opinion, the strength, stiffness, or durability of the structure may be compromised, test specimens may be taken from the structure at locations designated by the Architect/Engineer. Obtain and test the specimens in accordance with ASTM C 42 and/or perform petrographic analysis in accordance with ASTM C 856. Test results which indicate non-compliance with the Specifications are cause for rejection. Alternatively, at the Architect/Engineer's discretion, load tests may be performed and evaluated in accordance with ACI 318, Chapter 20.

C. Remove and replace concrete that, in the Architect/Engineer's opinion, does not satisfy the performance requirements of this Specification if repairs cannot be accomplished to the Architect/Engineer's satisfaction.

D. Where it is determined that repairs may be attempted, submit a complete repair procedure to the Architect/Engineer for review. Include all necessary information on proposed products, preparation, and sequence of repair including manufacturer's specifications and installation instructions. Do not proceed with repairs until this procedure has been reviewed and accepted by the Architect/Engineer. The repair must account for the strength, stiffness and long term durability of the entire structural element under repair.

E. The costs of all tests, additional services required of the Architect/Engineer, and for repair or removal and replacement are at the expense of the Contractor.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: The Owner will engage a Testing Agency, acceptable to the Architect/Engineer, to perform detailed concrete quality control, testing and inspection. Provide the Testing Agency with the following:

1. Materials, samples, and access to materials as required for testing.
2. Minimum one day's advance notice when concrete is to be placed.
3. Incidental labor required to facilitate testing.
4. Approved on-site storage facilities for concrete test cylinders.
5. Copies of the delivery ticket of each load of concrete as it arrives at the jobsite. Identify the concrete strength, water/cement ratio, type and size of coarse aggregate, batch plant of origin and time cement was discharged into the delivery truck.
6. Copy of the most current reinforcing steel shop drawings which have been reviewed by the Architect/Engineer, and access to the Contract Documents.

B. Testing Agency Responsibilities:

1. Conduct the tests and inspections required herein, interpret and evaluate the results for compliance with the Contract Documents, and promptly furnish reports of the results to the Owner, Architect/Engineer, Contractor, and Authority Having Jurisdiction.
2. At the start of the project, check the concrete constituents, including admixtures, for compliance with the Contract Documents. Test the dry-rodded weight of the coarse aggregate whenever a sieve analysis is made and when it appears there has been a change in the aggregate.
3. At the start of the job, perform inspections of the batch plant and its operation. Observe the batching equipment, the condition of materials used, and check for conformance with the design mix proportions.
4. Perform concrete compression strength testing in accordance with ASTM C 31 and C 39. Sample concrete for test specimens at the point of deposit in accordance with ASTM C 172. General concrete strength testing will consist of one (1) set of four (4) cylinders made from a single sampling for each 50 cubic yards (or fraction) thereof or for each 5000 square feet (or fraction thereof) of surface area of each class of concrete placed each day. All test specimens are to be laboratory-cured. Test as follows:

    a. One (1) 7-day break.
    b. Two (2) 28-day breaks.
    c. One (1) 56-day break. Hold in reserve for testing if 28-day breaks do not comply.
    d. Immediately notify the Contractor and Architect/Engineer if 7-day strengths are less than 70% of design strength.

5. The above frequencies assume that one batch plant will be used for each pour. If more than one batch plant is used, the frequencies cited above shall apply for each plant used.
6. Determine the air content of concrete per ASTM C 173 or ASTM C 231 (normal weight concrete only). For concrete required to be air-entrained, test the first truck, test trucks from which test cylinders are made, and at every 25 cubic yards thereafter each day. For concrete not required to be air-entrained, test trucks from which test cylinders are made and at every 100 cubic yards at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
7. Perform slump tests in accordance with ASTM C 143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the

hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.

8. Perform unit weight tests in compliance with ASTM C 138 for normal weight concrete and ASTM C567 for lightweight concrete. Test first truck and each time cylinders are made.
9. Determine the temperature per ASTM C 1064 each time test cylinders are made and for each truckload of concrete during hot weather and cold weather concreting operations.
10. Observe the placement of all concrete. Inspect the formwork and the reinforcing steel placement, including bar size, spacing and grade of steel prior to concrete placement. Submit detailed report of observations.
11. Immediately notify the Contractor of any items which do not comply with the requirements of the Contract Documents. If satisfactory corrections are not made, contact the Architect/Engineer for direction before the concrete is placed.
12. Review the delivery tickets of every ready-mix concrete truck arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect.

C. Contractor shall reimburse all costs for testing and inspection resulting from any of the following:

1. Work not in compliance with the Contract Documents.
2. Testing requested by the Contractor or Subcontractor such as additional cylinders for early breaks, form removal, etc.
3. Testing to confirm the adequacy of work performed without prior notice, without proper supervision, or contrary to standard construction practice.
4. Changes in source, quality, or characteristics of materials.
5. Wasted time of inspectors because of cancellations or delays of concrete placement or other work

D. Standard of Strength Control

1. The Owner's Testing Agency will establish a coefficient of variation for the statistical evaluation of concrete for the Project. The Contractor shall be fully acquainted with all provisions relative to coefficient of variation as specified herein and fully comply with the applicable requirements.
2. The coefficient of variation will be established for the project on the basis of not less than 30 test results from any one class of concrete. Once established, the Testing Agency will maintain the coefficient of variation as a moving average based on the 10 latest test results to check compliance with specification requirements. Maintain a continuous up to date log at the job site in both graphical and tabulated form for each class of concrete. Report results weekly to the Architect/Engineer.
3. The coefficient of variation shall be assumed as 20% unless another value has been determined from current similar tests, or until it may be calculated from the results of 30 or more job tests. This computation is described in ACI 214.
4. Strength Requirements and Compliance Therewith: Concrete will be considered to meet strength requirements of the Specifications when in compliance with ACI 318 Section 5.6.

END OF SECTION 033000

SECTION 04 2200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

1.3 DEFINITIONS

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

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

1.4 PERFORMANCE REQUIREMENTS

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

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to the following:

Net area compressive strength of concrete masonry units, psi		Net area compressive strength of masonry assembly (f'm), psi
Type M or S mortar	Type N mortar	
---	1,900	1,350
1,900	2,150	1,500
2,800	3,050	2,000
3,750	4,050	2,500
4,800	5,250	3,000

1.5 PRECONSTRUCTION TESTING

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

1. Concrete Masonry Unit Compressive Strength Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test: For each mix required, according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
3. Mortar Test: For each mix required, according to ASTM C 780 for compressive strength.
4. Grout Compressive Strength Test: For each mix required, according to ASTM C 1019.

1.6 ACTION SUBMITTALS

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

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement in unit masonry work. Comply with ACI 315. Show elevations of reinforced walls.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

    a. Include data on material properties and/or material test reports substantiating compliance with requirements.
    b. For masonry units, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry indicated in Performance Requirements article above.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.8 QUALITY ASSURANCE

A. Comply with applicable provisions of the following specifications and documents:
1. American Concrete Institute (ACI) 530 (ACI 530/ASCE 5/TMS 402): Building Code Requirements and Specification for Masonry Structures
2. ACI 530.1 (ACI 530.1/ASCE 6/TMS 602): Specifications for Masonry Structures
3. ASTM International (ASTM) A 36: Standard Specification for Carbon Structural Steel
4. ASTM A 82: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
5. ASTM A 153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
6. ASTM A 307: Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
7. ASTM A 325: Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
8. ASTM A 563: Specification for Carbon and Alloy Steel Nuts
9. ASTM A 580: Specification for Stainless Steel Wire
10. ASTM A 615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
11. ASTM A 641: Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
12. ASTM A 653: Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process
13. ASTM A 666: Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
14. ASTM A 767: Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
15. ASTM A 951: Specification for Masonry Joint Reinforcement
16. ASTM A 1008: Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High Strength Low Alloy, High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
17. ASTM B 663: Specification for Electrodeposited Coatings of Zinc on Iron and Steel
18. ASTM C 55: Standard Specification for Concrete Building Brick

19. ASTM C 90: Specification for Loadbearing Concrete Masonry Units
20. ASTM C 91: Specification for Masonry Cement
21. ASTM C 109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch Cube Specimens
22. ASTM C 129: Specification for Nonloadbearing Concrete Masonry Units
23. ASTM C 140: Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
24. ASTM C 143: Standard Test Method for Slump of Hydraulic Cement Concrete
25. ASTM C 144: Specification for Aggregate for Masonry Mortar
26. ASTM C 150: Standard Specification for Portland Cement
27. ASTM C 207: Specification for Hydrated Lime for Masonry Purposes
28. ASTM C 270: Specification for Mortar for Unit Masonry
29. ASTM C 404: Specification for Aggregates for Masonry Grout
30. ASTM C 476: Specification for Grout for Masonry
31. ASTM C 578: Specification for Rigid Cellular Polystyrene Thermal Insulation
32. ASTM C 744: Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units
33. ASTM C 780: Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
34. ASTM C 920: Standard Specification for Elastomeric Joint Sealants
35. ASTM C 1019: Standard Test Method for Sampling and Testing Grout
36. ASTM C 1093: Standard Practice for Accreditation of Testing Agencies for Masonry
37. ASTM C 1314: Standard Test Method for Compressive Strength of Masonry Prisms
38. ASTM C 1329: Standard Specification for Mortar Cement
39. ASTM C 1506: Standard Test Method for Water Retention of Hydraulic Cement Based Mortars and Plasters
40. ASTM C 1620: Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
41. ASTM C 1623: Standard Specification for Manufactured Concrete Masonry Lintels
42. ASTM D 226: Standard Specification for Asphalt Saturated Organic Felt Used in Roofing and Waterproofing
43. ASTM D 2287: Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
44. ASTM D 4637: Standard Specification for EPDM Sheet Used in Singly Ply Roof Membrane
45. ASTM E 119: Standard Test Methods for Fire Tests of Building Construction and Materials
46. ASTM E 488 Standard Test Methods for Strength of Anchors in Concrete Elements
47. ASTM E 514: Standard Test Method for Water Penetration and Leakage Through Masonry
48. ASTM F 1941: Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
49. National Concrete Masonry Association (NCMA): TEK 07-01C, Fire Resistance Ratings of Concrete Masonry Assemblies
50. NCMA TEK 08-02, Removal of Stains from Concrete Masonry Walls

B. Preconstruction conference: Conduct conference at Project site.

1. Conduct a meeting prior to the preparation of shop drawings and construction procedures to review the detailed requirements for preparing calculations and shop drawings, sequence of submittals, construction tolerances, inspection procedures, surveys, and other similar matters.
2. Responsible representatives from all concerned parties are required to attend the meeting, including but not limited to the following:
   a. Construction Manager's superintendent
   b. Contractor's superintendent
   c. Architect/Engineer
   d. Owner's Representative
   e. Owner's Testing Agency
   f. Surveyor
3. Record and distribute legible meeting minutes to all parties in attendance at the meeting and an additional copy to the Owner's representative.

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

D. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

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

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

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

1.10 PROJECT CONDITIONS

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

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

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in Section 1.8.C of ACI 530.1/ASCE 6/TMS 602.

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

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in Section 1.8.D of ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Do not use units where such defects will adversely affect the performance of the masonry system or where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

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

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

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Density Classification: Normal weight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

C. Concrete Building Brick: ASTM C 55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Density Classification: Normal weight.

2.3 LINTELS

A. Precast Concrete Lintels: Precast concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete" and with reinforcing bars indicated.

