SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. The Work required under this Section consists of structural steel, steel erection, shop painting, field touch-up painting, and related items necessary to complete the Work.
B. Miscellaneous angles, channels, anchor bolts, bent plates, sleeves, sag rods, leveling plates, bearing plates for structural steel and steel joists, and other incidental items of structural steel required to be built into concrete or masonry shall be provided as indicated or specified and be furnished to respective trades at proper time; including instructions and templates for their installation.
C. Provide, where specifically called for, loose lintels, steel shelf angles, perimeter angle closure, and accessories.
D. For openings in metal deck 12 by 12 inches and larger, provide steel reinforcing members. Reinforcing shall be not less than 4 by 4 inches by 1/4-inch angles, unless noted otherwise on Drawings. Openings in deck shall be cut under Section 05 31 00.
E. Total weight of steel used in structural steel shall contain a minimum of 50% combined post industrial and post consumer recycled content.

1.2 SUBMITTALS

A. Submit in accordance with Division 01 requirements.
B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
   1. High-strength bolts (each type), including nuts and washers.
      a. Include Direct Tension Indicators if used.
   2. Structural steel primer paint.
   3. Shrinkage-resistant grout.
   4. Product data and manufacturers specifications for prime paints as specified.
C. Shop drawings shall be prepared under supervision of a licensed Structural Engineer, in the State in the State of Florida including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
   1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
   2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
   3. Complete shop drawings by approved fabricator including plan layouts of columns and anchor bolt locations, erection diagrams, and shop detail drawings. Symbols and indications used for structural components on design drawings must appear identically on submitted shop drawings. Types of electrodes proposed for welding processes must also appear thereon.
      a. The fabricator must review and check shop drawings prior to submission to the Architect.

D. Letter from a Professional Engineer within the State of Florida certifying that he has studied the design drawings, that shop drawings have been prepared under his direct guidance and supervision, and that provided components and connections will meet or exceed loading requirements, where loads are shown at element ends. Such letter of certification must be evidenced by Engineer's full signature and seal authenticity. Architect/Engineer's review of shop drawings will not begin until such certification has been received. This certification is to verify the adequacy of members and connections designed by the fabricator and is not intended to require verifications of the design of structural elements shown on the plans.

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

F. Certified copies of each survey conducted by a licensed Land Surveyor, showing elevations and locations of base plates and anchor bolts to receive structural steel and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.

G. Environmental Submittals:
   1. Percentage of recycled material in structural steel.
   2. Documentation showing primers used comply with VOC requirements listed in Section 09 91 00 – Painting

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the latest editions for the following codes, specifications, and standards:
   1. AISC "Code of Standard Practice for Steel Buildings and Bridges."
   2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and including the "Commentary of the AISC Specification," and the current supplements.
   3. AISC "Specifications for Structural Joints using ASTM A325 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
   4. AWS "Structural Welding Code," AWS D1.1 and its latest revision.
   5. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piping, and Bars for Structural Use."

B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
   1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
   2. If re-certification of welders is required, re-testing will be Contractor's responsibility.

C. Structural fasteners shall be manufactured in the United States. Fabricator shall furnish proof of U.S. manufacturer to Architect/Engineer. If it becomes necessary to use imported fasteners, each size, type, and each large quantity package (500 pcs. or more) shall undergo a random sampling of a minimum 5 pieces for testing and the test results to be provided to Architect. Test shall be performed by an independent testing agency and the cost shall be included in the Base Bid. If inferior fasteners are discovered, all fasteners of that type shall be removed and replaced with acceptable fasteners at no cost to the Owner. Fasteners shall be tested prior to use in construction.

1.4 WELDING QUALITY CONTROL

A. Welding operators shall be qualified under the provisions of the AWS Structural Welding code, on test pieces in positions and with clearances equivalent to those actually to be encountered in construction. Welders shall make only those type of welds for which they are specifically certified.
B. Welds requiring inspection shall be so indicated in the Drawings.
   1. Welds indicated as requiring visual inspection shall be visually inspected by an independent inspector, acceptable to the Architect, pre-qualified to make the weld being inspected. Welders and inspectors shall be pre-qualified by the American Welding Society Qualification Test.
C. The Contractor performing the welding requiring inspection shall cooperate with the independent testing service performing weld testing.
D. Written reports will be submitted for each weld tested and will indicate whether or not weld is acceptable for intended use.
E. If by inspection welds fail to meet minimum acceptable criteria, the welds shall be cut out and replaced.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and re-lubricate before use.
   1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 INSPECTION

A. The materials and workmanship to be furnished under this Specification shall be subject to inspection in the mill, shop, and field by the Architect/Engineer. Inspection will be conducted without expense to the Contractor; however, inspection in the mill or shop shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE FABRICATORS

A. Firms acceptable as fabricators for structural steel Work under this Section shall be members of The American Institute of Steel Construction **(or)** shall be certified by an approved independent professional testing agency as being qualified for Category I Conventional Steel Structures in conformance to the requirements of the AISC Quality Certification Program.

2.2 MATERIALS

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

B. Rolled Structural Steel Shapes: Comply with the provisions of the latest editions for the following codes, specifications, and standards:
   1. W Shapes: ASTM A992, Fy = 50 ksi
   2. Channels, Angles, C, M, HP Shapes, Plates, and Bars: ASTM A 36.

C. Plates and Bars: ASTM A36, latest edition.

D. Structural Steel Tubular Products: Comply with the provisions of the latest editions for the following codes, specifications, and standards:
   1. Square, Rectangular, and Special Shapes: ASTM A500, Grade B.
   2. Round, Structural Steel Pipe: ASTM A53, Type E or S, Grade B.

E. Headed Stud-Type Shear Connectors: ASTM A 108, latest edition, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.

F. Anchor Bolts: ASTM F1554, latest edition, Grade 36, nonheaded type unless otherwise indicated.

G. Unfinished Threaded Fasteners: ASTM A 307, latest edition, Grade A, regular low-carbon steel bolts and nuts.
   1. Provide hexagonal heads and nuts for all connections.
   2. Provide either hexagonal or square heads and nuts, except use only hexagonal units for exposed connections.

H. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows: Comply with the provisions of the latest editions for the following codes, specifications, and standards:
   1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A 325. Use 3/4-inch bolts, unless noted otherwise on Drawings. Use bearing type connections with threads included in the shear plane.
      a. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot-dip galvanized complying with ASTM A 153.

I. Direct Tension Indicators: ASTM F 959, latest edition, type as required.
   1. Use on all A325 bolts.
   2. Use on all A325 bolts on connections that are slip critical.
   3. Use at Contractor's option.

J. Electrodes and Flux for Submerged Arc Welding: AWS Code and ASTM A588, latest edition, Series A233, Series E60 or E70 as required.

K. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with the latest edition of CE-CRD-C621-89A.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Sure-Grip High Performance Grout; Dayton Superior.
      b. Euco N.S.; Euclid Chemical Co.
      c. Crystex; L & M Construction Chemicals, Inc.
      d. Set Grout; Master Builders.
      e. Sealtight 588 Grout; W. R. Meadows.

f. Five Star Grout; U.S. Grout Corp.

