

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 WORK INCLUDED

- A. Extent of structural steel work is shown on drawings including schedules, notes and details which show size and location of members, typical connections, and type of steel required.
- B. Furnish all labor, materials and equipment, plant, tools, scaffolding, transportation and all other services and facilities necessary for the full performance and completion of all steel fabrication and erection work as shown on the drawings and as specified herein. The work includes, but is not necessarily limited to, the following principal items:
 - 1. Structural steel framing and support members and braces, complete with required erection braces, connection plates, welds, washers, bolts, nuts, shims, anchor bolts, rivets, and templates.
 - 2. Base plates, cap plates, and shear stud connectors.
 - 3. Inspection and testing-structural steel.
 - 4. Erecting, connecting, field welding, and adjusting for plumb and level.
 - 5. All other work normally related to the above or specified under this section, such as:
 - a. Installation of the erection bracing and the removal of the erection bracing when required.
 - b. Layout of work to axis lines and/or center lines.
 - c. Protection of work and property.
- C. Furnishing anchor bolts, anchor bolt templates, loose bearing plates and embedded items: Installed under Division 3, Concrete or Division 4, Masonry.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

- A. Placing anchor bolts and grouting under base plates and bearing plates. Expansion bolts in concrete & adhesive bolts in concrete: Division 3, Cast-in-Place Concrete.
- B. Expansion bolts in masonry. Adhesive bolts in Masonry: Division 4.
- C. Handrails
- D. Loose Steel Angle Lintels Not attached to Structural Steel: Division 5, Miscellaneous Metals.
- E. Steel Stairways: Division 5, Miscellaneous Metals.

1.04 REFERENCES

- A. The work in this section shall be subject to all applicable provisions of the state and local building and safety codes including OSHA - 29 CFR Part 1926 "Safety Standards for Steel Erection; Final Rule", and all other codes referenced therein.
- B. Any material or operation specified by reference to the published specification of a manufacturer shall comply with the requirements of the standards listed herein. In case of a conflict between the structural Drawings and specifications, the strictest interpretation shall govern. All references shall

be latest editions.

- C. If requested, furnish an affidavit from the manufacturer or fabricator certifying that the materials or products delivered to the job meet the requirements specified. However, such certification shall not relieve the Contractor of the responsibility for complying with any added requirements specified herein. Comply with the following except as modified herein.
1. "Load and Resistance Factor Design Specification for Structural Steel Buildings"
 2. Connections only: Specifications for structural steel Buildings (ASD), including the supplements thereto as issued by AISC.
 3. HS Bolting Specification: "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.
 4. AWS Code: D1.1, "Structural Welding Code-Steel," by American Welding Society (AWS).
 5. Appropriate Specifications of the Steel Structures Painting Council (SSPC).
- D. ASTM A6 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling.
- E. ASTM A36 - Carbon Structural Steel.
- F. ASTM A53 - Pipe Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- G. ASTM A108 - Steel Bars, Carbon, Cold Finished, Standard Quality. [shear studs only].
- H. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- I. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- J. ASTM A490 - Heat-treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
- K. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- L. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- M. ASTM A572 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- N. ASTM A992 Structural Steel.
- O. AWS D1.1 - Structural Welding Code.
- P. AISC "Code of Standard Practice for Steel Buildings and Bridges" and Commentary. Make the following modifications to the AISC Code of Standard Practice:
1. Delete Paragraph 3.3. Substitute the following: All things which, in the opinion of the Contractor, appear to be deficiencies, omissions, contradictions or ambiguities in the Contract Documents shall be brought to the attention of the Architect/Engineer. The Contract Documents will be corrected or a written interpretation of the alleged deficiency, omission, contradiction or ambiguity will be made by the Architect/Engineer before the affected work proceeds.
- Q. Industrial Fastener Institute Handbook on Bolt, Nut and Rivet Standards.
- R. Air Reduction Company "Manual for Arc Welded Structures, Part II."
- S. Steel Structures Painting Council (SSPC).

1.05 QUALITY CONTROL:

- A. The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.
 - 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.
 - 2. The Contractor shall be responsible for correction of work which inspections and laboratory test reports have indicated not to be in compliance with specified requirements. Promptly remove and replace or correct non-conforming work in a manner and with materials approved by the Architect/Engineer. The Contractor shall bear the cost of all corrective measures, including retesting to confirm compliance.
 - 3. Cost of extra work by the Architect/Engineer to approve corrective work shall be borne by the Contractor.
 - 4. Contractor shall include in his work the necessary quality control procedures, means and methods, etc., that will result in erected steel work that meets the tolerance requirements of the AISC Code of Standard Practice for Buildings and Bridges and these specifications. Steel work that does not conform to these tolerance limitations is subject to corrective work or removal and replacement at the Contractor's expense.
- B. Fabricator Qualifications: Experienced in fabrication of structural steel with not less than 5 years of experience in the successful fabrication of structural steel for projects of similar size and difficulty. AISC Quality Certification program, category II certified.
- C. Erector Qualifications: The structural steel erector shall have not less than 2 years successful experience in the erection of structural steel of a similar nature to this project. Evidence of compliance with this section shall be submitted to the Architect/Engineer.
- D. Welder Qualifications: Welding shall be done only by welding operators currently qualified according to AWS D1.1. If recertification of welders is required, retesting will be Contractor's responsibility.
- E. Each person installing connections shall be assigned an identifying symbol or mark, and all shop and field connections shall be identified so that the inspector can refer back to the person making the connections.

