DIVISION 05

METALS

SECTION 05010 - METAL MATERIALS

PART 1 - GENERAL

1.01 REQUIREMENTS

A. Metal materials not otherwise specified shall conform to the requirements of this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements for specific products made from the materials specified herein are included in other sections of the Specifications. See the section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. ASTM A36 Standard Specification for Structural Steel

B. ASTM A47 Standard Specification for Malleable Iron Castings

C. ASTM A48 Standard Specification for Gray Iron Castings

D. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

E. ASTM A123 Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip

F. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

G. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

H. ASTM A276 Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes

I. ASTM A307 Standard Specification for Carbon Steel Externally Threaded Standard Fasteners

J. ASTM A446 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) quality

K. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

L. ASTM A501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

M. ASTM A529 Standard Specification for Structural Steel with 42 000 psi (290 Mpa) Minimum Yield Point (1/2 in. (12.7 mm) Maximum Thickness)

N. ASTM A536 Standard Specification for Ductile Iron Castings

O. ASTM A570 Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality

P. ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

Q. ASTM A780 Standard Practice of Repair of Damaged Hot-Dip Galvanized Coatings

R. ASTM A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

S. ASTM A992 Standard Specification for Structural Steel Shapes

T. ASTM A666 Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications

U. ASTM B26 Standard Specification for Aluminum-Alloy Sand Castings

V. ASTM B85 Standard Specification for Aluminum-Alloy Die Castings

W. ASTM B108 Standard Specification for Aluminum-Alloy Permanent Mold Castings

X. ASTM B138 Standard Specification for Manganese Bronze Rod, Bar, and Shapes

Y. ASTM B209 Standard Specification for Aluminum-Alloy Sheet and Plate

Z. ASTM B221 Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

AA. ASTM B308 Standard Specification for Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded

AB. ASTM B574 Standard Specification for Nickel-Molybdenum-Chromium Alloy Rod

AC. ASTM F468 Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

AD. ASTM F593 Standard Specification for Stainless Steel Fasteners

1.04 SUBMITTALS

A. Material certifications shall be submitted along with any shop drawings for metal products and fabrications required by other sections of the Specifications.

1.05 QUALITY ASSURANCE

A. Owner may engage the services of a testing agency to test any metal materials for conformance with the material requirements herein. If the material is found to be in conformance with Specifications the cost of testing will be borne by the Owner. If the material does not conform to the Specifications, the cost of testing shall be paid by the Contractor and all materials not in conformance as determined by the Engineer shall be replaced by the Contractor at no additional cost to the Owner. In lieu of replacing materials the Contractor may request further testing to determine conformance, but any such testing shall be paid for by the Contractor regardless of outcome of such testing.

PART 2 - PRODUCTS

2.01 CARBON AND LOW ALLOY STEEL

A. Material types and ASTM designations shall be as listed below:

1. Structural Fabrications A992, A572 Grade 50, or A36

2.	Sheet Steel	A 570 Grade C
3.	Steel Angles and Plates	A36
4.	Bars and Rods	A 36 or A307 Grade A
5.	Pipe - Structural Use	A53 Type E or S, Grade B
6.	Tubes	A500 Grade B or A501
7.	Cold-Formed Structural Studs and Joists (18-22 gauge) Cold-Formed Structural Studs and Joists (12-16 gauge)	A 446 Grade C A 446 Grade D

B. Steel shapes, plates and bars which are to be galvanized shall be galvanized in accordance with ASTM A123. Iron and steel sheet which are to be galvanized shall be galvanized in accordance with ASTM A924. All connections for galvanized members shall use fasteners galvanized in accordance with ASTM A153 unless noted otherwise.

2.02 STAINLESS STEEL

A. All stainless steel fabrications exposed to underwater service shall be Type 316. All other stainless steel fabrications shall be Type 304, unless noted otherwise. All connections for stainless steel fabrications shall use Type 304 or 316 stainless steel fasteners. Fasteners shall be of the same alloy type as the structural members.

B. Material types and ASTM designations are listed below:

1.	Plates and Sheets	ASTM A167 or A666 Grade A
2.	Structural Shapes	ASTM A276
3.	Fasteners (Bolts, etc.)	ASTM F593

2.03 ALUMINUM

A. All aluminum shall be alloy 6061-T6, unless otherwise noted or specified herein.

B. Material types and ASTM designations are listed below:

1.	Structural Shapes	ASTM B308
2.	Castings	ASTM B26, B85, or B108
3.	Extruded Bars	ASTM B221 - Alloy 6061
4.	Extruded Rods, Shapes and Tubes	ASTM B221 - Alloy 6063
5.	Plates	ASTM B209 - Alloy 6061
6.	Sheets	ASTM B221 - Alloy 3003

C. All aluminum shall be provided with mill finish unless otherwise noted.

D. Where bolted connections are indicated, aluminum shall be fastened with Type 304 stainless steel bolts unless noted otherwise.