L. Masonry Bearing Plates:
1. All joists shall bear on masonry bearing plates with anchor rods embedded in the masonry below. Weld joists to bearing plates in accordance with SJI Specifications. See Framing Details and Plans for bearing plate sizes.
2. All beams shall bear on masonry bearing plates with anchor rods embedded in the masonry below. Weld beams to bearing plates unless otherwise noted.
3. Bearing plates are to be set under Work of Section 04 20 00.

M. Where trusses are indicated with continuous members, they shall be full length without splices or welded with full-penetration shop welds ground flush with grinding in the direction of applied stress and with weld soundness established by radiographic or ultrasonic inspection in accordance with the requirements of 9.2.5.2 or 9.2.5.3 of AWS D1.1. Splices will not be permitted at points of maximum stress. Field splices of tension members shall be designed to develop 110 percent of the spliced sections.

2.3 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members as shown.
1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections: Weld or bolt shop connections, as shown.
1. Bolt field connections, except where welded connections or other connections are indicated.
a. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
b. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.

C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with the latest edition of AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."

D. Welded Construction: Comply with the latest edition of AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

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

G. Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld steel bar stops to frames, except where shown removable. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches o.c., unless otherwise indicated.

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

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

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

K. Expansion Joints: Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical brick expansion joints as indicated on Drawings.

2.4 SHOP PAINTING

A. Shop-paint all structural steel work, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed; paint exposed portions and initial 2 inches of embedded areas only.
   1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
   2. Do not paint surfaces scheduled to receive sprayed-on fireproofing.
   3. Coat with tar all steel encased in concrete.

B. Surface Preparation for Exterior Exposed Steel (SSPC - SP 6): After inspection and before shipping, clean all steel work to be painted.
   1. Clean all steel scheduled to be exposed and installed in the exterior walls and all steel scheduled to be exposed and installed on the exterior of the building in accordance with SSPC - SP 6, Commercial Blast Cleaning.
   2. Prior to commercial blast cleaning, remove visible oil, grease, soluble welding residue and salts in accordance with SSPC - SP 1, Solvent Cleaning.
   3. After commercial blast cleaning and prior to shop painting, remove dirt, dust, and all similar contaminants from the surface.
   4. All steel lintels installed in exterior walls shall be hot-dipped galvanized, refer to requirements as specified herein.

C. Surface Preparation for Interior Steel (SSPC - SP 3): After inspection and before shipping, clean steel work to be painted.
   1. Clean all steel installed in the interior of the building in accordance with SSPC - SP 3, Power Tool Cleaning.
   2. Prior to power tool cleaning, remove visible oil, grease, soluble welding residue and salts in accordance with SSPC - SP 1, Solvent Cleaning.
   3. After power tool cleaning and prior to shop painting, remove dirt, dust, and all similar contaminants from the surface.

D. Shop Prime Painting: Immediately after surface preparation, apply structural steel rust inhibited primer paint in accordance with manufacturer's instructions and at rates as specified. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Exterior exposed steel scheduled to be finish painted and receiving the SP 6, Commercial Blast Cleaning, shall be prime painted with primer as follows:

a. Tnemec "90-97 Tneme-Zinc" two-component aromatic urethane zinc-rich primer. Color 90-97 Reddish-Gray. Metallic zinc content shall be 83% by weight in dried film. Lead content shall be less than 0.06% by weight in the dried film as defined in Part 1303 of the Consumer Product Safety Act Regulations. Apply at a rate to achieve a dry film thickness of 2.5 to 3.5 mils.

2. All interior structural steel shall be prime painted with primer as follows:
   a. Tnemec "Series 115 Uni-Bond DF" primer. Chemically active, rust-inhibitive acrylic primer. Color 31GR Slate Gray. Apply at a rate to achieve a dry film thickness of 2.0 to 4.0 mils. VOC: 1.17 lbs/gallon. HAPS: 1.1 lbs/gallon solids.

E. Galvanizing: All steel lintels exposed to the exterior and installed in exterior walls shall be hot-dipped galvanized in accordance with ASTM A 123, latest edition. Coating Grade 45 (1.0 oz/sq. ft.).

2.5 SOURCE QUALITY CONTROL

A. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
   1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.1 INSPECTION

A. Erector must examine the areas and conditions under which structural steel work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.

3.2 ERECTION

A. Comply with the AISC Specifications and Code of Standard Practice and with specified requirements.
B. Surveys: Employ a licensed land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Architect.
C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
D. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.
E. Setting Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and rough-in to improve bond to surfaces. Clean the bottom surface of base and bearing plates.
   1. Setting Plate Procedure:

a. Set loose and attached base plates and bearing plates for structural members on wedges or other adjustable devices.
b. 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.
c. Pack bedding grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturer's instructions, or as otherwise required.

2. Double Nut Procedure
   a. Install lower nuts and washers to required elevation.
   b. Erect column and install upper nuts and washers.
   c. After structure has been erected and plumbed, adjust lower nuts to relieve racking, adjust elevation, and distribute load equally to all anchor bolts.
   d. Tighten nuts.
   e. Pack bedding grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturer's instructions, or as otherwise required.

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

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

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

I. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
   1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
   2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

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

K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
   1. Apply by brush or spray to provide minimum dry film thickness of not less than that specified for the prime paint.

L. Lintels and Shelf Angles: Weld, bolt, or rivet members together where so indicated.
   1. Lintels shall have 8 inch bearing at each end, minimum, unless shown otherwise. Bearing pressures shall not exceed the allowable stress for masonry.
   2. Where shelf angles are attached to concrete with bolts and adjustable inserts, provide slotted holes in proper size and spacing in the vertical leg of shelf angles.

3.3 HIGH STRENGTH STEEL BOLTS

A. Structural joints using high strength bolts, hardened washers, and nuts shall be tightened to a high tension; the materials, methods of installation and tension control, type of wrenches to be used, and inspection methods shall conform to the latest edition of specifications for "Structural Joints using ASTM A325 or A490 Bolts," as approved by the Research Council on Structural Connections of the Engineering Foundation, November 13, 1985.
B. The high strength bolts used shall have a suitable identifying mark placed on top of the head before leaving the factory.
C. Tightening of nuts shall be done by the turn-of-nut method, according to the specifications for "Structural Joints using ASTM A325 or A490 bolts," unless direct tension indicator washers are used, in which case tightening will terminate when proper gap is attained.
D. For turn of the nut method, bolts that have been "Snug-Tight" shall be marked with identifying symbol and then given an additional 1/2 turn. Marks shall be such that visual inspection can be made of finished connections. Snug tight is defined as the tightness developed by the full effort of a man using a spud wrench on all bolts in the connections.

3.3 ERECTION ALIGNMENT

A. Framing: The framing shall be carried up true, plumb, and level within a tolerance of 1:500; and temporary bracing shall be introduced, wherever necessary, to take care of loads to which the structure may be subjected, including erection equipment and its operation. Such bracing shall be left in place as long as may be required for safety. It shall finally be removed by the Contractor as part of his equipment. As erection progresses, the Work shall be securely connected to take care of dead load, wind, and erection stresses.