1.06 QUALITY ASSURANCE:

- A. The Owner will engage a qualified Testing Agency, approved by the Engineer of Record, to perform the inspections and testing as defined in AISC "Code of Standard Practice for Steel Buildings and Bridges" and the ANSI/AWS D1.1 "American Welding Society Structural Welding Code," and as required by these specifications. The testing agency will inspect and test materials and fabrication procedures in the shop and field. Testing Agency shall comply with ASTM E329 and shall furnish a certificate of compliance signed by the Professional Engineer responsible for the management of the agency. The Professional Engineer shall be registered in the state where the project is located.
 - 1. Testing agency shall perform tests and inspections, maintain records and report results in accordance with The Building Code. The requirements specified herein apply only where they do not reduce the quality or extent of testing and inspection required by the building code.
 - 2. Perform additional tests to reconfirm any noncompliance of the original work and as may be necessary to show compliance.
 - 3. Contractor shall furnish Testing Agency access to work, facilities, and incidental labor required for testing and inspection. Retention by the Owner of an Independent Testing Agency shall in no way relieve the Contractor of responsibility for performing all work in accordance with the contract requirements. A minimum of 24-hours notification shall be

- given prior to commencement of work requiring testing and inspecting.
4. Furnish the testing agency with the following:
 - a. A complete set of approved Shop and Erection Drawings.
 - b. Mill test reports.
 - c. Full and ample means and assistance for testing all material.
 - d. Proper facilities, including scaffolding, temporary work platforms, etc., for inspection of the work in the shop and field.
 - e. Representative sample pieces requested for testing.
 - f. Reimbursement of costs for testing and inspection resulting as a consequence of the following:
 - 1) Work not in compliance with the Contract Documents.
 - 2) Testing required by the Contractor or Subcontractor.
 - 3) Testing to verify the adequacy of work done, without prior notice, or contrary to specifications and standard construction practices.
 5. Contract Obligations:
 - a. Owner Responsibility: The Owner shall pay for all initial shop and field inspections and tests as required during the fabrication and erection of the structural steel.
 - b. Contractor Responsibility: The Contractor shall pay for and arrange with the Testing Laboratory for the certification of all shop and field welders. The costs of all retesting of material or workmanship not in conformance with the Contract Documents shall be borne by the Contractor. The Fabricator and Erector shall provide the Laboratory inspector with access to all places where work is performed. A minimum of 24 hours notification shall be given prior to commencement of work requiring testing and/or inspection.
 6. Testing Agency Duties:
 - a. Assign an identifying symbol or mark to each workman installing connections. Perform shop and field inspections and tests noted herein in accordance with referenced standards. Retest and re-inspect work after corrected by Contractor.
 - b. Mark connections with Inspector's identifying mark upon acceptance; Interpret test results.
 - c. Prepare and issue reports covering each inspection and test. Specifically indicate whether work complies with Contract Documents.
 - d. At completion of inspection and testing, issue a certificate stating that all work tested and/or inspected complied with the Contract Documents. Specifically identify any work excluded from certification.
 - e. Testing Agency may inspect structural steel at plant before shipment; however, Architect/Engineer reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
 - f. The Testing Agency's inspector will perform his duties in such a way that neither fabrication nor erection is unnecessarily delayed or impeded. In no case will the inspector recommend or prescribe the method of repair of a defect.
 7. Unidentified Structural Steel:
 - a. Furnish Testing Agency with samples of structural steel not identified by mill test reports, heat or melt numbers in ample quantities to perform structural tests on 5 percent by weight of all unidentified steel. Perform tensile, bend and elongation test per ASTM A370. Submit test reports to Architect/Engineer and Construction Manager for information.
 8. Field Inspection and Testing:
 - a. Field Assembly: Inspect steel frame to verify compliance with details shown on approved drawings including, but not limited to: bracing, stiffening, member locations and proper application of joint details at connections.
 - b. Field Welding: Inspect and test during erection in accordance with AWS Code and as follows:
 - 1) Obtain copies of welders' certifications and conduct inspections and tests as required. Record types and location of all defects found in work. Record work required and performed to correct deficiencies.

- (a) Perform visual inspection of all welds. Check for size, length, pinholes, undercut and overlap. Test suspected defects using magnetic particle method for fillet welds and methods below for groove welds.
 - (b) Perform nondestructive tests of welds as follows:
 - (1) Fillet Welds: 25% of welds using magnetic particle testing methods.
 - (2) Partial Penetration Welds and Full Penetration Welds: 100% of all welds using ultrasonic testing methods.
 - 2) Additional testing: Additional testing by Owners testing agency at Contractors expense will be required if more than 10% of the tested welds are rejected, then test an additional 10% of such welds using the same testing methods. Repeat this 10% additional testing process until the rejection rate drops below one in ten.
 - c. High-Strength Bolted Connections: Inspect and test in accordance with HS bolting specification and as follows.
 - 1) Confirm accuracy of Contractor's Tension Calibration as noted above.
 - 2) Inspect as noted in "Specifications for Structural Joints Using ASTM A325 or A490 Bolts".
 - 3) Where "slip-critical" (SC) bolts are used, verify that erector is performing required pre-shift calibrations and tests. Inspect installed SC bolts by the "arbitration inspection" method, except, if any bolt fails, all bolts in that connection shall be checked and tightened, if necessary, by the erector and resubmitted. Inspect 10% of bolts, but not less than two, in each SC connection.
 - 4) Visually inspect all bolts for proper installation.
 - 5) Cost of retests on bolts and connections that fail shall be borne by Contractor.
 - 6) Alternative design tension control bolts. Visually inspect after installation per AISC requirements. Pre-test a representative sample of (5) bolts of each diameter, length, etc., at the jobsite in a device capable of indicating bolt tension.
- B. See Division 1, "Code-Required Special Inspections and Procedures"
- C. Design of Connections:
- 1. The Structural Engineer of Record (EOR) intends to provide all steel connection designs. Connection designs have been included in the contract documents.
 - a. If a connection design is inadvertently omitted from the contract documents the Contractor shall request specific, written connection design from the Structural Engineer.
 - b. Contractor deviations from connection designs shown on the contract documents will be rejected unless contractor submits complete structural calculations for approval. Calculations shall be sealed by a Professional Engineer registered in the state where the project is located.
 - c. Contractor deviations fabricated without written approval of the Structural Engineer will be deemed a Contractor design with total design responsibility remaining with the Contractor.