E. Aluminum in contact with dissimilar materials shall be insulated with an approved dielectric.

2.04 CAST IRON

A. Material types and ASTM designations are listed below:

1. Gray ASTM A48 Class 30B
2. Malleable ASTM A47
3. Ductile ASTM A536 Grade 60-40-18

2.05 BRONZE

A. Material types and ASTM designations are listed below:

1. Rods, Bars and Sheets ASTM B138 - Alloy B Soft

2.06 HASTELLOY

A. All Hastelloy shall be Alloy C-276.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, materials, equipment and services for furnishing and installing the structural steel as shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-In-Place Concrete - Section 03300

B. Metal Materials - Section 05010

1.03 SUBMITTALS

A. Complete shop and erection drawings shall be submitted for review. Shop drawings shall be submitted in accordance with Section 01300. All welds shall be indicated by standard welding symbols of the AWS.

B. Templates shall be furnished, together with instructions for the setting of anchors, anchor bolts, and bearing plates. The Contractor shall ascertain that the items are properly set during the progress of the work.

1.04 APPLICABLE PUBLICATIONS

The current issue of the following publications form a part of this specification to the extent indicated by the reference thereto:

A. American Institute of Steel Construction publications: (AISC):

1. Code of Standard Practice for Steel Buildings and Bridges.

2. Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.

3. Steel Construction Manual - Latest Edition.

B. American Welding Society Publication (AWS): Structural Welding Code, D1.1-82.

C. Research Council on Riveted and Bolted Structural Joints (RCRBSJ) of the Engineering Foundation Publication: Specifications for Structural Joints Using ASTM A 325 or a 490 Bolts.

1.05 GENERAL REQUIREMENTS

A. Except as otherwise specified hereinafter, the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings shall govern the Work. Welding shall be in accordance with AWS Code D1.1. High-strength bolting shall be in accordance with RCRBSJ Specifications for structural joints using ASTM A 325 or A 490 Bolts.

B. Design of members and connections for any portion of the structures not indicated on the Contract Drawings shall be completed by the fabricator and indicated on the shop drawings.

C. Substitution of sections or modification of details, or both, and the reasons therefor shall be submitted with the shop drawings for review. Approved substitutions, modifications, and necessary changes in related portions of the work shall be coordinated by the Contractor and shall be accomplished at no additional cost to the Owner.

D. Responsibility for Errors: The Contractor shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural member.

E. Storage of Materials: Materials shall be stored out of contact with the ground in such a manner and location which will minimize contamination and deterioration.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Material shall conform to the following:

1.	Wide Flange Shapes	ASTM A992
2.	Steel Plates, Channels, S-shapes, and HP-shapes	ASTM A36
3.	Rectangular and Round Hollow Structural Sections	ASTM A500, Grade B
4.	Steel Pipes	ASTM A53
5.	Crane Rails	ASTM A759
6.	Bolts	ASTM A325
7.	Anchor Bolts	ASTM F1554
8.	Rolled Steel Floor Plates	ASTM A786
9.	Steel Castings	ASTM A27,Grade 65-35
10.	Tension-control Twist-off type Bolt Assemblies	ASTM F1852
11.	Hardened Steel Washers	ASTM F436

B. Welding electrodes shall conform to requirements shown in Table 4.1.1 of AWS D1.1 and shall be E70XX or F7XEXXX.

PART 3 - EXECUTION

3.01 FABRICATION

A. Structural material shall be fabricated and assembled in the shop to the greatest extent possible. Shearing, flame cuttings, and chipping shall be done carefully and accurately. Sheared and flame cut edges shall be finished smooth by grinding, chipping, or planing. The radii of re-entrant flame cut fillets shall be not less than one inch and as much larger as practicable. Sole plates of beams and girders shall have full contact with the flanges. Where shown or required, stiffeners shall be fitted neatly between the flanges of beams and girders and, where tight fits are required to transmit bearing, the ends of stiffeners shall be milled or ground to secure an even bearing against the flanges or shall be grooved and fully buttwelded to the flanges. The corners of stiffener plates shall be cut to clear fillets of beams. The clearance between the ends of spliced web plates shall not exceed 1/4 inch. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the reaming operation. Structural steelwork shall be prepared for painting in accordance with the AISC specification and primed with paint materials hereinafter specified.