3.4 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
D. Testing agency may inspect structural steel at plant before shipment.
E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
F. Shop-Bolted Connections: Inspect or test in accordance with AISC specifications.
    1. Verify that gaps of installed Direct Tension Indicators are less than gaps specified in ASTM F 959, latest edition, Table 2.
G. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows, complying with the provisions of the latest editions for the following codes, specifications, and standards:
    1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
    2. Perform visual inspection of all welds.

3. Perform tests of welds as follows. Inspection procedures listed are to be used at Contractor's option.
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
   c. Radiographic Inspection: ASTM E 94; minimum quality level "2-2T."
   d. Ultrasonic Inspection: ASTM E 164.Structural Engineer to edit as required. Either para's H or I or both?

H. Field-Bolted Connections: Inspect in accordance with AISC specifications.
   1. For Direct Tension Indicators, comply with requirements of ASTM F 959, latest edition. Verify that gaps are less than gaps specified in Table 2.

I. Field bolted connections shall be tested in accordance with RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts". Frequency in testing shall be one (1) bolt in each connection and if a failure occurs then all bolts in that particular connection shall be tested.

J. Field Welding: Inspect and test during erection of structural steel as follows:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Perform visual inspection of all welds.
   3. Perform tests of welds as follows, complying with the provisions of the latest editions for the following codes, specifications, and standards:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
      c. Radiographic Inspection: ASTM E 94; minimum quality level "2-2T."
      d. Ultrasonic Inspection: ASTM E 164.

END OF SECTION 05 12 00

SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes steel joists and joist girders for floor and roof framing. Types of joists required include the following:
   1. K-Series Open Web Steel Joists.

B. When outriggers, angles, or other components are attached to the open web steel joists in the shop in such a way that they actually are a component part of the joists, they are to be provided under this Section.

C. The Work includes bridging anchors, sag rods, wall anchors, and beam anchors.

D. Related Work: Ends of joists resting on masonry require steel bearing plates furnished under Section 05 50 00 and installed under Section 04 20 00 over a leveling bed of mortar.
   1. Include manufacturer's certification that joists comply with SJI "Specifications."

E. Total weight of steel used in steel joists shall contain a minimum of 50% combined post industrial and post consumer recycled content.

1.2 SUBMITTALS

A. Submit in accordance with Division 01 requirements.

B. Product data and installation instructions for each type of joist and accessories.
   1. Include manufacturer's certification that joists comply with SJI "Specifications."
   2. Certification from joist manufacturer that joists are properly designed and will be furnished to meet live loads, dead loads, and slope conditions indicated on the Drawings.

C. Complete shop drawings by approved fabricator including plan layouts of columns and anchor bolt locations, erection diagrams, and shop detail drawings. Symbols and indications used for structural components on design drawings must appear identically on submitted shop drawings. Types of electrodes proposed for welding processes must also appear thereon.
   1. Provide templates or location drawings for installation of anchor bolts and metal bearing plates.

D. Letter from a Professional Engineer licensed within the State of Florida, certifying that he has carefully studied the design drawings, that shop drawings have been prepared under his direct guidance and supervision, and that provided components and connections will meet or exceed loading requirements. Such letter of certification must be evidenced by Engineer's full signature and seal of authenticity. Architect's review of shop drawings will not begin until such certification has been received.

1.3 QUALITY ASSURANCE

A. Provide joists fabricated in compliance with the following and as herein specified.

1. SJI "Standard Specifications and Load Tables" for K, LH, and DLH Series Open Web Steel Joists, latest edition, sizes as indicated on the Drawings.
2. Comply with Factory Mutual requirements.

B. Qualification of Field Welding Work
1. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure." Welders shall be certified to perform the type of work required.

C. Inspection: Inspect joists and girders in accordance with SJI "Specifications."

D. The deflection of floors and roofs with plaster ceiling or soffits suspended or attached, due to the design live load, shall not exceed 1/360 of the span; other roofs, not to exceed 1/240 of the span.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel joists as recommended in SJI and AISC "Standard Specifications," in a manner to avoid excessive stresses deforming members.

B. Bent joist members or broken welds shall be cause for joist rejection. Rejected joists shall be replaced without delay.

1.5 JOB CONDITIONS

A. During the construction period, Contractors shall provide means for the adequate distribution of concentrated loads so that the carrying capacity of any joist is not exceeded.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Member firms of the Steel Joist Institute will be acceptable manufacturers of steel joists specified herein.

2.2 MATERIALS

A. Steel: Comply with SJI and AISC "Standard Specifications."
1. Yield strength used as a basis for the design stresses shall be as follows:

   - Chords = 50,000 psi
   - Webs = 36,000 psi or 50,000 psi

2. Evidence that the steel furnished meets or exceeds the design yield strength shall be provided, on Architect's request, in the form of certified test reports.
3. Deduct the area of holes in chords from the area of the chord when calculating the strength of the member.

B. Steel Bearing Plates: ASTM A 36, latest edition.

C. Unfinished Threaded Fasteners: ASTM A 307, latest edition, Grade A, regular hexagon type, low carbon steel.

D. Surface Preparation (SSPC - SP 3): After inspection and before shipping, clean all joists to be prime painted.

1. Clean all steel joists in accordance with SSPC - SP 3, Power Tool Cleaning.
2. Prior to power tool cleaning, remove visible oil, grease, soluble welding residue and salts in accordance with SSPC - SP 1, Solvent Cleaning.
3. After power tool cleaning and prior to shop painting, remove dirt, dust, and all similar contaminants from the surface.

E. Shop Prime Painting: Immediately after surface preparation, apply steel joist rust inhibited primer paint in accordance with manufacturer's instructions and at rates as specified. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Steel joists receiving the SP 3, Power Tool Cleaning, shall be prime painted with primer as follows:
a. Tnemec "Series V10" primer. Chemically active, rust-inhibitive modified alkyd primer. Color 99 Red. Apply at a rate to achieve a dry film thickness of 2.0 to 3.5 mils. VOC: 2.77 lbs/gallon. HAPS: 0 lbs/gallon solids.
2. Do not apply primer paint to joists indicated to receive sprayed-on fireproofing.

2.3 FABRICATION

A. Fabricate steel joists in accordance with SJI and AISC "Standard Specifications," and as follows:
1. Make shop connections and splices using either arc or resistance welding. Shop-bolted connections are not acceptable.
2. Do not splice web members; use only full-length pieces.
3. Top and bottom chords shall be uniform size throughout their full length.
4. Do not splice bottom chord members in the middle third of the span.
5. Splices in bottom chord members shall be certified by the joist fabricator to provide 100 percent of the strength of the chord section used.

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.

C. Extended End: Provide extended ends on joists where indicated, complying with SJI "Specifications" and load tables.

D. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

E. Top Chord Extension: Provide top chord extensions ("S" type) on joists where indicated, complying with SJI "Specifications" and load tables.

F. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with SJI "Specifications."
1. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

G. End Anchorage: Provide end anchorages, including steel bearing plates, to secure joists to adjacent construction, complying with SJI "Specifications."

H. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.

I. Top Chords: Shall be absolutely flat across its full width and length for application of metal decking.
J. Bottom Chords: Shall be extended and connected to columns or webs of girders at column lines and where shown on structural drawings.
K. Joist Ends: Shall be beveled when slope exceeds 1/4 inch in 12 inch or sloped shoes shall be provided.