2.4 MORTAR AND GROUT MATERIALS

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

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

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

D. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand.

E. Aggregate for Grout: ASTM C 404.

F. Cold-Weather Admixture: not permitted.

G. Water-Repellent Admixture: not permitted.

H. Water: ASTM C 1602; potable, clean, and free from deleterious substances.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60.

B. Stainless Steel Reinforcing Bars: ASTM A 995, Grade 60, Type 304.

C. Masonry Joint Reinforcement, General: ASTM A 951.
1. Exterior and Interior Walls: Hot-dip galvanized, carbon steel.

2. Wire Size for Side Rods: 0.148-inch diameter.
3. Wire Size for Cross Rods: 0.148-inch diameter.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet**,** with prefabricated corner and tee units.

D. Masonry Joint Reinforcement: Ladder type with single pair of side rods.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, with ASTM A 153, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36, hot-dip galvanized to comply with ASTM A 153.

B. Partition Top anchors: 0.105-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

C. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

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

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

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

C. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

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

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.

c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
~~d.~~ Wire-Bond; Corelock or Figure 8 Rebar Positioner.

2.8 MORTAR AND GROUT MIXES

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

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide Type M or S mortar.

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

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, for specified 28-day compressive strength indicated, but not less than 3000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

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

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

3.2 INSTALLATION, GENERAL

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

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

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

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

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

B. Lines and Levels:

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

C. Joints:

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

3.4 LAYING MASONRY WALLS

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

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

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

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

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

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

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

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

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

3.6 MASONRY JOINT REINFORCEMENT

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

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

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

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

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

E. Cut and bend reinforcing units as directed by manufacturer for continuity at[**corners,**] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

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

B. Form control joints in concrete masonry as follows:
1. Install preformed control-joint gaskets designed to fit standard sash block.

3.8 LINTELS

A. Provide concrete lintels where shown.

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

3.9 FLASHING

A. General: Install embedded flashing in masonry where indicated on Architectural Drawings.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
6. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.10 REINFORCED UNIT MASONRY INSTALLATION

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

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

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."
   1. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

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

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

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

3.12 MASONRY WASTE DISPOSAL

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

3.13 CORRECTIVE WORK

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Masonry in place will be considered defective and may be rejected if the prism strength is less than what is shown on the Drawings. Additional causes for rejecting masonry include, but are not limited to:
   1. Grout placed with insufficient or excessive slump.
   2. Mortar and/or grout placed with insufficient or excessive air content.
   3. Mortar and/or grout placed beyond specified time limits.
   4. Unauthorized retempering of mortar and/or grout.
   5. Masonry constructed without proper supervision and/or testing.
   6. Improper curing or protection.
   7. Visible evidence of cracking, excessive deflection, or other signs of structural distress.

C. If, in the Architect/Engineer's opinion, the strength, stiffness, or durability of the structure may be compromised, test specimens may be taken from the structure at locations designated by the Architect/Engineer.—Test results which indicate non-compliance with the Specifications are cause for rejection.

D. Remove and replace masonry that, in the Architect/Engineer's opinion, does not satisfy the performance requirements of this Specification if repairs cannot be accomplished to the Architect/Engineer's satisfaction.

E. Where it is determined that repairs may be attempted, submit a complete repair procedure to the Architect/Engineer for review. Include all necessary information on proposed products, preparation, and sequence of repair including manufacturer's specifications and installation instructions. Do not proceed with repairs until this procedure has been reviewed and accepted by the Architect/Engineer. The repair must account for the strength, stiffness and long term durability of the entire structural element under repair.

F. The costs of all tests, additional services required of the Architect/Engineer, and for repair or removal and replacement, are at the expense of the Contractor.

END OF SECTION 04 2200

SECTION 044313.16 - ADHERED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone masonry adhered to unit masonry backup.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for concealed flashing.
2. Section 076200 "Sheet Metal Flashing and Trim".

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Samples for Verification:

1. For each stone type indicated. Include at least two samples in each set, and show the full range of color and other visual characteristics in completed Work.
2. For each color of mortar required. Label Samples to indicate types and amounts of pigments used.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Test Reports:

1. Stone Test Reports: For stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.
2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer, indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.

B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical exterior wall in sizes approximately 60 inches long by 60 inches high by full thickness, including face and backup construction and accessories.

    a. Include stone coping at top of mockup.
    b. Include a sealant-filled joint at least 16 inches long in mockup.
    c. Include through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit stone masonry above half of flashing).

3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.

1.8 FIELD CONDITIONS

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

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

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining stone masonry face.

1. Protect base of walls from rain-splashed mud and mortar splatter, using coverings spread on the ground and over the 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 end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

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

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

1.9 COORDINATION

A. Advise installers of other work about specific requirements for placement of flashing and similar items to be built into stone masonry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

2.2 OTHER STONE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Cultured Stone; Hewn Stone or comparable product as approved by the Architect.

B. Material Standards:

1. Compressive Strength: Not less than 1800 psi average for 5 specimens and not less than 2100 psi for individual specimen when tested in accordance with ASTM C 39 & ASTM C 192.
2. Bond Between Manufactured Masonry Unit, Mortar and Backing: Not less than 50 psi when tested in accordance with ASTM C 482 using Type S mortar.
3. Thermal Resistance: R-value of not less than 0.355 per inch of thickness when tested in accordance with ASTM C 177.
4. Freeze/Thaw: No disintegration and less than 3 percent weight loss when tested in accordance with ASTM C 67.
5. Unit Weight: Not more than 15 psf saturated.
6. Surface Burning Characteristics: Not more than the following when tested in accordance with UL 723:

    a. Flamespread: 25.
    b. Smoke Development: 450.

C. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.

1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

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

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

    a. Essroc.
    b. Holcim (US) Inc.
    c. Lafarge North America Inc.
    d. Lehigh Hanson; HeidelbergCement Group.
    e. Mutual Materials Co.
    f. Lafarge North America Inc.

D. Aggregate: ASTM C144 and as follows:

1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
2. White Aggregates: Natural white sand or ground white stone.

E. Latex Additive: [Manufacturer's standard] [Acrylic-resin] [or] [styrene-butadiene-rubber] water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.

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

a. Boiardi Products Corporation; a QEP company.
b. Bostik, Inc.
c. C-Cure.
d. Custom Building Products.
e. H.B. Fuller Construction Products Inc. / TEC.
f. Laticrete International, Inc.
g. MAPEI Corporation.
h. Parex USA, Inc.
i. Sakrete; CRH Americas, Oldcastle APG.
j. Southern Grouts & Mortars, Inc.
k. Summitville Tiles, Inc.

F. Water: Potable.

2.4 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.

2.5 FABRICATION

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.

B. Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.

1. Manufactured stone specified to be laid in three-course, according to manufacturers specifications.

C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.

D. Gage backs of stones for adhered veneer if more than 81 sq. in. in area.

E. Thickness of Stone: Provide thickness indicated, but not less than the following:

1. Thickness: 1 inch plus or minus 1/4 inch.

F. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples and mockups.

2.6 MORTAR MIXES

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

1. Do not use calcium chloride.
2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Stone Masonry: Comply with ASTM C270, Proportion Specification.

1. Mortar for Setting Stone: Type S.

D. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.

E. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.

1. For latex-modified portland cement, setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.

F. Mortar for Scratch Coat over Unit Masonry: 1 part portland cement, 1 part lime, 7 parts loose damp sand, and enough water to produce a workable consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.

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

3.2 PREPARATION

A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING STONE MASONRY

A. Perform necessary field cutting and trimming as stone is set.

1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.

B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.

C. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

D. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

E. Maintain uniform joint widths, except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than 1/4 inchat narrowest points or more than 1/2 inch at widest points.

F. Provide sealant joints of widths and at locations indicated.

1. Keep sealant joints free of mortar and other rigid materials.
2. Sealing joints are specified in Section 079200 "Joint Sealants."

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

1. At multiwythe masonry walls, extend flashing through stone masonry, turned up a minimum of 4 inches, and extend into or through inner wythe to comply with requirements in Section 042000 "Unit Masonry."
2. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches into masonry at each end.
3. At sills, extend flashing not less than 4 inches at ends.
4. At ends of head and sill flashing, turn up not less than 2 inches to form end dams.
5. Extend sheet metal flashing 1/2 inch beyond masonry face at exterior, and turn flashing down to form a drip.

3.4 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 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 or 1/2 inch in 40 feet or more.

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 or 1/2 inch in 40 feet or more.

C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.

D. Measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.

E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ADHERED STONE MASONRY VENEER

A. Coat backs of stone units and face of scratch coat with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar, so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and scratch coat.

B. Rake out joints for pointing with mortar to depth of not less than 1/2 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.6 POINTING

A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

B. Point stone joints by placing and compacting pointing mortar in layers of not more than 3/8 inch deep. Compact each layer thoroughly, and allow to it become thumbprint hard before applying next layer.

C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: Concave.

3.7 ADJUSTING AND CLEANING

A. Remove and replace stone masonry of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective joints.
3. Stone masonry not matching approved samples and mockups.
4. Stone masonry not complying with other requirements indicated.

B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.

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

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
3. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.

3.8 EXCESS MATERIALS AND WASTE

A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in greatest dimension.
2. Mix masonry waste with at least 2 parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

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

END OF SECTION

SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Extent of structural steel work is shown on the drawings. Provide all materials, labor, hardware, equipment, transportation, and services to perform structural steel work.

C. Cooperation with work of other sections.

1. Review contract drawings and specifications which affect structural steel work.
2. Perform work in a manner which will not interfere or delay work of other contractors. Cooperate with other trades a necessary.
3. Inform those performing work of other sections, in writing or by schedules, of requirements for services, materials, or other items prepared or supplied by other sections which affect work of this sections.

D. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.
3. Division 09 Sections for final coatings.

1.3 SUBMITTALS

A. Product Data and Test Reports: Submit copies of manufacturer's specifications and installation instructions for each proprietary product, including laboratory test reports and such other data as may be required to show compliance with the specifications. Indicate by transmittal form that copies of such data have been distributed to Fabricator/Installer and the Owner's Testing Agency.

1. Certified copies of mill reports covering the chemical and physical properties of the steel.
2. High-strength bolts, nuts, and washers, each type, including mechanical properties and chemical analysis.

3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Unfinished bolts and nuts.
6. Welding electrodes, each type.
7. Shear studs.
8. Shop coat primer paint.
9. Non-shrink grout.

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

1. Include drawing index sheets, including updated sheets, at the same time that details are submitted.
2. Include detail drawings showing complete details for the fabrication of all structural steel members and components, including but not limited to: identification marks, dimensions, size, type, weight, grade of steel, cuts, connections, splices, camber, holes, requirements for installation of other materials or parts of construction, cleaning requirements prior to priming, type and dry-thickness of primer, and other pertinent data.
3. Include baseplate and anchor rod plans showing the location, size, and identification marks of all baseplates, bolts, grades of steel, and setting elevations.
4. Include embedment drawings showing the location, size, and identification marks of all embedments, bolts, studs, grades of steel, and setting elevations.
5. Include erection plans (minimum 1/8" = 1'-0" scale) showing type, size, weight and identification marks of all structural steel members. Include temporary members required for erection, dimensions locating all members relative to column grid lines, elevations of all members, and clear cross references with all other related Drawings.
6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

C. Qualification Data: For installer, fabricator, professional engineer responsible for design of connections, licensed surveyor, shop-paint applicator, and testing agency.