B. Connections shall be as shown or, if connection details are not shown on the Drawings, the connections shall be designed for the reactions shown on the Drawings. Where connection details or reactions are not shown on the Drawings, the connections shall be designed for a shear equal to one-half of the allowable uniform load for simple beams, laterally supported, for the spans indicated, as tabulated in the AISC manual of steel construction, plus 5000 pounds. Connections shall be designed in accordance with the recommendations given in the AISC manual of steel construction, Eighth Edition. One-sided or other types of eccentric connections will be permitted only where shown on the Contract Drawings or accepted by the Engineer.

C. Steel work to be encased in concrete, including surfaces of top flanges of members supporting concrete slabs shall, after fabrication, be cleaned of all oil or grease by solvent cleaners and, after erection, be cleaned of dirt and foreign material by thoroughly sweeping with a stiff fiber brush or other approved method.

3.02 ERECTION

A. The erection of structural steel shall be in accordance with the applicable provisions of the AISC specification.

B. Anchor bolts and anchors shall be properly located and built into connecting work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

C. Column base and bearing plates shall be provided under all columns, and other members resting on walls or footings. Base and bearing plates may be attached or loose as noted on the shop drawings. Base plates and bearing plates shall be supported and aligned on steel wedges or shims. After the supported members have been plumbed and properly positioned and the anchor nuts tightened, the entire bearing area under the plate shall be filled solid with nonshrinking grout. Wedges and shims shall be cut off flush with edges of column base and bearing plates, and shall be left in place.

D. Holes, except for turned and ribbed bolts, shall not be enlarged more than 1/16 inch greater than the specified hole size without the approval of the Engineer.

E. Lockwashers shall be provided under all A 307 nuts. Threading shall be excluded form the shear planes for all a 307 and a 325 bearing-type bolted connections.

F. Driftpins may be used only to bring together the several parts and shall not be used in such manner as to distort or damage the metal.

G. Gas Cutting: The use of a gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. The use of gas-cutting torch will be permitted only on minor members, when the member is not under stress, and then only after the approval of the Engineer has been obtained.

3.03 PAINTING

A. All steel work shall be painted with one shop coat in accordance with Section 09961, High Performance Paints and Coatings-Wastewater, with the exception of the following:

Steel work encased in concrete and contact surfaces of welded and/or bolted connections not conforming to Paragraph 3 (C) of RCRBSJ Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts shall not be painted.

B. After erection, a prime coat shall be applied to all bolts, connections, damaged spots and areas which have been omitted in shop painting. Field painting shall be in accordance with Section 09900 "Painting."

3.04 QUALITY CONTROL

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

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

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

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

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

F. Bolted Connections: Inspect or test in accordance with AISC specifications.

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

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

2. Perform tests of welds (Ultrasonic Inspection: ASTM E 164).

END OF SECTION

SECTION 05140 - STRUCTURAL ALUMINUM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extent of structural aluminum work as shown on Drawings, including Schedules, Notes, and Details.

B. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests conducted by a qualified inspection agency in mill shop and field. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

C. Details shown are typical; similar details apply to similar conditions unless otherwise indicated. Verify dimensions at Site whenever possible without causing delay in Work.

D. Connections which are not designed shall be detailed such that the minimum connection capacity is equal to or greater than 1/2 the member capacity.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

1. Submit manufacturer's specifications and installation instructions.

2. Submit Shop Drawings prepared under supervision of a registered Professional Engineer, including complete details and schedules for fabrication and assembly of structural members, procedures, and diagrams. Include details of cuts, connections, camber, holes, welds, and other pertinent data.

3. Provide setting Drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as Work of this Section.

1.03 QUALITY ASSURANCE

A. Codes and Specifications:

1. Aluminum Association (AA), "Specifications for Aluminum Structures."

2. AA, "Specifications for Aluminum Bridge and Other Highway Structures."

3. ASTM B 221, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

4. ASTM B 483, Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.

5. American Welding Society (AWS) D1.0, "Code for Arc and Gas Welding."

B. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

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

2. If recertification of welders is required, retesting shall be Contractor's responsibility.

3. Parts shall be welded with an inert gas shielded arc or resistant welding process. No welding process that requires a welding flux shall be used.

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to Site at such intervals to ensure uninterrupted progress of Work.

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

B. Store materials to permit easy access for inspection and identification. Do not store materials in such a manner that would cause distortion or damage.

PART 2 - MATERIALS

2.01 PRODUCTS

A. Tubes and Shapes: Type 6061-T6.

B. Aluminum Bolts: Type 7075-T73.

C. Aluminum Nuts: Type 6061-T6.

D. Embedded Anchors: ASTM A 307 hot-dip galvanized.

E. Electrodes for Welding comply with AWS Code.

2.02 FABRICATION

A. Fabricate and assemble structural assemblies in shop to greatest extent possible. Mark and match-mark materials for field assembly.