PART 3 - EXECUTION

3.1 PREPARATION

A. Roof joist anchorage shall be designed to resist gross uplift force indicated on the Drawings.
B. Joist anchorage for un-enclosed areas and roof overhangs shall be designed to the upward pressure indicated on the Drawings.

3.2 ERECTION

A. Place and secure steel joists in accordance with SJI "Specifications," final shop drawings, and as herein specified.
B. Anchors: Furnish anchor bolts, steel bearing plates, and other devices to be built into concrete and masonry construction.
   1. Provide unfinished threaded fasteners for anchor bolts unless high strength bolts indicated.
C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
D. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.
   1. Where "open-web" joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.
E. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.
F. Fastening Joists: Comply with the following:
   1. Field weld joists to supporting steel framework and steel bearing plates where indicated in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.
   2. Bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used.
      a. Use unfinished threaded fasteners for bolted connections, unless otherwise indicated.
G. End Anchorage
   1. At steel supports the joist ends shall extend not less than 2-1/2 inches over beams.
   2. At masonry the joist ends shall extend not less than 4 inches over walls. The center line of bearing the joist shall coincide with the center line of the masonry bearing plate and the masonry wythe on which it bears, except where 2 joists from opposite sides bear on the same wythe.

3. Ends shall be anchored with the equivalent of two 3/16-inch fillet welds 1-1/2 inches long or two 1/2-inch bolts.

H. Field Welding

1. The total length of weld at a cross-section shall not exceed 50 percent of the overall developed width of cold-formed members.
2. Extreme caution must be exercised during welding. Completely cover and protect masonry and concrete in place from damage during welding.

I. Touch-Up Painting

1. After joist installation, paint field bolt heads and nuts and abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use the same type of paint as used for shop painting.

END OF SECTION 05 21 00

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SECTION 05 31 00
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes steel deck units for floor and roof applications.
   1. Metal roof deck units.

B. Related Work Specified Elsewhere
   1. The cutting, drilling, or punching of openings smaller than 12 by 12 inches for passage of pipes, ducts, and the attachment of other items shall be performed in the field by the respective trades requiring same.
   2. For openings 12 by 12 inches and larger, each shall be predetermined and provided or cut under this Section. Steel framing members indicated or required around openings 12 by 12 inches and larger through decks shall be provided and erected under Section 05 12 00.

C. Total weight of steel used in steel deck shall contain a minimum of 50% combined post industrial and post-consumer recycled content.

1.2 SUBMITTALS

A. Submit in accordance with Division 01 requirements.

B. Product data including manufacturer's specifications and installation instructions for each type of decking and accessories.
   1. Provide test data for mechanical fasteners used in lieu of welding for fastening deck to supporting structures.

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

D. Submit preinstallation conference meeting minutes.

E. Submit AWS welder certificates.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the latest editions for the following codes, specifications, 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."
   4. Comply with Factory Mutual requirements.

B. Qualification of Field Welding: Use qualified welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS.
   1. Welded decking in place is subject to inspection and testing. Owner will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

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.

D. Design Criteria:

1. Compute the properties of metal roof deck sections on the basis of the effective design width as limited by the provisions of the SDI specifications. Provide the deck section properties, including section modulus and moment of inertia per foot of width.
2. Allowable Deflection: Design and fabricate deck for a maximum deflection of 1/240 of the clear span under the uniform live load.

E. Preinstallation Conference: Prior to steel deck installation, conduct a preinstallation conference at the project site with the contractor and Architect. Refer to Section 01 31 19, Project Meetings, for preinstallation conference requirements. Submit preinstallation conference meeting minutes as specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Consolidated Systems, Inc.
2. Epic Metals Corp.
3. Vulcraft Div., Nucor Corp.
4. Wheeling Corrugating Co.
5. New Millennium Building Systems

2.2 MATERIALS: Comply with the provisions of the latest editions for the following codes, specifications, and standards:

A. Steel for Galvanized Metal Deck Units: ASTM A 653, grade as required to comply with SDI specifications.
B. Miscellaneous Steel Shapes: ASTM A 36.
C. Shear Connectors: Headed stud type, ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel, with dimensions complying with AISC specifications.
D. Shear Connectors: Strap type, ASTM A 1011, Grade D, hot-rolled carbon steel.
E. Sheet Metal Accessories: ASTM A 653, commercial quality, galvanized.
F. Galvanizing: ASTM A 653, G90 (.90 oz. per sq.ft.).
G. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.
H. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.
I. Self-Drilling Screws: Hilti No. 12 self-drilling screws or approved equal.
J. Powder Actuated Fasteners: Hilti ENP3/ENPH3/ENP2/ENKK pins or approved equal.

2.3 FABRICATION

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

1. Provide G-90 galvanized Type WR (wide rib) as specified by the Steel Deck Institute. Depth and gauge shall be as indicated on the Drawings.
2. Provide G-90 galvanized corrugated slotted metal form deck as specified by the Steel Deck Institute.
3. Depth and gauge shall be as indicated on the Drawings.

B. Metal Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness and materials as decking. Form to match contour of deck units and approximately 6 inches wide.

C. Metal Closure Strips: Fabricate metal closure strips, for cell raceways and openings between decking and other construction, of not less than 0.045-inch min. (18 gage) galvanized sheet steel. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking.

D. Roof Sump Pans: Fabricate from single piece of 0.071-inch min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans with bearing flanges not less than 3 inches wide. Recess pans not less than 1-1/2 inches below roof deck surface unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field by others.

1. Pans shall have an overall dimension of not less than 29 by 33 inches and an opening dimension of not less than 23 by 27 inches. Pans shall have a recessed surface of not less than 1-1/2 inch to receive roof sump.
2. Bearing flanges for metal deck shall be not less than 3 inches wide.
3. Pans shall be formed to provide flat (level) sump surface in relationship to the roof slope.

PART 3 - EXECUTION

3.1 INSPECTION

A. Install must examine the areas and conditions under which metal roof decking items are to be installed. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Field verify all conditions prior to installation.

3.2 INSTALLATION

A. Install deck units and accessories in accordance with manufacturer's recommendations, shop drawings, and as specified herein.

B. 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.

1. Do not start placement of roof deck units before supporting members are installed. Place roof deck units on supporting metal steel framework and adjust to final position with ends bearing on supporting members and accurately aligned end to end before being permanently fastened.
   a. Lap ends 1-1/2-inch roof deck units not less than 2 inches.
   b. Butt ends of 3-inch roof deck units.
   c. Do not stretch or compress the side-lap interlocks.

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

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

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

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

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

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

H. Fastening Deck Units:

1. Tack weld or use self-tapping No. 8 or larger machine screws at 4 feet o.c. 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.
   a. Use welding washers where recommended by deck manufacturer.
4. 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.
5. Mechanically fasten side laps of adjacent deck units between supports, at intervals not exceeding 36 inches o.c., using self-tapping No. 8 or larger machine screws.
6. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 psf at eave overhang and 30 psf for other roof areas.
   a. Keep the interiors of cells that will be used as raceways free of welds having sharp points or edges.

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

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

K. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.

L. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12 inches o.c. with at least one weld at each corner.

M. 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.

N. 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.

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

P. Ridge and Valley Plates: Weld ridge and valley plates to the top surface of the roof decking. Lap end joints not less than 3 inches, with laps made in the direction of water flow.

Q. Repair of Valley Plates:

1. Holes up to 1/2 inch in diameter fill with urethane or silicone sealant and cover with duct tape.
2. Holes above 1/2-inch diameter require galvanized sheet metal plate patches fastened to deck.

R. Provide all items and accessories as required for a complete installation in every respect.

3.3 SUPPORT OF OTHER WORK

A. Suspension wires, straps, and chains such as those used to support acoustical ceilings, ductwork, and lights shall not be attached to or through steel roof decks.

3.4 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Recheck measurements and dimensions, before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

END OF SECTION 05 31 00

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SECTION 05 44 00
COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Engineered light gauge metal trusses.
B. Cold-formed steel framing accessories.

1.2 RELATED SECTIONS

A. Section 05 31 00 - Metal Decking.
B. Section 05 40 00 - Cold Formed Metal Framing.

1.3 REFERENCES

A. AISI (American Iron and Steel Institute) - Specification for the Design of Cold-Formed Steel Structural Members, Latest edition.
B. ASTM A 370 - Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
C. ASTM A 500 - Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated by the Hot-Dip Process.
E. AISI (American Iron and Steel Institute) – Design Guide for Cold-Formed Steel Trusses, Latest edition.

1.4 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Design system components in accordance with AISI references.
   2. Conform to requirements of the applicable code(s) as indicated in the Engineer-of-Record’s drawings.
   3. Maximum Allowable Deflection: 1/240th of span, under total design loads.
   4. Maximum Allowable Deflection: 1/360th of span, under live design loads.
B. Performance Requirements: Truss system, with framing components and accessories, shall provide a complete horizontal framing system, ready for deck installation, meeting specified Design Requirements.
C. Component Requirements:
   1. Truss chord components shall be minimum 18 gauge.
   2. Truss chord and web components shall be preferred to have rolled or closed edges to minimize the danger of cutting during handling.
D. System Definitions:
   1. Truss Component Manufacturer: The approved maker of the components that will be assembled into trusses by the Truss Fabricator.
   2 Truss Fabricator: The approved truss manufacturer who assembles Truss Component Manufacturer's components into completed trusses (refer to Acceptable Fabricators, Section 2.1.A).

3. Truss Designer: The design professional, individual or organization, having responsibility for the design of the light gauge steel truss.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Truss Component Manufacturer's descriptive literature for each item of cold-formed metal framing and each accessory specified in this section.
C. Shop Drawings: Truss Fabricator's drawings and / or details that:
   1. Indicate special components and installations not fully detailed in product data.
   2. Indicate in the layout placement drawings the number, types, location, and spacings of trusses and other framing members.
   3. Indicate details of truss loading, reactions, uplifts, support locations, material sizes and gauges, permanent truss web bracing, and splices as required for a complete installation.
D. Quality Assurance Submittals:
   1. Truss Component Manufacturer's Instructions: Printed installation instructions for each item of cold-formed metal framing and each accessory specified in this section.
   2. Design Data: Results of design analysis, bearing the seal and signature of a professional engineer registered in the State in which project is located.
E. Truss Component Manufacturer's Recommendations for Handling and Storage:
   1. Observe written recommendations.

1.6 QUALITY ASSURANCE

A. Pre-installation Meetings:
   1. Confer at job site prior to scheduled beginning of construction activities of this section to review requirements of this section.
   2. Attendees shall include representatives of the following:
      a. Truss Fabricator, if requested by installer of products of this section.
      b. Installer of this section.
      c. Other entities directly affecting, or affected by, construction activities of this section, including but not limited to, the following:
         1) Installer of truss support framing.
         2) Installer of mechanical systems.
         3) Installer of electrical systems.
   3. Review potential interface conflicts; coordinate layout and support provisions.
B. Regular job progress and coordination meetings:
   1. As required.

1.7 DELIVERY, STORAGE, AND HANDLING OF STEEL TRUSSES

A. Packing, Shipping, Handling and Unloading: Handle and lift shop assembled units in accordance with Truss Component Manufacturer's recommendations to prevent damage or distortion.
B. Storage and Protection: Store shop assembled units in accordance with Truss Component Manufacturer's recommendations to prevent damage, distortion, and moisture buildup.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Truss Component Manufacturers for Light Gauge Steel Truss System:
   1. TrusSteel.
   2. Aegis Metal Framing, LLC
   3. Steel Technology & Design, Inc.
   4. MiTek.
   5. Steel Construction Systems.
   6. Nucor.
   7. United Structures, Cairo, Ga. Contact: Sam Mahdavi, 229 377-7771

B. Requests for substitutions will be considered in accordance with provisions of Section 01600. All permitted equals must be approved in writing by the Architect or Engineer-of-Record. All applications for substitution must include samples and technical data.

2.2 COMPONENTS

A. Load Bearing Members: Mechanical properties of components shall be determined by testing conforming to ASTM A 370 - Standard Test Methods and Definitions for Mechanical Testing of Steel Products. Members shall be cold-formed to indicated sizes, profiles, and thickness of steel conforming to ASTM A 653, minimum G60 coating, and ASTM A500 as follows:
   1. Chord materials - Minimum yield strength 40 KSI.
   2. Web materials - Minimum yield strength 40 KSI.
   3. Shapes: Indicated on shop drawings.
   4. Size: Indicated on shop drawings.
   5. Gauge: Indicated on shop drawings (minimum 18 gauge for chords).

B. Fasteners Used in Fabricating Trusses: All web to chord connections shall be made with the appropriate screw fastener as recommended by the Truss Component Manufacturer. Each screw shall bear the stamp of the Truss Component Manufacturer or shall be labeled in such a manner to ensure ready identification. Alternative fastening methods, such as welding, are not acceptable.

2.3 FABRICATION

A. Light Gauge Steel Trusses:
   1. Shop fabricate from cold formed steel components in accordance with shop drawings, using jigging systems to ensure consistent component placement and alignment of components, and to maintain specified tolerances as shown in Section 2.4 below.
   2. Field fabrication of trusses is strictly prohibited.

2.4 SOURCE QUALITY CONTROL

A. Material Tolerances: Steel for cold-formed chord components
   1. Nominal 22 ga. members:
      a. Minimum bare metal thickness: 0.0284 inch.
      b. Maximum design thickness: 0.0299 inch.
   2. Nominal 20 ga. members:
      a. Minimum bare metal thickness: 0.0329 inch.

b. Maximum design thickness: 0.0346 inch.
3. Nominal 18 ga. members:
a. Minimum bare metal thickness: 0.0428 inch.
b. Maximum design thickness: 0.0451 inch.
4. Nominal 16 ga. members:
a. Minimum bare metal thickness: 0.0538 inch.
b. Maximum design thickness: 0.0566 inch.