1.07 SUBMITTALS

A. Shop Drawings

- 1. Submit ONE (1) DIGITAL COPY of each shop drawing. Reproducible copies of contract documents shall not be used as shop drawings. Shop drawings shall be reviewed by Contractor prior to submission. Drawings shall bear Contractor's approval stamp accepting responsibility for coordination of dimensions shown in the contract documents, quantities and coordination with other trades. Drawings not bearing Contractor's stamp may be rejected at the discretion of the Architect or Structural Engineer. Digital copy will be returned with the Architect/Engineer's comments. Allow 14 calendar days in the Structural Engineers office for review of shop drawings.

- B. Submit manufacturer's certified copies of mill reports covering the chemical and physical properties of steel sections.
- C. Submit manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data as required to show compliance with the Contract Documents. Indicate by transmittal form that a copy of each applicable instruction has been distributed to fabricators, installers and erectors:
 - 1. Structural steel primer paint.
 - 2. Shrinkage-resistant grout.
 - 3. Shear studs.
 - 4. Drilled-in expansion bolts. (See Division 3 and 4 for requirements.)
- D. Shop Drawings:
 - 1. Submit Shop Drawings including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of erection.
 - a. Include details of cuts, connections, camber, holes and other pertinent data. Indicate welds by standard AWS symbols, show size, length and type of each weld.
 - b. Provide setting drawings, templates and directions for the installation of anchor bolts and other anchorages to be installed under other Sections of Work.
 - 2. Do not use reproducible copies of the Contract Documents as erection drawings.
 - 3. The Architect's/Engineer's review of Shop Drawings is for general conformance with design concepts only. Compliance with requirements for materials, fabrication and erection of structural steel is the Contractor's responsibility.
 - 4. Architect's/Engineer's review of Shop Drawings shall include the following:
 - a. Check shapes, steel grade, size, and locations.
 - b. Spot check beam lengths.
 - c. Spot check connection capacities.
 - d. Detail check of special connections.
 - e. Detail check of moment connections.
 - f. Spot check column lengths.
 - g. Check column base plate elevations.
 - h. Spot check dimensions.
 - 5. All fabricated materials and connections shall fit within architectural constraints.
 - 6. The omission from the Shop Drawings of any materials required by the Contract Documents shall not relieve the Contractor of the responsibility of furnishing and installing such materials, even though the Shop Drawings may have been reviewed and approved.
 - a. Submit dimensioned placing plans, details, and manufacturer's data for slide bearings.
 - b. Submit placing plan showing depth of embedment, spacing and edge distances, details, manufacturer's data, installation instructions for expansion and adhesive anchor bolts.
 - c. Substitutions for member sizes, type(s) of steel connection details or any other modifications proposed by the Contractor will be considered by the Architect/Engineer only under the following conditions:
 - 1) That the request has been made and accepted prior to the submission of Shop Drawings. All substitutions shall be clearly marked and indicated on the Shop Drawings as a substitute.
 - 2) That there is a substantial cost advantage or time advantage to the Owner; or that the proposed revision is necessary to obtain the required materials or methods at the proper times to accomplish the work in the time scheduled.
 - 3) That sufficient sketches, engineering calculations, and other data have been submitted to facilitate checking by the Architect/Engineer including cost reductions or savings in time to complete the work.
 - 4) In no case shall such revisions result in additional cost to the Owner.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site at such intervals to insure uninterrupted progress of the work.
 - 1. Materials to be installed by others: Deliver anchor bolts and other anchorage devices which are embedded in cast-in-place concrete or masonry construction to the project site in time to be installed before the start of cast-in-place concrete operations or masonry work. Provide setting drawings, templates and directions for installation of anchor bolts and other devices. Templates shall be permanently marked with column center lines and north arrow.
 - 2. Storage of Structural Steel: Structural steel members which are stored at the project site shall be supported above ground on platforms, skids, or other supports and stored upright to prevent twisting. Store materials in a way that permits easy access for inspection and identification. Protect steel from corrosion. Store other materials in a weather-tight and dry place until ready for use. Store packaged materials in their original, unbroken package or container.
 - a. Do not store materials on the structure in a manner that might cause distortion or damage to the members of the supporting structures. Repair or replace damaged materials or structures as directed.

1.09 JOB CONDITIONS

- A. The Contractor shall coordinate the fabrication and erection of all structural steel work with the work of other trades.
- B. Protection: Protect any adjacent materials or areas below from damage due to weld splatter or sparks during field welding.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Rolled Steel Plates, Shapes and Bars: Domestic Steel As shown on the Drawings.
 - 1. ASTM A572 Grade 50 or ASTM A992-GR50 unless noted otherwise.
 - 2. ASTM A36, where shown on the Drawings.
 - 3. Base plates and connection plates:
 - a. 8" thick or less --- A36 (Fy=36)
 - 4. Structural Steel Surfaces: For fabrication of work which will be exposed to view in the completed structure, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Cold-Formed Steel Tubing: ASTM A500, Grade B.
- C. Hot-Formed Steel Pipe: ASTM A501.
- D. Steel Pipe: ASTM A53, Type E or S, Grade B.
 - 1. Finish: Black, except where indicated to be galvanized.
- E. Anchor Bolts:
 - 1. All anchor bolts shall be made from threaded round stock conforming to ASTM Specifications as specified below as appropriate for the types and at the locations as specified on the drawings:

- a. ASTM A36 (Standard)
- b. Galvanized bolts shall be used with all galvanized base plates.
2. Nuts: All nuts with anchor bolts shall be hex head conforming to ASTM A563.
3. Washers: Washers for all base plates shall be 1/4" thick plates extending minimum 1" from edge of base plate holes on each side with holes 1/16" larger than the nominal bolt diameter. Washers shall conform to ASTM A36 steel.