B. Welded Construction: Comply with AWS code for procedures, appearance, and quality. Weld continuously along the entire area of contact except where tack welding is indicated.

PART 3 - ERECTION

3.01 GENERAL

A. Employ a land surveyor for accurate erection of structural members. Check elevations of concrete bearing surfaces, and locations of anchor bolts and similar devices before erection Work proceeds, and report discrepancies to Engineer. Do not proceed with erection until corrections have been made.

B. Temporary shoring and bracing shall be provided with sufficient strength to bear imposed loads and ensure stability.

C. Field Assembly: Set structural frames accurately to lines and elevations indicated.

D. Splice members only where indicated and accepted on Shop Drawings.

E. Do not enlarge unfit holes by burning or by use of drift pins except in secondary members. Ream holes that must be enlarged to admit bolts.

END OF SECTION

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Steel deck units for floor and roof applications.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, apply to Work of this Section.

C. Header Duct used in conjunction with cellular metal floor deck is specified in Division 16; not Work of this Section.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01330, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

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

2. Provide test data for mechanical fasteners used in lieu of welding for fastening deck to supporting structures.

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

1.03 QUALITY ASSURANCE

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

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

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

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

B. Qualification of Field Welding: Use qualified welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS.

C. FM Listing: Provide steel roof deck units that have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for Class I fire-rated construction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
1. Steel Decking:

a. Bowman Metal Deck Div., Cyclops Corp.

b. Consolidated Systems, Inc.

c. Epic Metals Corp.

d. Marlyn Steel Products, Inc.

e. H.H. Robertson Co.

f. Roll Form Products, Inc.

g. Roof Deck, Inc.

h. United Steel Deck, Inc.

i. Vulcraft Div., Nucor Corp.

j. Wheeling Corrugating Co.

2.02 MATERIALS

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

B. Miscellaneous Steel Shapes: ASTM A 36.

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

D. Galvanizing: ASTM A 525, G60.

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

E. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

F. Acoustic Sound Barrier Closures: Manufacturer's standard mineral fiber closures.

2.03 FABRICATION

A. Roof Deck Units: Provide deck configurations that comply with SDI "Specifications and Commentary for Steel Roof Deck."

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install deck units and accessories in accordance with manufacturer's recommendations, Shop Drawings, and as specified in this Section.

1. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.

2. Align deck units for entire length of run of cells and with close alignment between cells at ends of abutting units.

3. Place deck units flat and square, secured to adjacent framing without warp or deflection.

4. Do not place deck units on concrete supporting structure until concrete has cured and is dry.

5. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

6. Do not use floor deck units for storage or working platforms until permanently secured.

B. Fastening Deck Units:

1. Tack weld or use self-tapping No. 8 or larger machine screws at 4 feet on center for fastening end closures.

2. Fasten roof deck units to steel supporting members by not less than 5/8-inch-diameter puddle welds or elongated welds of equal strength, spaced not more than 12 inches at every support, and at closer spacing where indicated. In addition, secure deck to each supporting member in ribs where side laps occur.

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

4. Use welding washers where recommended by deck manufacturer.

5. Mechanical fasteners, either powder-actuated or pneumatically driven, may be used in lieu of welding. Locate mechanical fasteners and install in accordance with deck manufacturer's instructions.

6. Mechanically fasten side laps of adjacent deck units between supports, at intervals not exceeding 36 inches on center, using self-tapping No. 8 or larger machine screws.

C. Uplift Loading: Install and anchor roof deck units to resist uplift loading per components and cladding wind pressure schedule on Structural Drawings.

D. Cutting and Fitting: Cut and neatly fit deck units and accessories around other Work projecting through or adjacent to the decking, as shown.

E. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

F. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12 inches on center with at least 1 weld at each corner.

G. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking and in voids between decking and other construction. Weld into position to provide a complete decking installation.

1. Provide flexible closure strips instead of metal closures, at Contractor's option, wherever their use will ensure complete closure. Install with adhesive in accordance with manufacturer's instructions.

H. Touch-up Painting: After decking installation, wire brush, clean, and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.

1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.

2. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.

3. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

END OF SECTION

SECTION 05440 - COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cold-formed steel trusses for roofs.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.

2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: All cold-formed steel trusses and connections shall be designed by a Kentucky Registered Specialty Engineer. Shop drawings and calculations shall be submitted with the signature and seal of a Kentucky Registered Professional Engineer.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product test reports.

D. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

1. Aegis Metal Framing.
2. Nuconsteel, A Nucor Company.
3. TrusSteel; an ITW company.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on structural drawings.

2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:

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

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

C. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: Design according to AISI S210.