D. Welding certificates.

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

F. Source Quality-Control Reports.

1. Contractor's Shop Testing Reports: Submit in triplicate directly to the Architect/Engineer with copies to the Contractor, Owner's Testing Agency and others as indicated. Document all of the certifications, tests and inspections specified.
2. Owner's Testing Agency Reports: Submit in triplicate directly to the Architect/Engineer, with copies to the Contractor and others as indicated. Document all of the certifications, tests and inspections specified.

3. Source quality-control reports shall clearly indicate all pertinent data, including but not limited to the following: date; time; weather conditions; name and qualifications of inspector; certifications, tests and/or inspections performed; equipment used; location of structural member or assembly within the building; whether or not the test results indicate compliance with the specifications, etc.

G. Field Quality-Control Reports:

1. Owner's Testing Agency Reports: Submit in triplicate directly to the Architect/Engineer, with copies to the Contractor and others as indicated. Document all of the certifications, tests and inspections specified.
2. Field quality-control reports shall clearly indicate all pertinent data, including but not limited to the following: date; time; weather conditions; name and qualifications of inspector; certifications, tests and/or inspections performed; equipment used; location of structural member or assembly within the building; whether or not the test results indicate compliance with the specifications, etc.

H. Substitutions: Substitutions for the member sizes, type(s) of steel, connection details, or any other modifications proposed by the Contractor will be considered by the Architect/Engineer under the following conditions:

1. The revisions in no case result in additional cost to the Owner. In considering cost savings to the Owner, adequate compensation for the Architect/Engineer's review of these substitutions should be considered.
2. The request is made in writing and accepted prior to the submission of shop drawings.
3. It is suitably demonstrated that there is a substantial cost advantage or time advantage to the Owner.
4. Sufficient drawings, engineering calculations by a licensed professional engineer registered in the State of Florida, and other data are submitted to facilitate review by the Architect/Engineer.

I. Corrective Work: Report any structural steel members or assemblages having fabrication errors, installation errors, or deformations preventing proper assembly and fitting of parts to Architect/Engineer upon discovery. Corrective work proposed by the Contractor will be considered by the Architect/Engineer under the following conditions:

1. Corrective work will in no case result in additional cost to the Owner.
2. The request is made in writing and accepted prior to performing corrective work.
3. Sufficient drawings, engineering calculations by a licensed professional engineer registered in the State of Florida**,** and other data are submitted to facilitate review by the Architect/Engineer.

J. Minutes of preconstruction conference.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD. If the Fabricator's facility is not AISC certified, the Owner's Testing Agency will perform all

shop testing and inspection work, and the fabricator will be backcharged for this work. Refer to Paragraph “Source Quality Control” for additional information.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE. If the installer is not AISC certified, refer to Paragraph “Erection Quality Control” for additional information.

C. Shop-Painting Applicators: Qualified according to AISC SPE “Sophisticated Paint Endorsement” or SSPC-QP 3 "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

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

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

1. American Institute of Steel Construction (AISC) 303 “Code of Standard Practice for Steel Buildings and Bridges”.
3. AISC 360 “Specification for Structural Steel Buildings.”
4. ASTM International (ASTM) A 6, “Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.”
5. ASTM A 36, “Specification for Carbon Structural Steel.”
6. ASTM A 53, “Specification for Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated, Welded, and Seamless.”
7. ASTM A 108, “Specification for Steel Bar, Carbon and Alloy, Cold-Finished.”
8. ASTM A 325, “Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.”
9. ASTM A 354, “Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.”
10. ASTM A 449, “Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
11. ASTM A 490, “Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.”
12. ASTM A 1085, “Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).”
13. ASTM A 992, “Specification for Structural Steel Shapes.”
14. ASTM C 1107, “Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).”
15. ASTM E 164, “Practice for Ultrasonic Contact Examination of Weldments.
16. ASTM E 165, “Test Method for Liquid Penetrant Examination.”
17. ASTM E 709, “Guide for Magnetic Particle Examination.”
18. ASTM E 1444, “Standard Practice for Magnetic Particle Testing.”
19. ASTM F 436, “Specification for Hardened Steel Washers.”
20. ASTM F 959, “Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.”
21. ASTM F 1554, “Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.”
22. ASTM F 1852, “Standard Specification for ‘Twist-Off’ Type Tension Control Structural Bolt / Nut / Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

23. American Welding Society (AWS) D1.1, “Structural Welding Code – Steel.”
24. AWS D1.8, “Structural Welding Code - Seismic Supplement.”
25. International Fastener Institute (IFI) “Handbook on Bolt, Nut, and Rivet Standards.”
26. Master Painter Institute (MPI) #18, “Primer, Zinc-Rich, Organic.”
27. MPI #19, “Primer, Zinc-Rich, Inorganic.”
28. MPI #20, “Primer, Zinc-Rich, Epoxy.”
29. MPI #79, “Primer, Alkyd, Anti-Corrosive for Metal.”
30. MPI #107, “Primer, Rust-Inhibitive, Water-Based.”
31. National Association of Corrosion Engineers (NACE) No. 3, “Commercial Blast Cleaning.”
32. Research Council on Structural Connections (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
33. Steel Structures Painting Council (SSPC) “Steel Structures Painting Manual, Volumes 1 and 2."
34. SSPC PA1, “Shop, field, and Maintenance Painting of Steel.”
35. SSPC QP3, “Standard Procedure for Evaluating Qualifications of Shop Painting Applicators.”
36. SSPC-SP3, “Power Tool Cleaning.”
37. SSPC-SP6, “Commercial Blast Cleaning.”
38. Keep copies of these codes and standards available in shop and field.
39. In case of conflict between specified codes and standards, the most stringent requirements govern. In case of conflict between specified codes and standards and project Specifications, project Specifications govern.

F. Preconstruction Conference: Conduct conference at Project site.

1. Conduct a meeting prior to the preparation of shop drawings to review the detailed requirements for preparing calculations and shop drawings, sequence of submittals, erection tolerances, welding qualifications, inspection procedures, surveys and other similar matters.
2. Responsible representatives from all concerned parties are required to attend the meeting including, but not limited to, the following:

    a. Owner’s Representative.
    b. Construction Manager’s superintendent.
    c. Contractor's Superintendent.
    d. Architect/Engineer.
    e. Structural Steel Detailer and/or Fabricator.
    f. Erector.
    g. Steel Deck Installer.
    h. Owner's Testing Agency.
    i. Surveyor.

3. Record and distribute legible meeting minutes to all parties in attendance at the meeting and an additional copy to the Owner's representative.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and

spacers. Protect steel members and packaged materials from corrosion and deterioration.

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

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

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

1.6 COORDINATION

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

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

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

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

B. W-Shapes: ASTM A 992.

C. Channels and Angles: ASTM A 36.

D. Plate and Bar: ASTM A 36 or ASTM A 572 as indicated.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

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

G. Welding Electrodes: Conform to AWS D1.1, including addenda and the following requirements:

1. Shielded metal-arc welding (SMAW): AWS A5.1 and A5.5, E70 series.
2. Submerged arc welding (SAW): AWS 5.17 and A5.23.

3. Flux core arc welding (FCAW): AWS 5.20 and 5.29
4. Metal inert gas welding (MIG) of structural steel is not permitted.

2.2 BOLTS, CONNECTORS, AND ANCHORS

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

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish. Subject to compliance with requirements, the following are acceptable:

a. Coronet Load Indicators by TurnaSure LLC.
b. Load Indicator Washers by Portland Bolt & Manufacturing Co.
c. Squirter DTI by Applied Bolting Technology.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish. Subject to compliance with requirements, the following are acceptable:

a. Coronet Load Indicators by TurnaSure LLC.
b. Load Indicator Washers by Portland Bolt & Manufacturing Co.
c. Squirter DTI by Applied Bolting Technology.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers; bearing-type connections only. Subject to compliance with requirements, the following are acceptable:

1. Tension Control Assemblies by LeJeune Bolt Co.
2. High Strength Positive Tension Shear Bolts by St. Louis Screw & Bolt.
3. Tru-Tension Bolts by Nucor Fastener.

D. Unheaded Anchor Rods: ASTM F 1554.

1. Nuts: ASTM A 563.
2. Plate Washers: ASTM A 36.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: match connected construction.

E. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563.
2. Washers: ASTM F 436, Type 1, hardened.
3. Finish: to match connected construction.

F. Expansion Anchors: Install in accordance with manufacturer's printed instructions. Properly account for fastener spacing, embedment, edge distance, and strength of substrate. Use only with prior review and acceptance by Architect/Engineer for the specific applications indicated. Subject to compliance with requirements, the following manufacturers are acceptable:

1. Hilti North America.
2. Simpson Strong-Tie Co., Inc.
3. Powers Fasteners.
4. ITW Redhead.

G. Epoxy Adhesive Anchors: Install in accordance with manufacturer's printed instructions. Properly account for fastener spacing, embedment, edge distance, and strength of substrate. Use only with prior review and acceptance by Architect/Engineer for the specific applications indicated. Subject to compliance with requirements, the following manufacturers are acceptable:

1. Hilti North America.
2. Simpson Strong-Tie Co., Inc.
3. Powers Fasteners.
4. ITW Redhead.

2.3 PRIMER

A. Shop Primer: Compatible with Division 09 sections.

1. Steel not exposed to view and not covered in sprayed fire-resistive materials:

   a. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#107.

2. Steel exposed to view but not exposed to weather, for field-applied topcoat complying with MPI INT 5.1S (Institutional Low Odor / low VOC Finish):

   a. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI #107

3. Steel exposed to weather, for field-applied topcoat complying with MPI EXT 5.1G (polyurethane, pigmented finish (over epoxy zinc rich primer and high build epoxy).

   a. Fabricator's standard zinc-rich epoxy primer complying with MPI #20.

B. Other products will be considered only if the request is accompanied by certified test reports showing compliance with the requirements above.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: Factory premixed grout with no drying, shrinkage or settlement at any age. Compressive strength per ASTM C-1107 of not

less than 5,000 psi at 7 days and 8,000 psi at 28 days when placed in flowable consistency. Acceptable products include:

1. Masterflow 555 by BASF.
2. Hi-Flow Grout by Euclid Chemical Co.
3. Duragrout by L & M Construction Chemicals.
4. 10K Grout by Bonded Materials Co.
5. Five Star Grout by Five Star Products, Inc.
6. Other products will be considered only if the request is accompanied by certified test reports showing compliance with the requirements above.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303 and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly. Use marks which agree with those indicated on the Shop Drawings and Erection Drawings.Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting:

1. Perform manual oxygen cutting only with a mechanically guided torch, except as permitted below:

    a. Gas cut edges which are not to be welded and which will be free of substantial stresses (as determined by the Architect/Engineer) may be cut manually with an unguided torch provided that specified AISC edge distances to holes are maintained.
    b. Gas cut edges which will be subjected to substantial stress (over 1/2 the allowable stress, as determined by the Architect/Engineer), or which are to be welded may be cut manually with an unguided torch to a line not within 1/8-inch of the finished dimension. Complete the final removal of material by chipping or grinding to produce a surface quality equal to that of the base metal edges.

2. Do not oxygen cut holes for bolted connections; components prepared in this manner will be rejected.
3. Shape all re-entrant corners notch-free to a radius of at least 1/2 inch.
4. Cut only those openings of the size and location indicated on the reviewed Shop Drawings.