F. Fasteners:

1. Standard Fasteners: ASTM A307, Grade A. Provide hexagonal heads and nuts.
2. High-Strength Threaded Fasteners: Bolts, nuts and hardened washers complying with ASTM A325 or A490.
3. Galvanized Bolts: Provide bolts, nuts and washers that are hot-dip galvanized according to ASTM A153, Class C, when used to connect steel called for on the drawings or in the specifications as hot-dip galvanized after fabrication.
4. Provide mechanically galvanized bolts, nuts and washers for A490 bolts (do not hot-dip galvanize A490 bolts) connecting steel called for on the Drawings or in the specifications as hot-dip galvanized after fabrication. Cold galvanizing compound shall be "Z.R.C. Cold Galvanizing Compound" as manufactured by Z.R.C. Chemical Products.
5. Bolts:
 - a. As specified in H.S. bolting specification. Alternate design tension control bolts may be used at contractor's option. All bolts shall be new and unused.
 - b. Bolt Lubrication: All bolts shall be well lubricated at time of installation. Dry, rusty bolts will not be allowed. Bolts or nuts shall be wax dipped by the bolt supplier or "Johnson's Stick Wax 140" shall be used with all bolts in the shop or field.
6. Shear Connectors (Headed Studs): Shear connectors and their installation shall meet all requirements specified in AWS D1.1 "Structural Welding Code Steel", diameter and finished length of shear connectors are shown on the drawings.
7. Electrodes for Welding: Comply with requirements of AWS D1.1.

G. Coatings:

1. Shop Paint: (primer).
 - a. Shop paint not required. [Fabricators standard rust-inhibiting primer]
 - b. Where steel is to be field painted, provide shop coat of primer paint compatible with finish paint system specified in Division 9.
2. Hot-Dip galvanizing:
 - a. Scope: Hot-dip galvanize after fabrication all structural steel items and their connections permanently exposed to the weather. Such items include, but are not limited to:
 - 1) Shelf angles.
 - 2) Parapet wall supporting members.
 - 3) Screen wall supporting member.
 - 4) Window washing support members.
 - 5) All embedded plates in concrete.
 - 6) Garage guardrail steel and connections.
 - 7) Cooling tower support steel.
 - 8) Building skin support steel exposed to moisture outside the exterior waterproofing surface.
 - 9) Examine the architectural and structural drawings for other items required to be hot-dipped galvanized.
 - 10) Galvanize all nuts, bolts, and washers used in the connection of such steel. Field welded connections shall have welds protected with "Z.R.C. Cold Galvanizing Compound" as manufactured by Z.R.C. Products Company.
 - b. Surface Preparation: All steel to be hot-dip galvanized shall undergo the following surface preparation as specified by the Steel Structures Painting Council (SSPC),

Volume 2.

- 1) Remove grease, oil, grime and all foreign contaminants by thorough cleaning with an alkaline or organic solvent followed by thorough rinsing in cold water.
- 2) Remove scale by pickling in diluted sulfuric or hydrochloric acid. Pickling shall be followed by a rinse in warm water and a second rinse in cold water. As an alternative to pickling, the steel may be white metal blast cleaned according to SP5 of the SSPC Specification.
 - (a) Dipping in a flux solution of zinc ammonia chloride followed by drying at room temperature.
- c. Zinc Coating: The zinc coating for steel shapes and plates shall conform to ASTM A123, "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products." Weight of zinc coating per square foot of surface for 1/8 inch and 3/16 inch thick steels shall average not less than 2.0 oz. with no individual thickness less than 1.8 oz.; for 1/4 inch thick and heavier steel, the coating weight shall average not less than 2.3 oz. with no individual thickness less than 2.0 oz.
- d. Cold Galvanizing: Cold galvanizing compound shall be Z.R.C. Cold Galvanizing Compound" as manufactured by Z.R.C. Chemical Products and applied according to manufacturer's instructions.

2.02 FABRICATION

A. General:

1. Conform to requirements of standards listed in part 1.
2. Detailing and fabrication procedures shall account for distortion and shrinkage due to welding processes, both in the shop and in the field.

B. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in the shop to the greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the final approved Shop Drawings.
2. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
3. Properly mark and match-mark materials for field assembly. Clearly mark the grade of steel on each piece for purpose of field inspection and confirmation of grade of steel.
4. Take field measurements on site as required for correct fabrication and installation. Fabricator shall be responsible for errors in fabrication and for correct fit of structural steel.
5. Cutting: Manual oxygen cutting shall be done only with a mechanically guided torch. An unguided torch may be used provided the cut is not within 1/2 inch of the finished dimension and final removal is completed by means such as chipping or grinding to produce a surface quality equal to that of the base metal.
6. Ends of columns at splices and at other bearing connections shall be finished level and true. Filler plates used at finished surfaces shall be finished at same time as column, beam, etc.
7. Compression Joints: Compression joints which depend on contact bearing as part of the splice capacity shall have the bearing surfaces of individual fabricated pieces prepared to a common plane by milling, sawing, or other suitable means.
8. Fitted stiffeners shall be fabricated neatly between flanges, and the ends of stiffeners shall be milled or ground to secure an even bearing against abutting surfaces. All milled or ground joints shall bear throughout their contact length.
9. Splices in Structural Steel: Splicing of members in the shop or the field to obtain the required lengths is not permitted without prior approval of the Architect/Engineer unless shown on the Drawings. Any member having a splice not shown and detailed on approved Shop Drawings will be rejected.
10. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members as shown on the

contract documents, and/or the final Shop Drawings.