2. Lateral Design: Design according to AISI S213.

3. Roof Trusses: Design according to AISI S214.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.03 COLD-FORMED STEEL TRUSS MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST33H, minimum, or as required by structural performance.

2. Coating: G60, A60, AZ50, or GF30.

2.04 ROOF TRUSSES

A. Roof Truss Members: Manufacturer's standard steel sections.

1. Connecting Flange Width: 1-5/8 inches, minimum at top and bottom chords connecting to sheathing or other directly fastened construction.

2. Minimum Base-Metal Thickness: 0.0329 inch.

2.05 ACCESSORIES

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

B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.06 ANCHORS, CLIPS, AND FASTENERS

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

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and Appendix D in ACI 318, greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

C. Power-Actuated Fasteners: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Shims: Load bearing, of high-density multimonomer plastic, nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

2.08 FABRICATION

A. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate trusses using jigs or templates.
2. Cut truss members by sawing or shearing; do not torch cut.

3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.02 INSTALLATION

A. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.

1. Fasten cold-formed steel trusses by welding or mechanical fasteners.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.

C. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

D. Truss Spacing: As indicated on structural drawings.

E. Do not alter, cut, or remove framing members or connections of trusses.

F. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

G. Erect trusses without damaging framing members or connections.

H. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.

I. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's TechNote 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses.".

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.03 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform inspections.

B. Prepare test and inspection reports.

3.04 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure that cold-formed metal trusses are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05500- METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aluminum Stairs.

1.02 REFERENCE STANDARDS

A. Aluminum Association:

1. AA DAF-45 - Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association:

1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

3. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. American National Standards Institute:

1. ANSI A14.3 - Ladders - Fixed - Safety Requirements

D. ASTM International:

1. ASTM B26 - Standard Specification for Aluminum-Alloy Sand Castings.

2. ASTM B85 - Standard Specification for Aluminum-Alloy Die Castings.

3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

4. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

5. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire.

6. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. National Ornamental & Miscellaneous Metals Association:

1. NOMMA Guideline 1 - Joint Finishes.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft.

2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.

3. Uniform and concentrated loads need not be assumed to act concurrently.

4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.

5. Limit deflection of treads, platforms, and framing members to **L/240** or 1/4 inch whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.

b. Concentrated load of 200 lbf applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

b. Infill load and other loads need not be assumed to act concurrently.

1.04 SUBMITTALS

A. See Section 01300 – Submittals for submittal requirements

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.05 QUALITY ASSURANCE

A. Finish joints according to NOMMA Guideline 1.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01631 – Products and Substitutions for transporting, handling, storing, and protecting products.

B. Inspection: Accept metal fabrications on-Site in labeled shipments. Inspect for damage.

C. Protect metal fabrications from damage by exposure to weather or by ground contact.

1.07 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.01 STAIR NOSINGS

A. Stair Nosings: Slip resistant checker plate or equivalent to be approved by Engineer.

2.02 MATERIALS

A. Aluminum:

1. Extruded Aluminum: ASTM B221 Alloy 6063, Temper T5.

2. Sheet Aluminum: ASTM B209 Alloy 6061, Temper T6.

3. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 Alloy 6063, Temper T6

4. Aluminum-Alloy Bars: ASTM B211 Alloy 6063, Temper T6.

5. Aluminum-Alloy Sand Castings: ASTM B26, Alloy 356.

6. Aluminum-Alloy Die Castings: ASTM B85, Alloy as required to suit application.

7. Bolts, Nuts, and Washers: Stainless steel.

8. Welding Materials: AWS D1.1; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections for delivery to Site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small, uniform radius.

E. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish #1.

F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

H. Fabrication Tolerances:

1. Squareness: 1/8 in maximum difference in diagonal measurements.

2. Maximum Offset between Faces: 1/16 in.

3. Maximum Misalignment of Adjacent Members: 1/16 in.

4. Maximum Bow: 1/8 inch in 48 in.

5. Maximum Deviation from Plane: 1/16 inch in 48 in.

2.04 FINISHES

A. Aluminum:

1. Finish coatings to conform to AAMA 611. Comply with AA DAF-45.

2. Exterior Aluminum Surfaces:

a. Exterior Hard coat Two-step anodized to clear color, to 0.0007 in thickness.

b. Organic coating to color as selected.

3. Interior Aluminum Surfaces:

a. Interior Hard coat Two-step anodized to clear color, to 0.0007 in thickness.

b. Organic coating to color as selected.

4. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive Work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal and aluminum where Site welding is required.

B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, and free from distortion or defects.

B. Make provisions for erection stresses. Install temporary bracing to maintain alignment until permanent bracing and attachments are installed.