C. Punching, Drilling, and Reaming:

1. Material may be punched 1/16-inch larger than the nominal diameter of the bolts. Wherever the thickness of metal is greater than 7/8-inch or is greater than the

diameter of the bolts plus 1/8-inch, drill or subpunch holes and ream. The diameter for subpunched holes shall be 1/16-inch smaller than nominal diameter of bolt accommodated. Locate finished holes to insure passage of bolts through assembled materials without drifting. Enlarge holes to receive bolts by reaming. Remove burrs caused by punching or reaming before assembly of bolted joints or members.

2. Drill or punch holes at right angles to the surface of the metal. Do not make or enlarge holes by burning. Clean-cut holes without torn or ragged edges.
3. Punch and drill steel for attachment of other materials indicated on the Drawings or noted in the Specifications to be attached to the steel. Use suitable templates for proper location of this work. Provide slotted holes for adjustment where indicated.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads. Completely assemble and weld member attachments prior to milling of surfaces.

E. Built-Up Sections: Provide built-up sections free of warpage and with all axes in true alignment.

F. Embedded Plate Headed Studs - Prepare steel surfaces as recommended by the manufacturer of the headed studs. Shop weld studs, spaced as indicated, to the steel member. Use automatic end welding of the headed-stud connectors in accordance with the manufacturer's printed instructions.

G. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

H. Steel Exposed to View: All welds and mill stamps shall be ground smooth. Steel that is within 10 feet vertically and/or 3 feet horizontally of a walking surface shall have all sharp corners ground to a radius. All exposed bolt heads shall be aligned as shown.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Use bolts of a length that will extend at least 1/4-inch beyond the nuts in the completed connection. Enter bolts into the holes without damaging the thread.
2. Provide a calibrated bolt tension indicating device at the jobsite. Use the device to confirm the suitability both of the component parts of the fastener assembly and of the selected installation techniques. Tighten representative samples of each bolt type and size in the device to demonstrate both proper snug tight conditions and the additional tightening necessary to develop the bolt pretension prescribed in Table 8.1 of the RCSC "Specification." Use the device to insure that the installation wrenches and pneumatic supply are of adequate capacity.
3. Correct poor matching of holes by drilling hole to the next larger bolt size and using the larger size bolt, if approved by the Architect/Engineer.

4. Assemble joints without the use of separate erection bolts. Install bolts using powered impact wrenches of sufficient capacity and with an adequate supply of air.
5. Bring all plies of the connection into firm contact by tightening all bolts to a snug tight condition. Progress systematically from the most rigid portion of the joint out to the joint free edges. Retighten any bolts which may have loosened during the assembly process. Protect bolt heads and nuts during assembly and tightening.
6. Tighten bolts in connections identified as tension or slip-critical connections to the pretension levels specified in Table 8.1 of the RCSC "Specification." Acceptable methods of tightening pretensioned bolts include Direct Tension Indicators or the turn-of-the-nut method. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections. Follow the manufacturer's written instructions for the proper installation of Direct Tension Indicators.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
2. Use shielded metal arc welding or submerged arc welding for all shop welding. Flux core arc welding may be used provided AWS procedure qualification tests are made for the specific intended application of the process.
3. Prepare joint welding procedures and a program of welding sequences (for each component and component connections) and submit to the Architect/Engineer for review before any welding is done. Use detailing and procedures which reduce residual stresses to a minimum. Consider the toughness and notch sensitivity of the steel in formulating welding sequences to prevent brittle and premature fracture. After review, follow the welding procedures and sequences without deviation unless specific approval for change is obtained from the Architect/Engineer. Perform all welding in compliance with the AWS "Structural Welding Code" using AWS qualified welders. The Architect/Engineer may require re-qualification of operators by tests prescribed in the AWS "Standard Qualification Procedures" for changes in welding procedure.
4. Remove paint, grease, loose scale and foreign matter from the surfaces to be welded. Clean the welds each time the electrode is changed or a new pass is started. Chip clean burned or flame cut edges before depositing welds.
5. Do not begin structural welding until joint elements are bolted or tacked in intimate contact and adjusted to the dimensions indicated, with allowance for any weld shrinkage that is expected. Hold component parts of built-up members with clamps or other means to keep parts straight and in close contact. Take precautions to minimize "lock-up" stress and distortion due to heat.
6. Welds not otherwise specified are continuous fillet welds. Use the minimum fillet size in accordance with AISC unless specifically noted otherwise.
7. Weld heavy sections and those having a high degree of restraint with low hydrogen electrodes. Perform intermittent welding, continuous welding and straightening of built-up sections to minimize internal stresses.
8. The same electrode may be used with various thicknesses of plate, but adjust the current used and the number of passes proportionately.
9. Do not weld in a wind unless wind protection is provided. Do not splice members without prior approval or review by the Architect/Engineer.

10. After being deposited, brush welds with wire brushes. Make welds which exhibit uniform section, smoothness of welded metal, feather edges without undercuts or overlays and which are free of porosity and clinkers. Visual inspection of the edges and ends of fillets and butt joint welds must indicate good fusion, with penetration into the base metal. Cut out and replace defective welds.
11. Adjustable Veneer Anchors: Welders attaching adjustable veneer ties to structural steel shall hold current AWS certification.

C. Fire-Resistance Ratings: Provide prefabricated building column listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for ratings indicated, based on testing according to ASTM E 119.

1. Fire-Resistance Rating: As indicated.

2.7 SUPPLEMENTAL FRAMING

A. Provide supplemental framing as follows:

1. At all openings as indicated on the Drawings.
2. Edges of metal deck, hollow-core plank, open grating flooring, etc., not otherwise supported by structural framing.
3. At all suspended loads.

B. Where open web joists are used, provide additional framing to transfer loads from the supplemental framing and suspended loads to joist panel points.

2.8 SHOP PRIMING

A. Shop prime all steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces to receive metal deck and/or shear studs fastened by welding.
7. Machine-finished surfaces (e.g., bearing surfaces of columns and column baseplates).

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

1. Steel not exposed to view: SSPC-SP 3, "Power Tool Cleaning."
2. Steel exposed to view and not exposed to weather: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Steel exposed to view and exposed to weather: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning"

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 2 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.9 GALVANIZING

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

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. For AISC-certified facilities, submit a written program for the proposed fabrication quality control testing and inspection. After review and acceptance of these documents by the Architect/Engineer, perform all shop testing and inspection as specified herein and as required for Fabricator’s quality control testing and inspection program.

B. For facilities not AISC-certified, the Owner's Testing Agency will perform all shop testing and inspection work listed herein, and the fabricator will be backcharged for this work.

C. Owner’s Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Provide the testing agency with the following:

1. Complete set of current reviewed shop and erection drawings.
2. Full and ample means and assistance for testing.
3. Access to and proper facilities (e.g., scaffolding, temporary work platforms, hoisting facilities, etc.) for inspection of the Work in the shop and field.

D. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Structural Steel Fabrication Shop Quality Control Program: As a minimum, perform the following shop tests and inspections and submit daily reports of the results of all tests. State in each report whether the tested specimens conform to all requirements of the Contract Documents, and specifically note any discrepancies. If the inspections indicate defects in the Work, increase the degree of testing to insure that the full extent of defects in the joint are found and that similar defects are not present in similar joints.

1. Submit evidence that all welders employed in the Work hold current AWS certification for the welding procedures that each will perform. If recertification of welders is required, the retesting is the Fabricator's responsibility.

    a. Visually and acoustically inspect all headed anchor studs used on connection plates embedded in concrete or mortar. Check the shear stud installation for indications of insufficient or improper welding. Strike each stud sideways with a 3 pound sledge hammer to produce a ringing sound. Studs producing a hollow sound shall be replaced or rewelded.
    b. Visually inspect all fabrication operations, including dimensional and fit-up/alignment and control.
    c. Visually inspect all plate edges and rolled shape edges for material defects.
    d. Visually inspect material in accordance with AWS D1.1
    e. Bolted Connections: Test and inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
    f. Welded Connections: Test and inspect shop-welded connections according to AWS D1.1 and the following inspection procedures:

        1) Visual Inspection :

            a) Inspect all welding operations and welds, including edge preparation, fit-up, preheat, and adherence to welding procedures. Inspect welds prior to shop painting of steel.
            b) Measure the weld profiles for 20% of the length of each weld, at random.

        2) Non-Destructive Testing: Test welds using either Magnetic Particle Testing in accordance with ASTM E 709 or Ultrasonic Testing in accordance with ASTM E 164, at Inspecting Agency's option, as follows:

            a) 20% of all fillet welds, root and final passes, at random, except as noted below.
            b) i. 100% of fillet welds in tension, root and final passes, full length of each weld.
            c) ii. 100% of fillet welds in built-up columns and built-up girders, root and final passes, 20% of the length of each weld, at random.
            d) 100% of partial joint penetration welds, root and final passes, 20% of the length of each weld, at random, except as noted below.
            e) i. 100% of partial joint penetration welds in built-up girders, root and final passes, full length of each weld.
            f) 100% of complete joint penetration welds, full length of weld.

    g. Ultrasonically test in accordance with ASTM A435 for laminations or other material defects at the following locations:

        1) Column flanges and other plate material greater than 1-1/2 inch in thickness in the zone of welded beam/column moment connections.

Extend the test area 9 inches above and below each beam flange and/or continuity plate, scanning 100% of the test area.

2) Built-up girder flange plates 2-inches or more in thickness for laminations. Extend the testing area for the full width of the flanges for 5'-0" on each side of the column transfer location.

2. Schedule all work to allow the testing requirements listed above to be completed.
3. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Contractor's registered surveyor shall prepare and submit three (3) copies to the Architect/Engineer a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Report any discrepancies to the Architect/Engineer before proceeding with erection. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

1. The design, strength, safety and adequacy of all temporary bracing and methods of construction are the responsibility of the Contractor. This responsibility includes the safety and stability of the work at all stages of erection until the permanent lateral load resisting system of the structure becomes fully effective. No action by the Architect/Engineer will eliminate, lessen, or restrict this responsibility in any manner.
2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION QUALITY CONTROL

A. If the steel installer is not AISC certified, submit the following:

1. Evidence that all welders to be employed in the work hold current AWS certification for the welding procedures that each will perform.

2. Written welding procedures. A copy of all welding procedures shall be kept on-site at all times. Confirm that written welding procedures are compliant with AWS specifications. Submit evidence that welding procedures are used by welders.
3. Written bolt-tightening procedures. A copy of all bolt-tightening procedures shall be kept on-site at all times. Confirm that written bolt-tightening procedures are compliant with the Research Council on Structural Connections (RCSC) specifications. Submit evidence that bolt-tightening procedures are used by workers.
4. Evidence that crane operators are certified by the National Commission for the Certification of Crane Operators or are equivalently trained and experienced.
5. Evidence that project-specific erection plans with hoisting and erection requirements are communicated and implemented in the field.

3.4 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base, Bearing, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Temporarily set plates for structural members on leveling nuts. Provide shims as required.
2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove shims but, if protruding and exposed to view, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written instructions.

C. Maintain erection tolerances of structural steel within AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Use drift pins only to bring parts together; do not use drift pins in a manner which distorts or damages structural members.Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection without prior written approval of the Architect/Engineer.

G. Do not enlarge misaligned holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Studs: Prepare steel surfaces as recommended by manufacturer. Use automatic end welding of shear studs according to AWS D1.1 and manufacturer's written instructions.

I. Install sliding connections of the design indicated. Exercise particular care during installation to ensure proper functioning of these connections as sliding joints.