- a. Provide specialty items as indicated to receive other work.
 - b. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
 - c. No cutting or drilling will be permitted on the job without the written approval of the Architect/Engineer.
11. Built up sections with milled surfaces shall be completely assembled or welded before milling.
 12. Where shop painting is required, complete the assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in the final structure free of markings, burrs, and other defects.
 13. Finished Work: All work shall be finished in accordance with the approved Shop Drawings and shall be true and free from twists, kinks, buckles, open joints, and other defects.

C. Welding:

1. Comply with AISC specifications and latest American Welding Society standards.
2. Welding processes other than shielded metal arc and submerged arc may be used provided procedure qualification tests in accordance with the American Welding Society are made for the intended application of any such process.
3. The toughness and notch sensitivity of the steel shall be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.
4. Filler Metal Requirements: Weld metal shall be as specified in AWS D1.1, except E70-T-4 electrodes not allowed.
 - a. Electrodes and welding procedures used on moment frames that resist seismic loads shall produce a minimum weld toughness of 20 ft. lbs. at (-)20 degrees F. Submit proposed welding electrodes and procedures for approval.
5. Minimum Strength of Welded Connections:
 - a. Unless noted otherwise on the Drawings, all shop and field welds shall develop the full tensile strength of the member or element joined.
 - b. All members with moment connections, noted on the Drawings shall be welded to develop the full flexural capacity of the member, unless noted otherwise on the drawings.
6. Minimum Size of Welds:
 - a. Fillet welds not specified shall be 3/16 inch fillet continuous but not less than the AISC minimum based on the thickness of the parts joined.
 - b. Partial Penetration Groove Welds: The minimum effective throat thickness of partial penetration groove welds shall be as specified in AWS D1.1.
7. Welding Procedures:
 - a. Before welding, particular attention shall be paid to surface preparation, fit-up, and cleanliness of surfaces to be welded.
 - b. Shear Stud Connectors: Automatically end weld according to AWS D1.1. Shop weld where possible. Thoroughly clean surface where stud is to be attached; remove mill scale by grinding or sandblasting where it is sufficiently thick to interfere with proper welding. At metal deck, field install by welding through deck.

2.03 CONNECTIONS

A. General:

1. Provide connections as shown or noted on the Drawings. Bearing-type bolts in slotted holes shall not be used to transmit any component of stress in the direction of the slot. No combination of bolts and welds shall be used to transmit stress in the same faying surface of any connection.
2. Bolt field connections, except where welded connections or other connections are indicated on the Drawings. Provide high-strength threaded fasteners for all bolted connections.

3. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
 - a. Minimum bolt diameter shall be 3/4 inch except as shown otherwise.
 - b. Allowable values for "X" type bearing connections shall not be used in connection design unless noted otherwise on the drawings.
 - c. Bolts in slip critical connections shall be fully tensioned. All column splices, moment connections, brace connections, connections in tension, connections subject to vibration loads, and truss connections shall be detailed and installed as slip critical.
 - d. Snug tight bolts. Bolts in connections not within the slip-critical category, or subject to tension loads or required to be fully tensioned bearing type connections, need only be tightened to the snug tight condition. Snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact. This may be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
 - e. All shear connections at moment connected pieces shall be friction type connections.
 4. Minimum reaction capacity shall be 12.0 kips and each connection shall contain not less than two 3/4" diameter bolts.
- B. Simple Beam Connections:
1. Simple Beam Design Capacity: Unless a larger reaction is shown otherwise on the plans, minimum design forces shall be as follows:
 - a. For non-composite beams, select connections to support half of the allowable load on the beam, defined in the AISC Beam Tables.
 - b. For composite beams, select connections to support the reaction shown on the drawings or 50% of allowable load on the beam as defined in the AISC Beam tables, whichever is greater. Notify Architect/Engineer in writing of any missing reactions. Note reactions are service loads (ASD) and are not factored.
 2. Connections at the ends of plate girders shall be double angle framed beam connections using high-strength bearing bolts. Connection shall be designed using the reactions shown on the Drawings.
- C. Moment Connections:
1. Furnishing of Reinforcement in Moment Connected Joints: Column stiffeners and/or doubler plates shall be furnished as shown on the drawings.
- D. Columns:
1. Lifting and Erection Devices: The fabricator shall be responsible for designing, detailing and furnishing all lifting devices and erection aids required for erection. Such devices shall be removed after erection if they interfere with architectural finish requirements.
- E. Struts and Braces:
1. Connections for all struts, hangers, and braces not detailed on the drawings shall be designed to develop the full allowable tensile strength of the member.
 2. Compression members composed of two or more rolled shapes separated from one another by intermittent fillers shall be connected to one another at such fillers at intervals so that the slenderness ratio l/r of either shape, between the fasteners, does not exceed 75% of the governing slenderness ratio of the built-up member. The least radius of gyration, r , shall be used in computing the slenderness ratio of each component part.
- F. Stiffeners: Provide stiffeners finished to bear under all load concentrations on supporting members, on all members framing over columns, at beam column joints where shown on the Drawings.
- G. Steel Shelf Angles: Continuous shelf angles supporting face brick shall be furnished in lengths corresponding to dimensions between brick control joints. Provide supports (hangers) as shown on

drawings. Provide supports within 1-6" of control joints. Detail a 1/4" gap between angles at all joints. Shelf angles shall be continuous around corners. See Architectural drawings for location of control joints.

- H. Limitations on Use of A307 Bolts: All bolts shall be A325 or A490 except where shown as A307 on plans.
- I. Bolts in Combination with Welds: A307 or high-strength bolts used in bearing-type connections shall not be used in combination with welds for stress transmission in the same faying face of any connection, as specified in AISC Specification.