B. Material Tolerances: Steel for cold-formed web components
1. Nominal 20 ga. members:
a. Minimum bare metal thickness: 0.033 inch.
b. Maximum design thickness: 0.035 inch.
2. Nominal 18 ga. members:
a. Minimum bare metal thickness: 0.047 inch.
b. Maximum design thickness: 0.049 inch.
3. Nominal 16 ga. members:
a. Minimum bare metal thickness: 0.063 inch.
b. Maximum design thickness: 0.065 inch.

C. Materials Tolerances: Truss Assemblies: Fabricate to tolerances of maximum variation from plumb, level, or true to line as indicated below:
1. Trusses up to 30 ft long = max 1/2 in. variation from design length
2. Trusses over 30 ft. long = max 3/4 in. variation from design length
3. Trusses up to 5 ft. high = max 1/4 in. variation from design height
4. Trusses over 5 ft. high = max 1/2 in. variation from design height

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Verify that bearing surfaces and substrates are ready to receive steel trusses.
2. Verify that rough-in utilities and/or chases that will interface with the steel trusses or truss bracing are in correct locations and do not interfere with truss placement.

B. Installer's Examination:
1. Have installer of this section inspect conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable to installer.
2. Installer shall transmit two copies of installer's report to Architect within 24 hours of inspection.
3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
4. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.2 INSTALLATION

A. Field Fastening: Use correct fasteners.
B. Metal Trusses:

1. Install metal trusses in accordance with Truss Component Manufacturer's instructions and the Truss Fabricator's shop drawing submittal. Place components at spacings indicated on the Truss Fabricator's shop drawings. Install truss installation (erection) bracing. Truss installation (erection) bracing shall hold trusses straight and plumb and in safe condition until decking and permanent truss bracing has been fastened, forming a structurally sound framing system. All sub-contractors shall employ proper construction procedures to insure adequate distribution of temporary construction loads so that the carrying capacity of any single truss or group of trusses is not exceeded.
2. Install required roof and system permanent bracing and bridging as indicated by the drawings and notes of the Engineer-of-Record. See the Truss Fabricator's shop drawings for any additional bracing requirements. All truss installation (erection) bracing and permanent bracing and bridging shall be installed before the application of any load.
3. The field removal, cutting or alteration of any truss chord, web or bracing members is not allowed without prior written approval of the Engineer-of-Record and the Truss Designer.
4. Damaged chords, webs and complete trusses shall be repaired or replaced as directed and approved in writing by the Architect or Engineer-of-Record and the Truss Designer prior to installation or application of the repair or replacement.

C. Site Tolerances for Truss Bearings:
1. Variation from Level or Specified Plane: Maximum 1/8 inch in 10 feet.
2. Variation from Specified Position: Maximum 1/4 inch.

3.3 FIELD QUALITY CONTROL

A. Site Inspections: An inspection service shall be engaged to inspect field connections in accordance with Section 1400.

END OF SECTION 05 44 00

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SECTION INCLUDES

A. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
   1. Shop fabricated ferrous metal items.
   2. Shop fabricated aluminum items.

1.3 REFERENCES

A. AAMA 2603 – Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
B. AAMA 204 – Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
C. AAMA 606.1 – Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum
D. AAMA 607.1 – Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum
E. AAMA 608.1 – Voluntary Guide Specifications and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum
F. ANSI A14.3 – American National Standard for Ladders - Fixed - Safety Requirements
G. ASTM A36/A36M – Standard Specification for Carbon Structural Steel
H. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless
I. ASTM A123/A123M – Standard Specification for Zinc (Hot-Galvanized) Coatings on Iron and Steel Products
J. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
K. ASTM A283 – Carbon Steel Plates, Shapes, and Bars
L. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
M. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
N. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
O. ASTM B26 – Standard Specification for Aluminum-Alloy Sand Castings
P. ASTM B85 – Standard Specification for Aluminum-Alloy Die Castings
Q. ASTM B177 – Standard Guide for Engineering Chromium Electroplating
R. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

S. ASTM B210 – Standard Specification for Aluminum-Alloy Drawn Seamless Tubes
T. ASTM B211 – Standard Specification for Aluminum-Alloy Bar, Rod and Wire
U. ASTM B221 – Standard Specification for Aluminum-and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
V. AWS A2.4 – Standard Symbols for Welding, Brazing, Nondestructive Examination
W. AWS D1.1/D1.1M – Structural Welding Code Bundled Set B
X. FBC – Florida Building Code
Y. SSPC – Steel Structure Painting Council - Steel Structures Painting Council

1.4 SUBMITTALS FOR REVIEW

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size, and type of fasteners, and accessories.
   1. Include erection drawings, elevations, and details.
B. Indicate welded connections using standard AWS A2.0 welding symbols.
   1. Indicate net weld lengths.
C. Submit complete Shop and Erection drawings for review before starting work. Include plans, sections, elevations, details and all connection details and fabrication details.
D. Submit manufacturer's data and specifications indicating compliance with specified requirements.
E. Submit templates for anchors and bolts to be installed by other trades.
F. Product Data: Provide data on standard framing members; describe materials and furnish product criteria and limitations. Unless otherwise indicated, submit the following for each type of product provided under work of this Section.
   1. Recycled Content:
      a. Indicate recycled content: indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
   2. Local/Regional Materials*: Provide materials extracted/harvested and manufactured within a 500 mile radius from the project site.*
      a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
      d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.5 QUALITY STANDARDS

A. American Society for Testing and Materials (ASTM): As referenced, latest editions.
B. American National Standards Institute (ANSI) A14.3 for fixed ladders.
C. American Institute of Steel Construction (AISC).

D. American Welding Society (AWS).
E. Occupational Safety and Health Administration (OSHA).

1.6 QUALIFICATIONS

A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Florida.
B. Welders' Certificates: Submit under provisions of Section – Submittals Procedures, certifying welders employed on the Work, verifying AWS qualification within the previous 12-months.
C. Fabricator shall have minimum 5 years previous experience of successfully completed comparable work.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer shall be one of the following in each category however products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. Roof access ladders
      a. Basis of Design Product: Subject to compliance with requirements provide the following manufacturer.
         i) UPNOVR, Inc.
   2. The following manufacturers are acceptable provided they equal or exceed the material requirements and functional qualities of the basis of design product.
      a. FSI Industries
      b. O'Keefe's, Inc.