C. Field weld components indicated on Drawings or Shop Drawings.

D. Perform field welding according to AWS D1.1.

E. Obtain approval of Architect/Engineer prior to Site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation from Plumb: ¼ in per story or for every 12 ft in height, whichever is greater, non-cumulative.

B. Maximum Variation from Level: 1/16 inch in 3 ft and 1/4 inch in 10 ft.

C. Maximum Offset from Alignment: 1/4 in.

D. Maximum Out-of-Position: 1/4 in.

3.05 FIELD QUALITY CONTROL

A. Welding: Inspect welds according to AWS D1.1.

B. Replace damaged or improperly functioning hardware.

C. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

D. Touch up factory-applied finishes according to manufacturer-recommended procedures.

3.06 ADJUSTING

A. Adjust operating hardware and lubricate as necessary for smooth operation.

END OF SECTION

SECTION 05511- FIXED METAL LADDERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fixed aluminum wall ladders.

B. Fasteners and installation accessories.

1.02 RELATED SECTIONS

A. Section 06100 - Rough Carpentry

B. Section 08370 - Access Hatches

1.03 REFERENCES

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.

B. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2002.

C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.

D. ASTM B 308 - Standard Specification for Aluminum - Alloy T6061-T6 Standard Structural; 2002

E. OSHA 29 CFR Standard 1910.27 - Fixed ladders; Occupational Safety and Health Standards; current edition

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop Drawings: Detailed drawings showing complete dimensions, all materials, mounting attachments, and fabrication details.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the engineering and manufacturing of metal ladders, with not less than twenty years of experience.

1.06 WARRANTY

A. See Section 01770 - Closeout Project, for additional warranty requirements.

B. Provide manufacturer's standard limited five-year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Alaco Ladder Co.
2. ACL Industries, Inc.
3. Jomy Products, Inc.
4. O'Keeffe's, Inc.

B. Requests for substitutions will be considered in accordance with provisions of Section 01631.

2.02 MATERIALS

A. Extruded Aluminum Profiles: ASTM B 221, ASTM B 210, ASTM B 308, Alloy 6061-T6; standard mill finish.

B. Aluminum Sheet and Plate: ASTM B 209, Alloy 6061-T6; standard mill finish.

C. Fasteners: Aluminum solid aircraft rivets rated at 300 lbs shear strength.

D. Cast fittings, connectors and rung ends: Cast Aluminum alloy 356

2.03 LADDERS

A. Ladders - General: Comply with ANSI A14.3 and OSHA regulations.

B. Fixed Wall Ladders: Extruded aluminum; serrated rungs 1-1/8 inches (29 mm) in diameter, connected to 2-7/8 inch (73 mm) side rail channels with cast aluminum rung connectors, each secured to rails by means of four solid aircraft rivets.

1. Capacity: 500 lbs (225 kg).
2. 24" Wide.

2.04 FINISHES

A. Provide all aluminum in standard mill finish.

2.05 FALL PREVENTION DEVICES

A. All ladders (including manhole rung ladders) shall be equipped with Saf-T-Climb fall prevention system, Manufactured Miller Honeywell, or equal.

B. All ladders and safety devices shall meet OSHA regulations

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, and in compliance with ANSI A14.3 and OSHA 1910.27.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 05520 - HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Extent and dimensions of handrails and railings are indicated on Drawings and include miscellaneous handrails and railing systems not included in other Sections of these Specifications.

B. Type of handrails and railing systems in this Section is aluminum pipe handrails and railing systems.

C. Products furnished but not installed under this Section include inserts and anchors preset in masonry and concrete for anchorage of hand rails and railing systems.

1.02 RELATED WORK SPECIFIED ELSEWHERE

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

1.03 SUBMITTALS

A. Product Data: Manufacturer's technical data for products and processes used in handrails and railing systems, including finishes and grout.

B. Shop Drawings: Shop details of fabrication and installation for each type and material of handrail and railing system required including plans, elevations, sections, profiles of rails, fittings, connections, and anchors.

C. Samples: Prepare samples of each type of metal finish required on metal of same thickness and alloy indicated for final work. Where finish involves normal color and texture variations, include sample sets composed of two (2) or more units showing limits of such variations expected in completed work. Include 6" long samples of each distinctly different railing member including handrails, top rails, posts, and samples of fittings and brackets.

1.04 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

1.05 SYSTEM DESCRIPTION

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.

1. Top Rail of Guardrail Systems: Concentrated load of 200 lbf (890 N) applied at any point and in any direction and a uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with a uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.

2. Handrails Not Serving as Top Rails: Concentrated load of 200 lbf (890 N) applied at any point and in any direction and a uniform load of 50 lbf per linear foot (730 N/m) applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.