2.04 SHOP CLEANING AND PAINTING

- A. Clean steel in accordance with Steel Structures Painting Council (SSPC):
 - 1. SP-2 "Hand Tool Cleaning"
 - 2. SP-3 "Power Tool Cleaning"
 - 3. SP-6 "Commercial Blast Cleaning"
- B. Coordinate all shop painting of structural steel with Architect's painting requirements as specified on the architectural drawings and in the specifications. Prepare structural steel scheduled to receive architectural finish paint in accordance with SP-6 "Commercial Blast Cleaning".
- C. Shop prime all structural steel, except as follows:
 - 1. Structural steel surfaces to be welded or high-strength bolted with slip-critical connections.
 - 2. Structural steel surfaces scheduled to receive sprayed fireproofing.
 - 3. Structural steel top flange surfaces that are to receive shear connectors field welded through composite metal deck.
 - 4. Structural steel members or those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on the exposed portion and the initial 2 inches of embedded areas only.
 - 5. Contact milled bearing surfaces.
 - 6. Do not paint surfaces that are galvanized.
 - 7. Surface Preparation - Unpainted Steel: All structural steel that is not specified to receive a shop coat of primer paint shall be cleaned of oil and grease using solvent cleaners and cleaned of dirt and other foreign material by sweeping with a wire brush or other suitable means.
- D. Apply two (2) coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.
- E. Members that are exposed to the weather in the finished structure shall be hot-dipped galvanized. Galvanizing shall not contaminate or otherwise impede the welding process.
- F. Clean structural steel scheduled to be primed. Remove loose rust, loose mill scale, spatter and slag or flux deposits in accordance with SP-2 "Hand Tool Cleaning" or SP-3 "Power Tool Cleaning" at Contractor's option.
- G. Clean after fabrication and immediately prior to shop painting or shipment. Apply shop coat of paint in accordance with manufacturer's instructions within four (4) hours after cleaning and before rust-bloom occurs.

PART 3 EXECUTION

3.01 INSPECTION/VERIFICATION

- A. The Contractor and the structural steel erection contractor shall separately check and agree on the

correct positioning of anchor bolts before concrete is placed.

- B. Prior to start of erection, the steel erector shall check the elevation of all bearing surfaces and the location of all embedded anchor bolts and connection plates, and shall notify the Architect/Engineer in writing of all deviations from the Contract Documents.
- C. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 ERECTION

- A. Erect structural steel in accordance with the AISC Code of Standard Practice for Steel Buildings and Bridges and Commentary as modified herein.
- B. Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Consider all structural steel as non-self-supporting steel frames. Remove temporary members, bracing, and connections when permanent members are in place, final connections are made, and concrete for floor slab has attained 75% of its design strength. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds.
 - 1. Column base plates have been designed for conditions that exist upon completion of the structure and for minimum requirements of OSHA - 29 CFR Part 1926. Unless structural drawings indicate otherwise, columns have not been designed for other temporary lateral construction loads. Contractor should assume columns are unstable and require temporary support.
- C. Provide temporary planking and working platforms as necessary to effectively complete the Work.
- D. Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
 - 1. Furnish 1/8" minimum steel templates and other devices as necessary for pre-setting bolts and other anchors to accurate locations.
- E. Prior to setting base plates and bearing plates, clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing plates.
 - 1. Set loose and attached base plates and bearing plates [and leveling plates] for structural members level (+ 1/32") and at correct elevation (+ 1/16") on steel shims or wedges or other adjustable devices.
 - 2. Tighten the anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.
- F. Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of the structure within specified AISC tolerances.
 - 2. Establish required leveling and plumbing measurements on a mean operating temperature of the structure of 70 degrees F. Compensate for the difference in temperature at time of erection.
 - 3. Do not enlarge improperly located holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
 - 4. Splice members only where shown on the Drawings.

- G. Field Connections: Make field connections with bolts, high-strength bolts, or field welding unless otherwise indicated. Bolts in columns splices, moment connections subject to vibration loads and truss connectors shall be detailed and installed as slip critical and shall be tightened to provide minimum tension shown in "Specification for Structural Joints using ASTM A325 or A490 Bolts." Unless noted otherwise, other bolts need only be tightened to the snug tight condition. Clean existing surfaces before welding to existing steel. No drifting or cutting to enlarge unfair holes will be allowed. Make minor corrections by reaming. Serious defects shall not be corrected in the field but shall be called to the attention of the Architect/Engineer for a decision as to the method and/or procedure.
1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to field welds.
 2. At moment connections where beams are groove welded directly to columns or girders in the field, welds shall be made after installation of erection bolts to draw the pieces together and before the shear connection bolts are tightened. Where loose moment plates are used, such plates shall be groove welded to columns prior to connecting these plates to the beams.
 3. On exposed welded construction, remove erection bolts, fill holes and plug welds, and grind smooth at exposed surfaces.
- H. Compression Splices: Fasten splices in compression after bearing surfaces have been brought into contact. Clean bearing surfaces before assembling. All gaps 1/32" wide or greater shall be closed by driving non-tapered mild steel shims full depth of the bearing surface along the full length of the gap.
- I. Do not use gas cutting torches in the field for correcting fabrication errors in the structural framing. Cutting will be permitted only on secondary members who are not under stress only when approved by the Architect/Engineer. Finish gas-cut sections equal in accordance with requirements of AWS D1.1 when permitted. The fabricator shall be responsible for errors in fabrication and for correct fit in the field.
- J. After erection, clean field welds, bolted connections and abraded areas of shop primed members. Apply primers to exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mills.
- K. Erection Tolerances: Comply with requirements of AISC Code of Standard Practice.
1. Other Members: Deviation of member working point horizontal location and elevation with respect to the supporting member shall not exceed +/- 1/16" from the location and elevation shown on the Drawings.
- L. Verification of Erection Tolerances:
1. Surveys, made by the Contractor's Surveyor shall be made as follows:
 - a. Actual plan location at the top and bottom splice points of each column shall be determined immediately upon completion of each of the first four tiers erected and every third tier thereafter.
 - b. Actual elevation at the top splice point of each column shall be determined immediately upon completion of every third tier.
 - c. Actual elevation at each support and at midspan of the top of all members framing into columns shall be determined prior to erection and/or installation of any materials over the top of the members.
 2. Survey reports shall be provided to the Architect/Engineer and Owner for information within 24 hours after recording the data. Such reports shall, in addition, identify all deviations of member location and/or elevation in excess of allowable tolerances specified.
 3. Take necessary measures and modify details and/or procedures as required to correct any columns whose plan location or top elevation vary beyond allowable tolerances. Review of survey data by the Owner and/or his consultants is for verification of compliance with

specified tolerances only and does not relieve the Contractor of responsibility for complying with all contract requirements.