2.2 MATERIALS – STEEL

A. Steel Sections: ASTM A36/A36M
B. Steel Tubing: ASTM A500, Grade B
C. Plates: ASTM A283
D. Pipe: ASTM A53, Type E or S, Grade B, Schedule 40 minimum
E. Steel Tubing, hot-formed, welded, or seamless: ASTM A501.
F. Bolts, Nuts, and Washers: ASTM A325 or A307 galvanized to ASTM A153/A153M for galvanized components
G. Welding Materials: AWS D1.1; type required for welded materials

2.3 MATERIALS – ALUMINUM

A. Extruded Aluminum: ASTM B221, Alloy 6063, Temper T5
B. Sheet Aluminum: ASTM B209, Alloy, Temper
C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210, Alloy 6063, Temper T6
D. Aluminum-Alloy Bars: ASTM B211, Alloy 6063, Temper T6
E. Aluminum-Alloy Sand Castings: ASTM B26, Alloy
F. Aluminum-Alloy Die Castings: ASTM B85, Alloy
G. Bolts, Nuts and Washers: Stainless steel

H. Welding Materials: AWS D1.1/D1.1M; type required for welded materials

2.4 MISCELLANEOUS MATERIALS

A. Concrete Inserts: Phillips Redhead.
B. Hot Dip Galvanizing: Where specified or indicated, hot dip galvanize ferrous items according to ASTM A385 and ASTM A123, minimum 2.0 ounces per square foot.
C. Stainless Steel Fasteners: Type 304
D. Isolation Coating: Zinc chromate paint or acceptable non-conductive tape.
E. Fastenings, Anchors and Bolts:
   1. Provide required cast-in-place or built-in anchor bolts for miscellaneous metal items of galvanized steel, complete with matching washers and nuts. Select fasteners for the type, grade and class required.
   2. Where not practical to pre-locate bolts, provide self-drilling or toggle type concrete anchors.
   3. Bolts and Nuts: Regular hexagon-head type, ASTM A307, grade A.
   4. Lag Bolts: Square head type, Fed. Spec. FF-B-561.
   5. Machine Screws: Cadmium plated steel, Fed. Spec. FF-S-92.
   6. Wood Screws: Flat head carbon steel, Fed. Spec. FF-S-111.
   7. Plain Washers: Round, carbon steel, Fed. Spec. FF-W-92.
   8. Masonry Anchorage Devices: Expansion shields, Fed. Spec. FF-S-325.
   9. Toggle Bolts: Tumble wing type, Fed. Spec FF-B-588, type, class and style as required.
   10. Lock Washers: Helical spring type, carbon steel, Fed. Spec. FF-W-84.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide miscellaneous steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work
B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
   2. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
   3. In addition to miscellaneous framing and supports provide specialized framing for the following.
      a. Supports for operable partitions
      b. Elevator hoist beams.
      c. Curtain tracks

2.6 ACCESS LADDERS

A. General: Ladders shall be designed to meet or exceed OSHA and ANSI A14.3 standards and constructed of all welded fabrication. The rungs shall be 24" wide with 1000 pound load capacity. Ladders shall have walk-through hand railing and a return ladder from a parapet to the roof. Ladder shall be extruded aluminum with standard mill finish.
B. Hatch Access Vertical Ladder: Ladder shall be based on Model No. U-200

1. Ladder shall be provided with wall mounting brackets and all additional mounting items to provide a complete installation.

C. Roof Parapet Access w/ Return Vertical Ladder: Ladder shall be based on Model No. U-203
1. Ladder shall be provided with wall mounting brackets and all additional mounting items to provide a complete installation.

2.7 ELEVATOR PIT LADDERS

A. ANSI A14.3 specifies minimum design requirements for ladders and safety cages. Space siderails 18 inches apart unless otherwise indicated.
B. Rungs: 3/4-inch diameter.
C. Provide fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
D. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive, coat with abrasive material metallically bonded to rung or by using a type of manufactured rung filled with aluminum-oxide grout.
E. Support each ladder at top and bottom and not more than 60 inches with welded or bolted steel brackets.

2.8 ELEVATOR SUMP COVERS

A. Fabricate from 3/16-inch rolled-steel floor plate with four 1-inch diameter holes for water drainage and for lifting.
B. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 1/2 inch in least dimension.
C. Provide cast-in-place galvanized steel angle supports, ASTM A36 as indicated and if not indicated minimum 1" by 1" by 1/8" angle.
D. Rungs: Fabricate from 3/16-inch rolled-steel floor plate with four 1-inch diameter holes for water drainage and for lifting.

2.9 STEEL PIPE BOLLARDS

A. Fabricate pipe bollards to conform with ASTM F3016.
B. Fabricate pipe bollards from Schedule 80 steel pipe. Fill bollards with concrete. Provide a rounded top.
C. Provide 1/8" thick HDPE bollard covers based on "Fixed Post Bollard Covers" by Cal Pipe Manufacturing, Downey, CA; or equal. Color as selected by the Architect.

2.10 FABRICATION TOLERANCES

A. Square: 1/8" maximum difference in diagonal measurements.
B. Maximum Offset between Faces: 1/16"
C. Maximum Misalignment of Adjacent Members: 1/16"
D. Maximum Bow: 1/8" in 48"
E. Maximum Deviation from Plane: 1/16" in 48"

2.11 FINISHES – STEEL

A. Prepare surfaces to be primed in accordance with SSPC SP 2.
B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Do not prime surfaces in where field welding is required.
D. Prime paint items with one coat.
E. Structural Steel Members:
   1. Galvanize after fabrication to ASTM A123/A123M.
   2. Provide minimum 1.25 oz/sq ft galvanized coating.
F. Non-structural Items:
   1. Galvanize after fabrication to ASTM A123/A123M.
   2. Provide minimum 1.25 oz/sq ft galvanized coating.
G. Chrome Plating: ASTM B177, weight, nickel-chromium alloy, satin finish.
H. Ladders: ANSI A14.3
I. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide
J. Touch-Up Primer for Galvanized Surfaces: SSPC 20, Type I Inorganic zinc rich
K. Galvanized Metal Repair Compound:
   1. Hot Applied: Federal Specifications O-G-93.
   2. Cold Applied: Galvaneal, Galvicon, or Z.R.C.
L. Shop Prime Coat: Zinc chromate primer.

2.12 FINISHES – ALUMINUM

A. Aluminum Surfaces: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.
B. Exterior Aluminum Surfaces: Clear Anodic Finish: Class 1, AAMA 611, AA-M12C22A41, Mechanical finish, nonspecular as fabricated, chemical finish, 0.7 mils or thicker.
C. Interior Aluminum Surfaces: Clear Anodic Finish: Class 2, AAMA 611, AA-M12C22A31, Mechanical finish, nonspecular as fabricated, chemical finish, 0.4 mils or thicker.
D. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.13 ENVIRONMENTAL

A. Recycled Content: Minimum total recycled content equal to 25 percent with 23 percent post-consumer recycled content or minimum 7 percent pre-consumer recycled content at Contractor's option.

2.14 MISCELLANEOUS FRAMING, SUPPORTS AND ROUGH HARDWARE

A. Provide miscellaneous steel framing and supports which are not part of the structural steel framework, as required to complete the work.
B. Provide bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing, supporting, anchoring or securing itself or other work, to concrete and other structures.
C. Equip units with integrally welded anchors for casting into concrete or building into masonry and furnish inserts if units must be installed after concrete is placed.