3. Infill Area of Guardrail Systems: Horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system including gates, panels, intermediate rails, balusters, or other elements composing the infill area. Loads on infill area need not be assumed to act concurrently with loads on top rails.

B. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Material for rails and gates shall be a minimum of 1-1/2" diameter Schedule 40 and for posts, a minimum of Schedule 80.

1.06 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Design Responsibility: Engage a qualified professional engineer to prepare or supervise the preparation of structural computations for handrails and railing systems to determine compliance with structural performance requirements indicated.

1.07 STORAGE

A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide handrails and railing systems of one of the following, or an approved equal. Handrail System shall be equal to "TUFRAIL" as manufactured by Thompson Fabricating Company.

1. Thompson Fabricating Company, Inc., Birmingham, Alabama.

2. Superior Railing Company

3. Alumaguard

2.02 METALS

A. General: Comply with standards indicated for forms and types of metals indicated or required for handrail and railing system components.

B. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.

1. Extruded Bar and Shapes: ASTM B 221, 6063-T6.

2. Extruded Pipe and Tube: ASTM B 429, 6063-T6.

3. Plate and Sheet: ASTM B 209, 6061-T6.

4. Die and Hand Forgings: ASTM B 247, 6061-T6.

5. Castings: ASTM B 26, 356-T6.

2.03 MISCELLANEOUS MATERIALS

A. Nonshrink Nonmetallic Grout: Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.

B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS Specifications, and as required for color match, strength, and compatibility in fabricated items.

C. Fasteners: Use fasteners of Type 304 stainless steel for aluminum components, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.

D. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.

E. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

F. Anchors and Inserts: Provide anchors of type, size, and material required for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use nonferrous metal of hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

G. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel: Sherwin-Williams Zinc-Clad Galvanizing Compound #143-0255 or equal.

H. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

I. Zinc Chromate Primer for Galvanized Metals: Sherwin-Williams Galvite, B50W3 or equal; for Ferrous Metals: Sherwin-Williams KemKromik Universal, B50Z Series or equal.

2.04 FABRICATION

A. General: Fabricate handrails and railing systems to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to comply with requirements indicated for structural performance. Handrail systems which use fittings which are glued or pop-riveted will not be acceptable.

B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Nonwelded Connections: Fabricate railing systems and handrails for interconnection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

D. Welded Connections for Aluminum Pipe: Fabricate aluminum pipe handrails and railing systems for interconnection of members by concealed internal welds, which eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

E. Form changes in direction of railing members by bending members, insertion of prefabricated elbow fittings, radius bends, or by mitering.

F. For handrails and railing systems with nonwelded connections which are exposed to exterior or to moisture from condensation or other sources, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.

G. Toe Boards: Where required by O.S.H.A. and where indicated on the Drawings, provide toe boards at railing systems around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details shown or, if not shown, use manufacturer's standard detail. Toe boards shall be 4" high.

H. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, hinges, miscellaneous fittings and anchors for interconnection of handrail and railing members to other work, unless otherwise indicated.

I. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices which are capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

J. For railing posts set in concrete provide preset sleeves of steel, not less than 6" long and inside dimensions not less than 2" greater than outside dimensions of post, with steel plate forming bottom closure.

K. Provide slip-fit metal sockets to receive removable railing posts. Fabricate sockets for a close fit with posts and to limit deflection of post without lateral load, measured at top, not to exceed 1/12 of post height. Design and fabricate socket covers to resist accidental dislodgement.

L. Gates: Provide gates of equal structural properties of railing system, with toe board. Hinges shall be capable of providing a swing of 180 degrees. Provide positive latching device which shall be operable from both sides of gate.

2.05 METAL FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

B. Class I Clear Anodized Finish: AA-M10C22A41 (medium satin directional textured mechanical finish; chemical etch, medium matte; 0.7 mil min. thick clear anodic coating) complying with AAMA 607.1.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.

B. Field Measurements: Take field measurements prior to fabrication.

3.02 INSTALLATION, GENERAL

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installation of handrails and railing systems. Set work accurately in location, alignment, and elevation, plumb, level, true, and free of rack,

measured from established lines and levels. Do not weld, cut or abrade surfaces of handrails and railing components which have been coated or finished after fabrication, and are intended for field connection by mechanical means without further cutting or fitting.

C. Field Welding: Comply with applicable AWS Specification for procedures of manual shielded metal-arc welding, for appearance and quality, of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent rail surfaces.

D. Corrosion Protection: Coat concealed surfaces of aluminum, which will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint or zinc chromate primer.

E. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at 5'-0" o.c. MAX but not more than that required by design loadings.