3.03 SUPPORT OF OTHER WORK

- A. No permanent loading, other than the weight of supported steel deck and concrete slabs, shall be imposed on steel composite beams and girders until the concrete in such slabs has achieved 75 percent of its design strength, without prior approval by the Architect/Engineer. If for construction convenience, additional loads are proposed, the Contractor shall submit calculations prepared by a Structural Engineer registered in the state where the project is located verifying the adequacy of the steel members to support the anticipated loading. All costs associated with the accommodation of such loading, including review of submittals and modification of steel members and/or details, shall be borne by the Contractor.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous steel framing and supports.
 - 2. Miscellaneous steel trim.
 - 3. Metal bollards.
 - 4. Countertop support
 - 5. Loose bearing and leveling plates.
 - 6. Pre-manufactured balconies
 - 7. Juliette balconies
 - 8. Metal coping
 - 9. Metal screening
 - 10. Bent exterior metal sheet

- B. Products furnished, but not installed, under this Section:
 - 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.

1.2 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.

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

- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- F. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and preprimed by the coil-coating process to comply with ASTM A 588 (Corten)

2.3 NONFERROUS METALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Post-Installed Anchors: Torque-controlled expansion anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.5 MISCELLANEOUS MATERIALS

- A. Epoxy Zinc-Rich Primer: Compatible with topcoat.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

- E. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. 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.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches o.c.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.
- D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.8 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.
- C. Galvanize exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.9 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- thick steel plate welded to bottom of sleeve.
- C. Prime bollards with zinc-rich primer.

2.10 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3 unless otherwise indicated.
 - 2. For elevator pit ladders, comply with ASME A17.1.
- B. Galvanized Steel Ladders:
 - 1. Space siderails 18 inches apart unless otherwise indicated.
 - 2. Siderails: Continuous channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
 - 3. Rungs: Not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.

2.11 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on concrete construction. Drill plates to receive anchor bolts and for grouting.

2.12 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Galvanize and prime loose steel lintels located in exterior walls.
- C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.13 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.14 PREMANUFACTURED BALCONIES

- A. Engineered aluminum deck and balcony framing system designed for commercial and residential applications.
 - 1. Basis of Design: Endurable Building Products.
 - 2. Finish: Powder coat
 - 3. Color: As selected by manufacturers full range.
- B. Provide all deck, railings, and all support systems as detailed and as recommended by manufacturer.
- C. Provide all components including, joists, beams, composite deck, railings, and all fasteners and support systems as detailed and as recommended by manufacturer.
 - 1. Railing shall be designed by licensed Engineer in the State of Colorado in accordance with ASTM E 985, ASTM E 894 and E 935.

- a. Refer to Division 05 Section "Railings" for additional requirements.

2.15 JULIETT BALACONIES

- A. Fabricate balconies to match architects design, provide all fasteners and anchors required.
 - 1. Finish: Powder coat

2.16 COUNTERTOP SUPPORT

- A. Flush Countertop Support Brackets:
 - 1. Basis of Design: Rakks/Rangine Corporation; EH-1824-FM
 - 2. Size: 18x26 inches
 - 3. Finish: Clear anodized.
- B. Concealed Supports: Refer to Drawings.

2.17 METAL SCREENING

- A. Welded Wire Mesh: Intermediate-crimp, square pattern, made from 0.250 inch nominal diameter wire complying with ASTM A 510.
 - 1. Galvanized, Pre-Galvanized, Mill Finish.
 - 2. Size: 2x2 inches Opening (Square)
 - 3. 79 percent Open Area
- B. Fabricate steel frame to comply with Drawings, finish to match architects sample.

2.18 BENT METAL SHEET EXTERIOR PANELING

- A. Fabricate panels from 22 gauge galvanized steel sheet.
- B. Refer to Drawings for additional information on finish and anchoring to substrate.

2.19 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.20 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- 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.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

- D. Shop Priming: Apply alkyd shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- E. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- F. Custom exposed "raw" steel finishes: Match architects sample, Options include but not limited to, fabricator to provide samples for approval prior to the finishing of steel.
 - 1. Oil Based Coating: Basis of Design, Penetrol
 - 2. Natural Wax (Beeswax and Carnauba was); Briwax
 - 3. Clear Lacquers: Permalac Clearcoat

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.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING METAL BOLLARDS

- A. Refer to Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
- C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055100 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Preassembled steel stairs.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, licensed in the State of Utah, using performance requirements and design criteria indicated.
- B. Single Source Responsibility: Provide components, products and materials specified in this section from a single American Institute of Steel Construction (AISC) certified manufacturer.
- C. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 1. Uniform Load: 100 lbf/sq. ft..
 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less.

1.3 SUBMITTALS

- A. Product Data: For metal stairs.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation, licensed in the State of Colorado.

1.4 QUALITY ASSURANCE

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- F. Wire Rod for Grating Crossbars: ASTM A 510.
- G. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.
- H. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.
- I. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

2.2 MISCELLANEOUS MATERIALS

- A. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
 - 1. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
- C. Apply clear lacquer to concealed surfaces of extruded units set into concrete.
- D. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer compatible with topcoat.