3.5 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Use shielded metal arc or flux core welding for all field welding.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Test and inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Assign an identification symbol or mark to each bolting crew working on the project. Use this identification on each joint completed.
2. Visually inspect all anchor-rod nut installation and tightening.
3. Inspect the job site calibration of each size bolted fastener assembly and installation technique in the calibrated tension measuring device. Verify that the proper bolt pretension listed in Table 8.1 of the RCSC "Specification" is achieved and that installation equipment is of sufficient capacity.
4. Periodically monitor field bolting procedures during bolt installation. Verify that all bolts in all connections are brought to a "snug tight" condition with all plies of the connection in firm contact. Verify that bolts in connections identified as either slip-critical or direct tension connections are being additionally tightened by the proper technique(s) determined in the tension testing device described above.
5. Confirm that all bolted connections are being installed in accordance with the procedures outlined in the RCSC "Specification."

C. Welded Connections: Visually inspect all field welds according to AWS D1.1.

1. Provide temporary enclosures, shielding, etc., to protect joints to be welded against the elements during all welding operations.

2. Non-Destructive Testing: Test welds using either Magnetic Particle testing in accordance with ASTM E 709 or Ultrasonic testing in accordance with ASTM E 164, at Testing Agency's option, as follows:

    a. 20% of all fillet welds, root and final passes, at random, except as noted below.

        1) 100% of fillet welds in tension for root and final passes, full length of weld.
        2) 100% of fillet welds in built-up columns and built-up girders, 20% of the length of each weld, at random.

    b. 100% of partial joint penetration welds, root and final passes, 20% of the length of each weld, at random, except as noted below.

        1) 100% of partial joint penetration welds in built-up girders, root and final passes, full length of each weld.

    c. 100% of complete joint penetration welds, full length of weld.
    .

D. Testing agency shall submit inspection reports promptly and in writing to Architect/Engineer, Owner, and Contractor.

E. After erection, remove all loose mill scale, loose rust, oil, grease, or other bond-inhibiting foreign substances from steel to receive spray-applied fire-resistive coating.

F. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.7 FABRICATION AND ERECTION TOLERANCES

A. Unless otherwise noted, level and plumb individual members of the structure to an accuracy of 1 in 500, and erect structural steel to within the tolerances specified in the AISC 303. Base all leveling and plumbing on the mean operating temperature of the structure. Make allowances for the differences in temperature at time of erection and the mean temperature at which the structure will be when completed and in service. Base all measurements relating to tolerances on the theoretical centerline of the columns. Plumb and align columns as follows:

1. Columns adjacent to elevator shafts - accurate to 1:1000, not to exceed 1-inch for their full height.
2. All exterior columns - within 1-inch of the theoretical centerline either toward or away from the building.
3. The centerline of any two (2) adjacent exterior columns - within 3/4-inch of each other either toward or away from the building.
4. All intermediate exterior columns - within 3/4-inch of a line between the corner columns.

3.8 FIELD SURVEYS OF COMPLETED STRUCTURE

A. Establish bench marks and survey the base structure for dimensional extremes before proceeding with erection to determine the range of any required compensating adjustments. Survey actual column locations, including vertical elevations and plumbness, immediately upon the completion of every tier of steel. Promptly submit report to the Architect/Engineer. Include resurvey of tier below. Should column locations vary beyond the allowable tolerances, promptly notify Architect/Engineer and submit proposed corrective measures to the Architect/Engineer for review and acceptance prior to proceeding with the work. Survey the final erected structural steel frame prior to the application of any other work, and report any discrepancies from Contract requirements to the Architect/Engineer.

3.9 GROUTING OF BEARING PLATES AND BASE PLATES

A. Grout Mixture: Use the specified grout mix with the minimum amount of water required to produce a flowable grout. Extend grout with 3/8 inch coarse aggregate for grout placements over 2-inches thick. The proposed grout mix with the 3/8 inch aggregate must be reviewed and approved by the grout manufacturer and the Architect/Engineer prior to use.

B. Mixing: In accordance with grout manufacturer's printed instructions. Do not mix more grout than can be placed within 20 minutes.

C. Preparation:

1. Remove all defective concrete, laitance, dirt, etc. from the concrete surface. Saturate the surface of the concrete thoroughly with clean water for at least 24 hours. Remove free water just prior to placing the grout.
2. Clean, align, and level the base plate into final position and maintain that position during grouting. Bring the concrete and plate to be grouted to a temperature of 65 degrees to 90 degrees F just prior to grouting.

D. Grouting:

1. Place the grout quickly and continuously to provide complete bearing and avoid air entrapment.
2. After the grout has acquired its initial set, cut off all unconfined, exposed edges, leaving sloping "shoulders". Cure the grout for a minimum of 3 days by application of a curing compound applied to the exposed shoulders. Maintain temperature above 50 degrees F for this time period.

3.10 CORRECTIVE WORK

A. Report to the Architect/Engineer any structural steel members or assemblages having fabrication errors, erection errors, or deformations preventing proper assembly and fitting of parts.

B. Submit Drawings and Calculations to the Architect/Engineer showing the reasons for and details of proposed corrective work. Perform the corrective work only after the Architect/Engineer has reviewed and accepted the corrective procedures.

C. Corrective work, including any additional tests that may be necessary to show compliance of corrected work, shall be performed at no additional cost to the Owner.

D. All costs associated with efforts of the Architect/Engineer will be backcharged to the Contractor.

3.11 REPAIRS AND PROTECTION

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

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 3 power-tool cleaning.

END OF SECTION 05 1200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Miscellaneous Steel Framing and Supports.

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.

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

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
2. Section 051200 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.

1.2 COORDINATION

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

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
2. Shop primers.

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

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.4 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

B. Welding certificates.

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

D. Research Reports: For post-installed anchors.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

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

2.2 METALS

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

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.

E. Zinc-Coated Steel Wire Rope: ASTM A741.

F. Stainless Steel Wire Rope: Wire rope manufactured from stainless steel wire complying with ASTM A492, Type 316.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening stainless steel .

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

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

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

C. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

D. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

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

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanizeexterior miscellaneous steel trim.

D. Prime miscellaneous steel trim with zinc-rich primer.

2.8 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.9 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

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

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

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

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

B. Anchor supports for overhead doors securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction with anchor bolts.

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

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

    a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.

B. Related Requirements:

1. Section 061600 "Sheathing" for roof sheathing.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

1.3 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PRESERVATIVE TREATMENT

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
3. After treatment, redry dimension lumber to 19 percent maximum moisture content.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.2 FIRE-RETARDANT TREATMENT

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664 and design value adjustment factors shall be calculated according to ASTM D6841.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by testing agency.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.

2.3 DIMENSION LUMBER FRAMING

A. Ceiling Joists: Construction or No. 2 grade.

1. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Douglas fir-larch (north); NLGA.
e. Southern pine or mixed southern pine; SPIB.
f. Spruce-pine-fir; NLGA.
g. Hem-fir; WCLIB or WWPA.
h. Douglas fir-south; WWPA.
i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
j. Northern species; NLGA.
k. Eastern softwoods; NeLMA.
l. Western woods; WCLIB or WWPA.

B. Joists, Rafters, and Other Framing by Grade: Construction or No. 2 grade.

1. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Southern pine or mixed southern pine; SPIB.
e. Spruce-pine-fir; NLGA.
f. Douglas fir-south; WWPA.
g. Hem-fir; WCLIB or WWPA.
h. Douglas fir-larch (north); NLGA.
i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.4 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fastenersof Type 304 stainless steel.
2. For pressure-preservative-treated wood, use stainless steel fasteners.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC58 as appropriate for the substrate.

2.6 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets:

1. Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
2. Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
3. Self-adhering sheet consisting of 64mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side[; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction].

B. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. ICC-ES evaluation report for fastener.

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

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

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 INSTALLATION OF CEILING JOIST AND RAFTER FRAMING

A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- size or 2-by-4-inch nominal- size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and[toe nail or] use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.4 PROTECTION

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

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

END OF SECTION

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof sheathing.
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 061000 "Rough Carpentry".
2. Section 074113.16 "Standing-Seam Metal Roof Panels".
3. Section 076200 "Sheet Metal Flashing and Trim".

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer..

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

1. Wood-preservative-treated plywood.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat all plywood unless otherwise indicated.

2.2 ROOF SHEATHING

A. Plywood Roof Sheathing: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.

1. Nominal Thickness: Not less than 5/8 inch.

2.3 FASTENERS

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

1. For roof sheathing, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

2.4 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Roof Sheathing:

a. Nail or staple to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION

SECTION 06 1753 - METAL-PLATE-CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Wood roof trusses.
2. Wood girder trusses.
3. Wood truss bracing.
4. Metal truss accessories.

B. Extent of Metal-Plate-Connected Wood Trusses is shown on the Drawings. Provide all materials, labor, services, equipment, transportation, and hardware for all metal-plate-connected wood trusses.

C. Cooperation with Work of other Sections:

1. Review Contract Drawings and Specifications for requirements of other Sections which affect the construction of rough carpentry.
2. Perform work in a manner which will not interfere or delay work of other Contractors. Cooperate with other trades regarding installation of embedded items. Templates and instructions will be provided for setting items placed in forms.
3. Inform those performing Work of other Sections, in writing or by schedules, of requirements for services, materials, or other items prepared by or supplied by other Sections which affect Work of this Section.

D. Related Sections include the following:

1. Division 6 Section “Rough Carpentry” for rough carpentry.
2. Division 6 Section “Heavy Timber Construction.”
3. Division 6 Section "Sheathing" for roof sheathing and subflooring.

E. Allowances: Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "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.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Submit details of floor and roof trusses, including comprehensive design by a qualified licensed professional engineer registered in the State of Florida, to resist the loads and reactions indicated on the Drawings and to comply with other information and restrictions indicated. Submit details and calculations for review before preparation of detail drawings.

B. 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 Structural Drawings
2. Maximum Deflection Under Design Loads:

    a. Roof Trusses: Vertical deflection of 1/240 of span.

1.5 SUBMITTALS

A. Product Data: For metal truss accessories, and fasteners.

B. Research/Evaluation Reports: For the following, showing compliance with *Florida Building Code.*
1. Engineered wood products.
2. Power-driven fasteners.
3. Metal framing anchors.
4. Construction adhesives.

C. Shop Drawings: Show fabrication and installation details for trusses.

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 locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

D. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data

signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and truss fabricator

B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.

C. Product Certificates: For metal-plate-connected wood trusses, signed by an officer of truss fabricating firm.

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

1. Wood-preservative-treated lumber.
2. Fire-retardant-treated wood.
3. Metal-plate connectors.
4. Metal truss accessories.

E. Corrective Work: Report any metal-plate-connected wood truss members or assemblages having fabrication errors, installation errors, or deformations preventing proper assembly and fitting of parts to Architect/Engineer upon discovery. Corrective work proposed by the Contractor will be considered by the Architect/Engineer under the following conditions:

1. Corrective work will in no case result in additional cost to the Owner.
2. The request is made in writing and accepted prior to performing corrective work.
3. Sufficient drawings, engineering calculations by a licensed professional engineer registered in the State of Florida, and other data are submitted to facilitate review by the Architect/Engineer

1.7 QUALITY ASSURANCE

A. Codes and Standards; Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the latest editions of the following:

1. American Forest & Paper Association (AF&PA): National Design Specifications for Wood Construction and its "Supplement."
2. American Society of Mechanical Engineers (ASME) B18.2.1: Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
3. ASME B18.6.1: Wood Screws (Inch Series)
4. ASTM International (ASTM) A 153
5. ASTM A 653: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
6. ASTM A 666: Standard Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

7. ASTM A 780: Standard Practice for Repair of Damaged and Unocated Areas of Hot Dip Galvanized Coatings
8. ASTM F 1667: Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
9. U.S. Department of Commerce (DOC) Voluntary Product Standard PS 20: American Softwood Lumber Standard
10. Forest Stewardship Council (FSC) STD-01-001: FSC Principles and Criteria for Forest Stewardship
11. International Code Council Evaluation Service (ICC-ES), “Evaluation Service Report ESR-1539
12. Truss Plate Institute (TPI) TPI 1: National Design Standard for Metal Plate Connected Wood Truss Construction
13. TPI BCSI: Building Component Safety Information
14. TPI DSB: Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses.