3.03 ANCHORING POSTS

A. Anchor aluminum handrail posts to concrete with manufacturer's base flange assembly (3 anchors per base) for top and side mount brackets recommended for meeting the design criteria. Base flanges and side mount brackets will not be welded to the post but will be mechanically fastened so as to achieve a rigid construction without annealing the post. All connections to concrete will be made using stainless steel wedge anchors, which are to be sized and furnished by the handrail manufacturer as an integral part of their handrail system. Anchor post on new concrete shall be side mounted except where shown otherwise on the drawings.

B. Anchor posts to metal surfaces with manufacturer's standard fittings designed for this purpose unless otherwise indicated.

C. Provide removable railing sections as indicated, using slip-fit metal sockets. Accurately locate sockets to match post spacing.

3.04 RAILING CONNECTIONS

A. Nonwelded Connections: Use manufacturer's standard mechanical joints for permanently connecting railing components. Components that are glued or pop riveted at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railing systems.

B. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

3.05 ANCHORING RAILING ENDS

A. Anchor railing ends into concrete or masonry with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.

B. Anchor railing ends to metal surfaces with manufacturer's standard fittings using concealed fasteners, unless otherwise indicated.

C. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 feet. Provide slip-joint internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post.

3.06 ATTACHMENT OF HANDRAILS TO WALLS

A. General: Secure handrails to walls with manufacturer's standard wall brackets and end fittings, unless otherwise indicated.

B. For concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.

C. For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.

3.07 PROTECTION

A. Protect finishes of railing systems and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.

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

END OF SECTION

SECTION 05530 - GRATING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install metal bar grating in accordance with the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

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

1.03 SUBMITTALS

Comply with Section 01300 as well as the requirements specified herein.

A. Submit shop drawings to the Engineer for review before fabrication.

B. Indicate areas to receive grating, grating details and dimensions, and material specifications.

C. Show anchorage details and locations.

D. Indicate coordination with equipment suppliers where openings for such equipment are required.

1.04 REFERENCE STANDARDS

A. Design, fabrication and installation of grating shall be in accordance with Standard Specifications and Voluntary Code of Practice in Metal Bar Grating Manual, 1979 Edition, published by National Association of Architectural Metal Manufacturers, Chicago, Illinois (ANSI A 202.1).

PART 2 - PRODUCTS

2.01 DESIGN CRITERIA

Gratings shall meet or exceed the following design criteria:

A. Support uniform live load of 100 psf unless noted otherwise on Structural Drawings.

B. Deflection not to exceed span of bearing bars (in inches) divided by 360.

C. Maximum fiber stress: 12,000 psi.

2.02 BASIC DESIGN

The basic design requirements are listed below:

A. Shape: Rectangular.

B. Type Construction: Pressure locked.

C. Bar Sizes, unless otherwise shown on the Drawings:

1. Bearing Bars: 1-1/2" x 3/16".

2. Cross Bars: 1" x 1/8".

D. Maximum Bar Spacing:

1. Bearing Bars: 1-3/16" c-c.

2. Cross Bars: 4" c-c.

E. Banding Bars:

1. Same thickness as bearing bars to which they are attached.

2. At free ends: Same depth as bearing bars.

3. At supported ends: 1/8" less in depth than bearing bars.

F. Bearing and crossbars shall be flush at surface.

G. All free and supported bar ends around perimeter and around cutouts shall be banded.

H. Provide removable sections of grating with suitable end bearing where noted on the Drawings or otherwise required.

2.03 MATERIALS

A. Aluminum Grating:

The materials of construction shall meet the following requirements:

1. Bearing Bars: ASTM B 221, 6061-T6 or 6063-T6, aluminum.

2. Cross Bars: ASTM B 221 (extruded) or ASTM B 210 (drawn) aluminum.

3. All steel fasteners used with aluminum grating shall be aluminum or Type 304 stainless steel.

4. Finish: Aluminum mill finish (as fabricated).

5. Anchors: Saddle clips of manufacturer's standard design, aluminum or Type 304 stainless steel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Grating shall be fabricated as indicated by shop drawings which have been revised to reflect actual field measurements.

B. Grating shall be set with full and uniform end bearing to preclude rocking; do not use wedges or shims.

C. Provide 1-inch minimum bearing with maximum erection clearance of 1/4-inch all around.

D. Anchor grating with saddle clips in accordance with manufacturer's recommendations or as detailed on the Drawings.

E. Provide cutouts for the passage of pipe, valve and equipment operators, conduit, stems and similar work; cutouts for circular obstructions shall be at least 2" larger in diameter than the obstruction.

F. Protect all surfaces of angles and frames to be in contact with concrete or dissimilar metals with two (2) coats of Fed. Spec. TT-V-51F Asphalt Varnish.

END OF SECTION