2.3 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
 - 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without impairing work.
- E. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

4. Weld exposed corners and seams continuously unless otherwise indicated.
 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- F. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- ## 2.4 STEEL-FRAMED STAIRS
- A. Stair Framing:
1. Fabricate stringers of channels.
 2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements indicated.
 3. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below.
 5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- B. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
- C. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from rolled-steel floor plate of thickness needed to comply with performance requirements, but not less than 1/4 inch needed to comply with performance requirements, but not less than 3/16 inch needed to comply with performance requirements, but not less than 1/8 inch. Form treads with integral nosing and back edge stiffener. Weld steel supporting brackets to stringers and weld treads to brackets.
- ## 2.5 FINISHES
- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
- D. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- E. Install precast concrete treads with adhesive supplied by manufacturer.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- C. Clean exposed surfaces of stair treads and risers. Use cleaners appropriate for precast concrete finishes and colors. Acid based cleaners may alter finish and color.
- D. Barrier Gates shall be shimmed if necessary to properly fit and close to rail termination post. Adjust spring hinges for proper tension to allow gate to close without assistance.

END OF SECTION 055100

SECTION 055213 - RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes steel pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 80), unless another grade and weight are required by structural loads.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
 - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- D. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer compatible with topcoat.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Welded Wire Mesh: Intermediate-crimp, square pattern, 3 inch wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 510.

2.4 FABRICATION

- A. 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.
- B. Form work true to line and level with accurate angles and surfaces.
- C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- D. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- E. Form changes in direction by inserting prefabricated elbow fittings.

- F. Close exposed ends of railing members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers to transfer loads through wall finishes.
- I. Mesh Infill: Woven wire mesh crimped into 1-by-1/2-by-1/8-inch steel channel frames. Orient wire mesh with as indicated.

2.5 STEEL AND IRON FINISHES

- A. Powder-Coat Finish: Prepare, treat, and coat ferrous metal to comply with resin manufacturer's written instructions and as follows:
 - 1. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Treat prepared metal with metallic-phosphate pretreatment, rinse, and seal surfaces.
 - 3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils.
 - 4. Color: As indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Anchor posts in concrete by inserting into formed or core-drilled holes and grouting annular space.
- D. Anchor posts to metal surfaces with oval flanges.
- E. Anchor railing ends at walls with round flanges anchored to wall construction.
- F. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.
- G. Attach railings to wall with wall brackets, except where end flanges are used. Use type of bracket with predrilled hole for exposed bolt anchorage.
- H. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION 055213

SECTION 055800 - FORMED-METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes closures and trim also reference in the drawings as “Brake Metal”

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. Closure and trim.
- B. Shop Drawings: Detail fabrication and installation of the following formed-metal fabrications. Include plans, elevations, sections, and details of components and their connections. Show anchorage and accessory items.
 - 1. Closures and trim.
- C. Coordination Drawings: For formed-metal fabrications housing items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.
- D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch- square samples of metal of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing formed-metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Source Limitations: Obtain formed-metal fabrications through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver formed-metal fabrications wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.
- B. Store products on elevated platforms in a dry location.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where formed-metal fabrications 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.

PART 2 - PRODUCTS

2.1 SHEET METAL

- A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.
- B. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial quality or lock-forming quality, stretcher-leveled standard of flatness.
- C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Class C coating, commercial quality, stretcher-leveled standard of flatness.
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 366/A 366M, matte finish, stretcher-leveled standard of flatness. Electrolytic zinc-coated steel sheet complying with ASTM A 591/A 591M, Class C coating, commercial quality, stretcher-leveled standard of flatness, may be substituted at fabricator's option.
- E. Aluminum Sheet: Flat sheet complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy 5005-H15.

2.2 MISCELLANEOUS MATERIALS

- A. Flexible Cellular Neoprene Gaskets: ASTM D 1056, Type 1, Class A, grade as recommended by gasket manufacturer to obtain airtight seal for application indicated.
- B. Joint Sealants for Concealed Joints: One-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids.
- C. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.
 - 1. Use filler metals that will match the color of metal being joined and will not cause discoloration.
- D. Fasteners: Use fasteners fabricated from same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnecting formed-metal fabrications and for attaching them to other work, unless otherwise indicated.

2.3 PAINT

- A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."
- B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble formed-metal fabrications in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of formed-metal fabrications with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned, unless otherwise indicated.
- C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.
- D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness specified for stretcher-leveled sheet metal and sufficient strength for indicated use.
 - 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.
- F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install formed-metal fabrications.

2.5 CLOSURES AND TRIM

- A. Form closures and trim from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction.
 - 1. Metal for Interior and Exterior Installations: Aluminum as indicated on the Drawings.
 - 2. Closures and trim may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view and not exposed to weather.
- B. Conceal fasteners where possible; otherwise, locate where they will be as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.
- C. Drill and tap holes needed for securing closures and trim to other surfaces.
- D. Incorporate gaskets where indicated or needed for concealed, continuous seal at abutting surfaces.
- E. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

2.7 ALUMINUM FINISHES

- A. Finish: Match adjacent metal.

2.8 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.
- B. Finish: Match adjacent metal.

2.9 STEEL SHEET FINISHES

- A. Pretreatment: Immediately after cleaning, apply a conversion coating of type suited to organic coating applied over it.
- B. Finish: Match adjacent metal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate and place formed-metal fabrications level, plumb, and in alignment with adjacent construction.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- D. Install concealed gaskets, joint fillers, insulation, and flashings, as the Work progresses, to make exterior formed-metal fabrications weatherproof.
- E. Install concealed gaskets, joint fillers, and insulation, as the Work progresses, to make interior formed-metal fabrications soundproof or lightproof as applicable to the type of fabrication indicated.
- F. Corrosion Protection: Coat concealed surfaces of aluminum, zinc-coated, and nonferrous metals that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 ADJUSTING

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

3.3 PROTECTION

- A. Protect finishes of formed-metal fabrications from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 055800