B. In case of conflict between specified codes and standards, the most stringent requirements shall govern. In case of conflict between coded and standards and project Specifications, project Specifications shall govern. In case of conflict between Contract Documents, immediately notify Architect/Engineer for resolution.

C. 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.

D. 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/Engineer and authorities having jurisdiction

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

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in TPI BCSI**,** "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & 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.

C. 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 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.

B. 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.
2. Maximum Deflection Under Design Loads:

   a. Roof Trusses: Vertical deflection of 1/240 of span.

C. 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 BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 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: For truss chord and web members, provide dimension lumber of any species, visually or mechanically graded, and capable of supporting required loads without exceeding the allowable design values according to AF&PA.

C. Minimum Chord Size for Roof Trusses: 2 by 4 inches nominal for both top and bottom chords]

D. Minimum Specific Gravity for Top Chords: 0.50.

E. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry.

2.3 METAL CONNECTOR PLATES

A. Source Limitations: Obtain metal connector plates from single manufacturer.

B. General: Fabricate connector plates to comply with TPI 1.

C. Hot-Dip Galvanized-Steel Sheet: ASTM A 653; 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 unless otherwise indicated.

2.4 FASTENERS

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

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-1539

D. Wood Screws: ASME B18.6.1

E. Lag Bolts: ASME B18.2.1

F. Bolts: ASTM A 307, Grade A, with ASTM A 563 hex nuts and flat washers

2.5 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following manufacturers. Comparable alternate products shall meet or exceed the capacities of the products indicated on the Drawings. Manufacturer's published values shall be determined by empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. Southeastern Metals Manufacturing Co., Inc.
6. USP Structural Connectors.

C. 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.

D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation.

E. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to masonry wall below. Tie fits over top of truss and fastens to both sides of truss..

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 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 and as indicated below:

a. Length: 1/2" for trusses up to 30 feet long, 3/4" for trusses 30 feet or longer.
b. Height: 1/4" for trusses up to 60 inches high. 1/2" for trusses 60 inches or higher.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.8 SOURCE QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.

1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.

B. Correct deficiencies in Work that special inspections indicate does not comply with the Contract Documents.

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 metal framing anchors 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.

J. Install bracing to comply with Section 061000 "Rough Carpentry."

1. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

K. Install wood trusses within installation tolerances in TPI 1 and as indicated below:

1. Out-of-plumb: lesser of truss depth (D) / 50 or 2 inches.
2. Out-of-plane: lesser of span length (L) / 200 or 2 inches.
3. Location in plan: 1/4".

L. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

M. Replace wood trusses that are damaged or do not meet requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect/Engineer.

3.2 REPAIRS AND PROTECTION

A. Protect wood trusses from weather. If, despite protection, wood trusses become 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.

3.3 CORRECTIVE WORK

A. Report to the Architect/Engineer any members or assemblages having fabrication errors, erection errors, or deformations preventing proper assembly and fitting of parts.

B. Submit Drawings and Calculations to the Architect/Engineer showing the reasons for and details of proposed corrective work. Perform the corrective work only after the Architect/Engineer has reviewed and accepted the corrective procedures.

C. Corrective work, including any additional tests that may be necessary to show compliance of corrected work, shall be performed at no additional cost to the Owner.

D. All costs associated with efforts of the Architect/Engineer will be backcharged to the Contractor.

END OF SECTION 06 1753

SECTION 061800 - GLUED-LAMINATED CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes framing using structural glued-laminated timber.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.

1.3 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on lumber, adhesives, fabrication, and protection.

B. Shop Drawings:

1. Show layout of structural glued-laminated timber system and full dimensions of each member.
2. Indicate species and laminating combination.
3. Include large-scale details of connections.

1.5 INFORMATIONAL SUBMITTALS

A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.

B. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.

C. Research/Evaluation Reports: For structural glued-laminated timber from ICC-ES.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: An AITC- or APA-EWS-licensed firm.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Structural glued-laminated timber and connectors shall withstand the effects of structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117 or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

2.2 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
2. Provide structural glued-laminated timber made from single species.
3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
4. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.
5. Adhesive shall not contain urea-formaldehyde resins.
6. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Species and Grades for Structural Glued-Laminated Timber: Any species species that complies with beam stress classifications indicated.

C. Species and Grades for Beams:

1. Species and Beam Stress Classification: Douglas fir-larch or southern pine, 24F-1.8E
2. Lay-up: Balanced

D. Appearance Grade: Architectural complying with AITC 110.

1. For Premium and Architectural appearance grades, fill voids as required by AITC 110.

2.3 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

C. Sealers shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

1. Dress exposed surfaces as needed to remove planing and surfacing marks.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. Where preservative-treated members are indicated, fabricate (cut, drill, surface, and sand) before treatment to greatest extent possible. Where fabrication must be done after treatment, apply a field-treatment preservative to comply with AWPA M4.

1. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
2. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

D. End-Cut Sealing: Immediately after end cutting each member to final length apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

E. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

2.5 FACTORY FINISHING

A. Wiped Stain Finish: Manufacturer's standard, dry-appearance, penetrating acrylic stain and sealer; oven dried and resistant to mildew and fungus.

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

B. Clear Finish: Manufacturer's standard, two-coat, clear varnish finish; resistant to mildew and fungus.

C. Finishing materials shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.

B. Framing Built into Masonry: Provide 1/2-inch (13-mm) clearance at tops, sides, and ends of members built into masonry; bevel cut ends 3 inches (76 mm); and do not embed more than 4 inches (102 mm) unless otherwise indicated.

C. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

D. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.

1. Predrill for fasteners using timber connectors as templates.
2. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
3. Coat cross cuts with end sealer.
4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

    a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
    b. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

E. Install timber connectors as indicated.

1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.

2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION 061800

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Lumber siding.
   2. Engineered wood siding.

B. Verify materials in the field to match existing materials in order to restore noted areas on architectural drawings to original conditions. This document provides the specifications for either scenario.

1.2 DEFINITIONS

A. MDO: Plywood with a medium-density overlay on the face.

B. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

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

   1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

   1. For lumber that is not marked with grade stamp.
   2. For preservative-treated wood that is not marked with treatment-quality mark.

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

1. Wood-preservative-treated wood.

C. Sample Warranties: For manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.7 WARRANTY

A. Engineered Wood Manufacturer's Warranty: Manufacturer agrees to repair or replace components of engineered wood siding that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, deformation or deterioration beyond normal weathering.
2. Warranty Period for Factory-Applied Finish: Five years from date of Substantial Completion.
3. Warranty Period: Siding (Excluding Finish), 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade

lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

B. Hardboard: ANSI A135.4.

2.2 LUMBER SIDING

A. Provide kiln-dried lumber siding complying with DOC PS 20.

B. Pattern: Match existing conditions on site where indicated.

2.3 ENGINEERED WOOD SIDING

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

1. Collins Products LLC.
2. Or Equal Approved.

B. Engineered Wood Siding: ANSI A135.6, primed with manufacturer's standard exterior primer.

C. Colors, Textures, and Patterns: Refer to architectural drawings.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

1. For face-fastening siding, provide ringed-shank siding nails or hot-dip galvanized-steel siding nails.
2. For pressure-preservative-treated wood, provide hot-dip galvanized-steel fasteners.
3. For applications not otherwise indicated, provide hot-dip galvanized-steel fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

C. Flashing if required:

1. Horizontal Joint Flashing for Panel Siding: Preformed, galvanized-steel, Z-shaped flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

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

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed.

1. Cut to required lengths and prime ends.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut exterior finish carpentry to fit adjoining work.
3. Refinish and seal cuts as recommended by manufacturer.
4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
6. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 INSTALLATION OF SIDING

A. Install siding to comply with manufacturer's written instructions and warranty requirements.

B. Horizontal Lumber Siding:

1. Apply starter strip along bottom edge of sheathing or sill.
2. Install first course of siding, with lower edge at least 1/8 inch (3 mm) below starter strip and subsequent courses lapped 1 inch (25 mm) over course below.

    a. Nail at each stud.
    b. Do not allow nails to penetrate more than one thickness of siding.

3. Leave 1/8-inch (3-mm) gap at trim and corners unless otherwise recommended by manufacturer, and apply sealant.
4. Butt joints only over framing or blocking, nailing top and bottom on each side and staggering joints in subsequent courses.

C. Engineered Wood Siding:

1. Install engineered wood siding to comply with manufacturer's written instructions.
2. Install panels with edges over framing or blocking.
3. Leave 3/16-inch (5-mm) gap at perimeter, openings, and horizontal panel joints unless otherwise recommended by panel manufacturer.
4. Seal butt joints at inside and outside corners and at trim locations.
5. Install continuous metal flashing at horizontal panel joints.
6. Apply battens and corner trim as indicated.
7. Conceal fasteners to greatest practical extent by placing in grooves of siding pattern or by concealing with applied trim or battens as detailed.

D. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.

E. Finish: Apply finish within two weeks of installation.

3.5 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements.

1. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.

B. Product Data Submittals: For each product.

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

D. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.5 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels from AWI certification program indicating that woodwork complies with requirements of grades specified.

B. Architectural Woodwork Standards Grade: Premium.

C. High-Pressure Decorative Laminate: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.

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

    a. Formica Corporation.
    b. Laminart LLC.
    c. Wilsonart LLC.

D. Semiexposed Surfaces:

    a. Edges of Plastic-Laminate Shelves: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
    b. Edges of Thermally Fused Laminate Panel Shelves: PVC or polyester edge banding.
    c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, grade to match exposed surface.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

    1. As indicated by laminate manufacturer's designations.
    2. Match Architect's sample.
    3. As selected by Architect from laminate manufacturer's full range in the following categories:
        a. Solid colors with core same color as surface, matte finish.
        b. Wood grains, matte finish.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

2.3 CABINET HARDWARE AND ACCESSORIES

A. Grommets for Cable Passage: 2-inch (51-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

    1. Color: To match laminate surface. Submit color sample to architect for approval.

2.4 MISCELLANEOUS MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.5 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber blanket insulation.
2. Glass-fiber board insulation.
3. Mineral-wool board insulation.
4. Loose-fill insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Glass-fiber blanket insulation.
2. Glass-fiber board insulation.
3. Mineral-wool board insulation.
4. Loose-fill insulation.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Glass-Fiber Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

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

   a. CertainTeed Corporation.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Owens Corning.
   d. Or Equal Approved.

2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 GLASS-FIBER BOARD INSULATION

A. Glass-Fiber Board Insulation, Faced : ASTM C612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder.

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

   a. CertainTeed Corporation.
   b. CertainTeed Insulation.
   c. Johns Manville; a Berkshire Hathaway company.
   d. Knauf Insulation.
   e. Owens Corning.
   f. Or Equal Approved.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Nominal Density: 3 lb/cu. ft..
5. Thermal Resistivity: 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
6. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

1.1 MINERAL-WOOL BOARD INSULATION

A. Rigid, monolithic, monodensity mineral wool insulation board intended for use with mechanically fastened or ballasted roofing membranes to ASTM C726.

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

   a. Johns Manville; a Berkshire Hathaway company.
   b. Owens Corning.

c. ROCKWOOL.

1.2 LOOSE-FILL INSULATION

A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C739, chemically treated for flame-resistance, processing, and handling characteristics.

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

a. Greenfiber, LLC.
b. Hamilton Manufacturing, Inc. (HMI).
c. Nu-Wool Co., Inc.
d. ROCKWOOL

2.3 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

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

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Standing-seam metal roof panels.
2. Underlayment Materials.

B. Related Sections:

1. Section 061600 "Sheathing" for roof insulation, insulation accessories, substrate board and cover board.
2. Section 074646 "Fiber-cement siding" for soffit panel.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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

10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings:

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

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for typical roof area only, including accessories.

a. Size: 12 feet long by 6 feet.
b. Each type of exposed seam and seam termination.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 CODE/STANDARD COMPLIANCE

A. Product Compliance: The roofing system shall have a State of Florida Product Control Notice of Acceptance (NOA) and meet all requirements of the Florida Product Approval System as required by Florida Statute 553.842 and Florida Administrative Code 9B-72.

B. UL Class A Roof System requirements and FMG Class I Roof System for designated wind load per FMG Loss Prevention Data Sheet 1-28, “Wind Loads to Roof Systems and Roof Deck Securement.”

C. Provide roof covering materials bearing UL Classification Marking on bundle, package and/or container indicating that materials have been produced under UL's Classification and Follow-up Service.

D. Comply with the following testing procedures:

1. Florida Building Code Test Protocol TAS 105-Test Procedure for Field Withdrawal Resistance Testing.
2. Florida Building Code Test Protocol TAS 114-Test Procedures for Roof System as the High Velocity Hurricane Zone Jurisdiction.

a. Appendix A- Test Procedure for Above Deck Combustibility ASTM E 108.
b. Appendix C-Test Procedure for Simulated Uplift Pressure Resistance of Roof System Assemblies.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.10 FIELD CONDITIONS

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

1.11 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.

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

1. Uplift Rating: UL 90.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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

2.2 STANDING-SEAM METAL ROOF PANELS

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

1. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.

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

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

    a. Berridge Manufacturing Company.
    b. CENTRIA Architectural Systems.
    c. McElroy Metal, Inc.
    d. Merchant and Evans.
    e. Morin - A Kingspan Group Company.
    f. PAC-CLAD; Petersen Aluminum Corporation. (BOD)
    g. Or Approved Equal.

2. Aluminum Sheet: Coil-coated sheet, ASTM B209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

    a. Thickness: 0.032 inch.
    b. Surface: Smooth, flat finish.
    c. Exterior Finish: Three-coat fluoropolymer.
    d. Color: As selected by Architect from manufacturer's full range.

3. Clips: ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating, configured for concealment in panel joints accommodate thermal movement.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 40 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carlisle Residential; a division of Carlisle Construction Materials; WIP 300HT.

b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Grace Ice and Water Shield HT.
c. Henry Company; Blueskin PE200 HT.
d. Kirsch Building Products, LLC; Sharkskin Ultra SA.
e. Metal-Fab Manufacturing, LLC; MetShield.
f. Owens Corning; WeatherLock Metal High Temperature Underlayment.
g. Or Approved Equal.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

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

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

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

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.

3.5 ERECTION TOLERANCES

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

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

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

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes fiber-cement siding, soffit, and column covers.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.

1.3 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

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

B. Samples for Initial Selection: For fiber-cement siding and soffit including related accessories.

C. Samples for Verification: For each type, color, texture, and pattern required.

1. 12-inch- long-by-actual-width Sample of siding.
2. 12-inch- long-by-actual-width Sample of soffit.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding and soffit.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish full lengths of fiber-cement siding and soffit including related accessories, in a quantity equal to 2 percent of amount installed.

1.9 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockups for fiber-cement siding and soffit including accessories.

    a. Size: 48 inches long by 60 inches high.
    b. Include outside corner on one end of mockup and inside corner on other end.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracking and deforming.
b. Deterioration of materials beyond normal weathering.

2. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

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

a. CertainTeed Corporation.
b. GAF Materials Corporation.
c. James Hardie Building Products, Inc.
d. Or Equal Approved.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 5/16 inch.

D. Pattern, texture, color and size: As selected by Architect from Manufacturer's full range.

E. Factory Priming: Manufacturer's standard acrylic primer.

2.3 FIBER-CEMENT SOFFIT

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

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

    a. CertainTeed Corporation.
    b. James Hardie Building Products, Inc.
    c. Or Equal Approved.

B. Nominal Thickness: Not less than 5/16 inch.

C. Pattern, texture, color and size: As selected by Architect from Manufacturer's full range.

D. Ventilation: Provide perforated soffit unless otherwise indicated.

E. Factory Priming: Manufacturer's standard acrylic primer.

2.4 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:

1. Corner posts.
2. Door and window casings.
3. Fasciae.
4. Moldings and trim.
5. Decorative panels.

C. Flashing: Provide stainless-steel flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

D. Fasteners:

1. For fastening to wood, use siding nails or ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch into substrate.
2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
3. For fastening fiber cement, use stainless-steel fasteners.

E. Insect Screening for Soffit Vents: Stainless steel, 18-by-18 mesh.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding soffit and related accessories.

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

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Install fasteners no more than 24 inches o.c.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof-drainage sheet metal fabrications.
2. Low-slope roof sheet metal fabrications.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 077100 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashings.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.

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

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
9. Include details of special conditions.

10. Include details of connections to adjoining work.
11. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches (1:5).

C. Samples for Initial Selection: Images for each type of sheet metal and accessory indicated with factory-applied finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop is to be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge, including built-in gutter & fascia, approximately 10 feet (3.0 m) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

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

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); prepainted by coil-coating process to comply with ASTM A755/A755M.
1. Surface: Smooth, flat .

2. Color: As selected by Architect from manufacturer's full range.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Lead Sheet: ASTM B749 lead sheet.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions. Verify with manufacturer if underlayment can be used with proposed slopes.

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

a. ATAS International, Inc.
b. Carlisle WIP Products; a brand of Carlisle Construction Materials.
c. GCP Applied Technologies Inc.
d. Henry Company; a Carlisle company.

e. Owens Corning.
f. Polyglass U.S.A., Inc.
g. Protecto Wrap Company.
h. SDP Advanced Polymer Products Inc.

2. Source Limitations: Obtain underlayment from single source from single manufacturer.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C) or lower.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

F. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

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

B. Fabrication Tolerances:

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

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

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

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Built-in Gutters:

1. Fabricate to cross section required, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required.

2. Fabricate in minimum 96-inch- (2400-mm-) long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.
3. Fabricate gutters with built-in expansion joints and gutter-end expansion joints at walls.
4. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
5. Fabricate from the following materials:
   a. Stainless Steel: 0.0156 inch (0.396 mm) thick.

B. Open Top Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fabricate from the following materials:
1. Stainless Steel: 0.0188 inch (0.477 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION OF UNDERLAYMENT

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lap joints not less than 2 inches (50 mm).

B. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses.
5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
6. Roll laps and edges with roller.

7. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of welds and sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
7. Do not field cut sheet metal flashing and trim by torch.
8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of [**10 feet (3 m)**] <**Insert dimension**> with no joints within 24 inches (600 mm) of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Built-in Gutters:

1. Join sections with joints sealed with sealant.
2. Provide for thermal expansion.
3. Slope to downspouts.
4. Provide end closures and seal watertight with sealant.
5. Install underlayment layer in built-in gutter trough and extend to drip edge at eaves and under underlayment on roof sheathing.

a. Lap sides minimum of 2 inches (50 mm) over underlying course.
b. Lap ends minimum of 4 inches (100 mm).
c. Stagger end laps between succeeding courses at least 72 inches (1830 mm).
d. Fasten with roofing nails.

6. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.

C. Open Top Overflow Scuppers:

1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
2. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

3.5 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches (100 mm) over base flashing.
3. Lap counterflashing joints minimum of 4 inches (100 mm).

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets: Installation of reglets is specified in Section 042000 "Unit Masonry."

3.7 INSTALLATION TOLERANCES

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

3.8 CLEANING

A. Clean off excess sealants.

3.9 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof-edge drainage systems.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.
2. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
3. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

C. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

D. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, either the Architect or project manager, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

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

D. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.5 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Provide Miami-Dade County notice of approval (NOA.) or Florida product approval for products used.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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

2.2 ROOF-EDGE SPECIALTIES

A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet (3.6 m) and a continuous metal receiver with integral drip-edge cleat to engage fascia cover. Provide matching corner units.

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

   a. ATAS International, Inc.
   b. Drexel Metals.
   c. FlashCo Manufacturing Inc.
   d. SAF Perimeter Systems Division.

2. Metallic-Coated Steel Sheet Fascia Covers: Zinc-coated (galvanized) steel, nominal thickness as required to meet performance requirements.

   a. Surface: Smooth, flat finish.
   b. Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.

3. Corners: Factory mitered and continuously welded.
4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
5. Fascia Accessories: Overflow scuppers Spillout scuppers.

2.3 ROOF-EDGE DRAINAGE SYSTEMS

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

1. Architectural Products Company.
2. Castle Metal Products.
3. Metal-Era, Inc.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Zinc-Coated Steel: Nominal 0.034-inch (0.86-mm) thickness.
2. Gutter Profile: Style A according to SMACNA's "Architectural Sheet Metal Manual."
3. Corners: Factory mitered and continuously welded.

4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.

C. Downspouts: Corrugated rectangular complete with machine-crimped elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Aluminum Sheet: 0.040 inch (1.02 mm) thick.

D. Aluminum Finish: Three-coat fluoropolymer.

1. Color: To match color of existing gutter system to be removed as indicated on architectural drawings. Architect to approve of color before application.

2.4 REGLETS AND COUNTERFLASHINGS

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

1. ATAS International, Inc.
2. Castle Metal Products.
3. Drexel Metals.
4. Keystone Flashing Company, Inc.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:

1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.
2. Corners: Factory mitered and continuously welded.
3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches (100 mm) and in lengths not exceeding 12 feet (3.6 m) designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:

1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.

D. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.5 MATERIALS

A. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

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

3.2 INSTALLATION, GENERAL

A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

D. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

E. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.3 INSTALLATION OF ROOF-EDGE DRAINAGE SYSTEMS

A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 12 inches apart. Attach ends with rivets and solder to make watertight. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

1. Provide elbows at base of downspouts at grade to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

3.4 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonstaining silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Mildew-resistant joint sealants.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Joint sealants.
2. Joint-sealant backing materials.

B. Samples: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Manufacturers' special warranties.

B. Installer's special warranties.

1.5 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

When warranties are required, verify with Owner's counsel that special warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

Verify available warranties and warranty periods for joint-sealant installation.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain joint sealants from single manufacturer for each sealant type.

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

1. Construction Foam Products; a division of Nomaco, Inc.
2. Master Builders Solutions.
3. Sika Corporation - Building Components.
4. Tremco Incorporated.
5. Or Equal Approved.

2.2 JOINT SEALANTS, GENERAL

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

2.3 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

B. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.

C. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

D. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 100/50, Uses T and NT.

E. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

2.4 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use T and NT.

C. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

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

a. Construction Foam Products; a division of Nomaco, Inc.
b. Master Builders Solutions.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

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

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

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

3.5 PROTECTION

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

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Exterior standard steel doors and frames.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

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

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

C. Samples for Verification:

1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. Fabrication: Prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:

   a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
   b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

D. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, :

1. Baron Metal Industries Inc.; an Assa Abloy Group company.
2. Ceco Door; ASSA ABLOY.
3. Curries Company; ASSA ABLOY.
4. Custom Metal Products.
5. Daybar Industries, Ltd.
6. JR Metal Frames Manufacturing, Inc.
7. Karpen Steel Custom Doors & Frames.
8. Michbi Doors Inc.
9. MPI Group, LLC (The).
10. National Custom Hollow Metal Doors & Frames.
11. North American Door Corp.
12. Rocky Mountain Metals, Inc.
13. Security Metal Products; a brand of ASSA ABLOY.
14. Steelcraft; an Allegion brand.
15. Steward Steel Door & Frame Division.
16. Trillium Steel Doors Limited.
17. West Central Manufacturing, Inc.
18. Or Equal Approved.

2.2 PERFORMANCE REQUIREMENTS

A. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 3 for basic protection.

1. Large-Missile Test: For glazed openings located within 30 feet of grade.

2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule.

1. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A40 coating.
d. Edge Construction: Model 1, Full Flush.

e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
h. Core: Manufacturer's standard .

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
b. Construction: Full profile welded.

3. Exposed Finish: Prime.

2.4 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.6 MATERIALS

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

B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

2.7 FABRICATION

A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 LOUVERS

A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.

B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.

2. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

    1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.

3.3 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hollow-core flush wood plastic-laminate-faced doors.

B. Related Requirements:
   1. Section 083473.16 "Wood Sound Control Door Assemblies" for acoustic flush wood doors.
   2. Section 099124 "Interior Painting" for field finishing doors.

1.2 ACTION SUBMITTALS

A. Product Data for architect’s reference: For each type of product, including the following:

   1. Door core materials and construction.
   2. Door face type and characteristics.
   3. Door frame construction.
   4. Factory-priming specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

   1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
   2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
   3. Details of frame for each frame type, including dimensions and profile.
   4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
   5. Dimensions and locations of blocking for hardware attachment.
   6. Dimensions and locations of mortises and holes for hardware.
   7. Clearances and undercuts.
   8. Doors to be factory primed and application requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons, and wrap bundles of doors in plastic sheeting.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.5 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty also includes installation and finishing that may be required due to repair or replacement of defective doors and frames.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Provide labels and certificates from AWI certification program indicating that doors comply with requirements of grades specified.

2.3 HOLLOW-CORE FLUSH WOOD PLASTIC-LAMINATE-FACED DOORS

A. Interior Doors, Hollow-Core Plastic-Laminate-Faced:
   1. Performance Grade: ANSI/WDMA I.S. 1A Standard Duty.
   2. Architectural Woodwork Standards Grade: Premium.
   3. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
   4. Colors, Patterns, and Finishes: As indicated.
   5. Exposed Vertical Edges: Plastic laminate that matches faces, applied before faces.

      a. Polymer Edging Color: Same color as faces.

   6. Construction: Institutional hollow core.
   7. Blocking: Provide wood blocking with minimum dimensions as follows:

      a. 5-by-18-inch (125-by-460-mm) lock blocks at both stiles.
      b. 5-inch (125-mm) top- and bottom-rail blocking.

B. Factory fit doors to suit frame-opening sizes indicated.

   1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

   1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.

   1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3.2 mm in 2400 mm).
   2. Anchor frames to anchors or blocking built in or directly attached to substrates.

a. Secure with countersunk, concealed fasteners and blind nailing.
b. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.

1) For factory-finished items, use filler matching finish of items being installed.

D. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.

a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.

2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:

a. Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors.
b. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

5. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspecting agency.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Concealed Flanges:

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

a. ACUDOR Products, Inc.
b. Babcock-Davis.
c. Cendrex Inc.
d. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
e. Karp Associates, Inc.
f. MIFAB, Inc.
g. Nystrom, Inc.

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Optional Features: Piano hinges .
4. Locations: Ceiling.
5. Door Size: Refer to drawings.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage, factory primed.
7. Frame Material: Same material, thickness, and finish as door.
8. Latch and Lock: Cam latch, hex-head wrench operated.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

C. Frame Anchors: Same material as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

SECTION 083313 - COILING COUNTER DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Counter door assemblies.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for door-opening framing and corner guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling counter door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Show locations of controls, locking devices, and other accessories.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

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

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

1. Obtain operators and controls from coiling counter door manufacturer.

2.2 COUNTER DOOR ASSEMBLY

A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Cornell Rolling Counter Door Model ESC20 or comparable product that may be incorporated into the Work include, but are not limited to the following:

a. Cookson; a CornellCookson company.
b. Overhead Door Corporation.
c. Or Equal Approved.

B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Door Curtain Material: Stainless steel.

D. Door Curtain Slats: Flat profile slats of 1-1/2-inch center-to-center height.

E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match door.

F. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.

G. Hood: Match curtain material and finish .

1. Shape: As indicated on Drawings.
2. Mounting: As indicated on Drawings.

H. Integral Frame, Hood, and Fascia: Stainless steel.

1. Mounting: As indicated on Drawings.

I. Locking Devices: Equip door with slide bolt for padlock.

J. Manual Door Operator: Push-up operation.

K. Door Finish:

1. Stainless Steel Finish: ASTM A480/A480M No. 4 (polished directional satin).

2.3 DOOR CURTAIN MATERIALS AND FABRICATION

A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Stainless Steel Door Curtain Slats: ASTM A240/A240M or ASTM A666, Type 304; sheet thickness of 0.025 inch; and as required.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.4 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Stainless Steel: 0.025-inch- thick, stainless steel sheet, Type 304, complying with ASTM A240/A240M or ASTM A666.

B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):

1. Stainless Steel: Type 304, complying with ASTM A240/A240M or ASTM A666.

2.5 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

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

1. Lock Cylinders: As standard with manufacturer.

2.6 CURTAIN ACCESSORIES

A. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches high.

2.7 COUNTERBALANCE MECHANISM

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

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.8 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf.

2.9 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: ASTM A480/A480M No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

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

3.2 INSTALLATION, GENERAL

A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 STARTUP SERVICE

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

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service is to include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
4. Include point-to-point wiring diagrams showing the following:

a. Power requirements for each electrically operated door hardware.
b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

E. Delegated Design Submittal: For aluminum-framed entrances and storefronts & aluminum awnings including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

a. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Test and Evaluation Reports:

1. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by qualified testing agency.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, in accordance with recommendations in ASTM C1401. Include periodic quality-control reports.

E. Qualification Statements:
1. For egress door inspector.

a. Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
b. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

F. Delegated design engineer qualifications.

G. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrances and storefronts.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installers: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in FLORIDA where Project is located and who is experienced in providing engineering services of the type indicated.
3. Testing Agency: Qualified in accordance with ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025 and acceptable to Owner and Architect.
4. Egress Door Inspector: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

    a. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

C. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems that include structural glazing.

1.7 WARRANTY

A. Special Warranty: Manufacturer and Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures, including, but not limited to, excessive deflection.
    b. Noise or vibration created by wind and thermal and structural movements.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Five years from date of Substantial Completion.

C. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
c. Cracking, peeling, or chipping.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels, aluminum awnings and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

    a. Thermal stresses transferring to building structure.
    b. Glass breakage.
    c. Noise or vibration created by wind and thermal and structural movements.
    d. Loosening or weakening of fasteners, attachments, and other components.
    e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m).
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).

    a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

3. Cantilever Deflection: Limited to 2L/175 at unsupported cantilevers.

E. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

    a. Fixed Glazing and Framing Areas: NFRC 200.

2. Solar Heat-Gain Coefficient (SHGC):

    a. SHGC of as required by AHJ.

F. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.

G. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996.

1. Assembly to meet all requirements and have Miami-Dade Notice of Approval or Florida Product Approval with HVHZ endorsement.

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

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

I. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.

J. Structural Sealant: ASTM C1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed, aluminum-framed entrances and storefronts without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate, because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.3 STOREFRONT SYSTEMS

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Glazing Plane: Front.
3. Finish: Refer to finish schedule .
4. Fabrication Method: Field-fabricated stick system.
5. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
6. Steel Reinforcement: As required by manufacturer.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Insulated Spandrel Panels:
1. Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.

a. Overall Panel Thickness: 1 inch (25.4 mm).
b. Exterior Skin: Aluminum.

1) Thickness: Manufacturer's standard for finish and texture indicated.
2) Finish: Match framing system.
3) Texture: Smooth.

c. Interior Skin: Aluminum.

1) Thickness: Manufacturer's standard for finish and texture indicated.
2) Finish: Matching storefront framing.
3) Texture: Smooth.

d. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1) Flame-Spread Index: 25 or less.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: As indicated.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

4. Finish: Match adjacent storefront framing finish.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

B. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

C. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305.

D. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

E. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.

F. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

G. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

H. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

I. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).

J. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Structural Glazing Sealants: ASTM C1184 chemically 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 structural-sealant manufacturer for use in storefront system indicated.

1. Color: Black.

E. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Match structural sealant.

2.7 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.8 ACCESSORIES

A. Automatic Door Operators: Section 087113 "Power Door Operators."

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.

C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

F. Rigid PVC filler.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.10 ALUMINUM FINISHES

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

2.11 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

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

3.3 INSTALLATION OF STRUCTURAL GLAZING

A. Prepare surfaces that will contact structural sealant in accordance with sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

B. Set glazing into framing in accordance with sealant manufacturer and framing manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.

C. Set glazing with proper orientation so that coatings face exterior or interior as specified.

D. Hold glazing in place using temporary retainers of type and spacing recommended by manufacturer, until structural sealant joint has cured.

E. Apply structural sealant to completely fill cavity, in accordance with sealant manufacturer and framing manufacturer's written instructions and in compliance with local codes.

F. Apply structural sealant at temperatures indicated by sealant manufacturer for type of sealant.

G. Allow structural sealant to cure in accordance with manufacturer's written instructions.

H. Clean and protect glass as indicated in Section 088000 "Glazing."

3.4 INSTALLATION OF WEATHERSEAL SEALANT

A. After structural sealant has completely cured, remove temporary retainers, and insert backer rod between lites of glass as recommended by sealant manufacturer.

B. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.5 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.6 ERECTION TOLERANCES

A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
    c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections: Perform the following tests on representative areas of aluminum-framed entrances and storefronts.

1. Structural-Sealant Adhesion: Test structural sealant in accordance with recommendations in ASTM C1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

    a. Test a minimum of two areas on each building facade.
    b. Repair installation areas damaged by testing.

2. Egress Door Inspections: Inspect each aluminum-framed entrance door equipped with panic hardware, each aluminum-framed entrance door located in an exit enclosure, each electrically controlled aluminum-framed egress door, and

each aluminum-framed entrance door equipped with special locking arrangements, in accordance with NFPA 101, Section 7.2.1.15.

B. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 MAINTENANCE SERVICE

A. Entrance Door Hardware Maintenance:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 084113