2.15 FABRICATION

A. Fabricate miscellaneous items according to AISC Specifications and approved shop drawings. Provide mitered joints for field connections unless otherwise indicated. Grind and buff smooth rough edges, sharp corners, and welded joint of exposed steel and miscellaneous ferrous items.
B. Fabricated miscellaneous units to sizes, shapes, and profiles shown, or if not shown, of required dimensions to receive adjacent other work to be retained by the framing.
C. Cut, drill, and tap units to receive hardware.
D. Vertical ladders: fabricate to configurations and dimensions indicated, including size of members. Rungs shall extend full size through rails and all connections shall be welded. Bolts for attachment to masonry or concrete shall be expansion type unless otherwise indicated.
E. Repair to galvanized surfaces: Repair damaged galvanized surfaces with hot or cold applied compound.
F. Shop painting of ferrous metal items: Provide 1 coat of shop primer unless indicated or specified to be hot dip galvanized.
G. Contact with dissimilar materials. Provide isolation coating where dissimilar metals are in contact or where aluminum contacts masonry, concrete, plaster, or mortar.
H. Fit and shop assemble in largest practical sections for delivery to site.
I. Fabricate items with joints tightly fitted and secured.
J. Continuously seal joined members by continuous welds.
K. Grind exposed joints flush and smooth with adjacent finish surface.
    1. Make exposed joints butt tight, flush, and hairline.
    2. Ease exposed edges to small uniform radius.
L. Exposed Mechanical Fastenings: Provide flush countersunk screws or bolts unobtrusively located consistent with design of component except as noted otherwise
M. Supply components required for anchorage of fabrications.
    1. Fabricate anchors and related components of same material and finish as fabrication, except as noted otherwise.

2.16 GROUT

A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
B. Nonshrink Metallic Grout: Factory packaged, ferrous aggregate grout complying with ASTM C1107, specifically recommended by manufacturer for heavy duty loading applications.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal and aluminum where site welding is required.
B. Supply required items for casting into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Field weld components indicated on shop drawings.
D. Perform field welding in accordance with AWS D1.1.
E. Obtain approval prior to site cutting or making adjustments not scheduled.
F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
G. Provide isolation coatings where dissimilar metals are in contact or where aluminum is in contact with concrete.
H. Coordination: Coordinate miscellaneous metal items, including field dimensions where required with masonry openings and various other trades as applicable so items fit and function as intended.
I. Erect and install miscellaneous metal items at proper locations and elevations, plumb, level, in alignment and not distorted by fastenings, according to approved shop and erection drawings, manufacturer's directions, and as specified. Provide adequate temporary supports to allow field connections of members without misalignment.
J. Supplementary Parts: Furnish and install necessary to complete each item.
K. Conform to best quality and accepted standard practice.
L. Weld on back or bottom side so welds are not visible.
M. Provide acceptable fasteners, inserts, and expansion anchors for supports placed in shear position where possible.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Plumb: ¼" per story, non-cumulative
B. Maximum Offset from True Alignment: ¼"
C. Maximum Out-of-Position: ¼"

3.5 FIELD QUALITY ASSURANCE

A. Touch up abrasions to shop prime surfaces and welds with specified primer after erection and installation operations are complete.

3.6 WASTE MANAGEMENT

A. Waste Management: Collect cut offs and scrap and place in designated areas for recycling.

END OF SECTION

SECTION 05 51 13
METAL PAN STAIRS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications, and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Section Includes:
   1. Provide labor, materials, services, and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
      a. Pre-assembled steel stair with concrete filled treads.
      b. Aluminum pipe tube railing (bolt-on).

1.3 REFERENCES

A. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
B. ASTM A48 – Standard Specification for Gray Iron Castings.
C. ASTM A53 – Standard Specification for Pipe, Black, and Hot-Dipped, Zinc-coated Welded and Seamless.
D. ASTM A283/A283M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
E. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
F. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
G. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
H. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
I. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts.
J. ASTM A652 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
K. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
L. ASTM B210 – Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
M. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
N. ASTM B241/A241M – Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
O. ASTM B483 – Standard Specification for Aluminum and Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.
P. ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

Q. ASTM E935 – Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
R. ASTM E985 – Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
S. AWS – Structural Welding Code.
T. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
U. ASTM D1187 -– Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
V. ASTM B663 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
W. ASTM E935 – Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
X. ASTM E985 – Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
Y. AWS A2.4 – Standard Symbols Welding, Brazing, Nondestructive Examination.
Z. AWS D1.1/D1.1M – Structural Welding Code Steel Bundled Set B.
AA. NAAMM AMP 510 – Metal Stairs Manual.
BB. SSPC (Steel Structures Painting Council) – Steel Structures Painting Manual.
CC. FBC – Florida Building Code.

1.4 ACTION SUBMITTALS

A. Product Data: For metal pan stairs components.
B. Submit shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.
C. Samples: For each item and type of exposed finish required.
D. Delegated-Design Submittal: Submit design calculations, analysis data and shop drawings indicating compliance with dedicated design and performance requirements signed and sealed by the qualified Florida registered professional engineer responsible for their preparation.
E. Recycle: Submit manufacturer's documentation substantiating the following requirements for materials for each type provided under work of this section for recycled content:
    1. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
    2. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
    3. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
    4. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
F. Local/Regional Materials: Submit manufacturer's documentation substantiating the following requirements for materials extracted/harvested and manufactured within a 500 mile radius from the project site. Not less than 20 percent of building materials (by cost) shall be regional materials. Unless otherwise indicated, submit the following for each type of product provided under work of this section for locations:
    1. Sourcing Location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
    2. Manufacturing Location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.

3. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
4. Product Component(s): Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.5 INFORMATION SUBMITTALS

A. Welder current certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
B. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
B. Manufacturer's Qualifications: Provide products from a firm that makes the indicated products as a regular production item and with not less than ten (10) years experience.
C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation of specified materials and assemblies with not less than five (5) years experience.
D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel."
E. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.
B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
C. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
D. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.8 PERFORMANCE

A. Fabricate stair assembly to NAAMM – Metal Stairs Manual, Class Architectural.
B. General: In engineering railings and stairs to withstand structural loads indicated, determine allowable design working stresses of railing materials based performance requirements.
C. Structural Performance: Railings and stairs shall withstand the effects of gravity, horizontal, uniform and concentrated loads and stresses indicated in applicable codes and shall the designated design.

D. Design shall include all member, supports and connections for fully functional stairs as indicated in the delegated design.
E. 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.
F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
G. Welding: Welders employed on the work shall perform all work in accordance with AWS standards.
H. Structural Performance: Stairs and railings including attachment to building construction, shall withstand the effects of gravity loads and the loads and stresses within limits and under conditions indicated as indicated by applicable codes.
I. Delegated-Design: Provide delegated design services including calculations and shop drawings for load bearing items to comply with performance requirements, applicable code requirements and design criteria signed and sealed by an engineer registered in the State of Florida.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Manufacturer shall be one of the following however products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. American Stair Corp.
   2. Sharon Stairs
   3. Alfab, Inc.

2.2 ALUMINUM RAILING

A. Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand design loads.
   1. Handrails, Rails, and Posts: 1-1/2-inch outside diameter, schedule 40 minimum.
   2. Picket Infill: 1/2-inch round pickets spaced 4 inches o.c., schedule 40 minimum 0.125" minimum wall thickness
   3. Lower Rails: 1-1/2-inch, schedule 40 minimum.
B. Railing Welded Connections: Fabricate railings with welded connections.
C. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
   1. For railings, provide ferrous-metal fittings, brackets, fasteners, and sleeves, except provide galvanized anchors embedded in exterior masonry and concrete construction.
   2. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
   3. Fasteners for Interconnecting Railing Components: Provide concealed spigots and fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
   4. Provide aluminum mounting base plate to attach aluminum railings to steel stair system.

2.3 STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.
B. Stair Framing:
   1. Fabricate stringers of steel channels and provide closures for exposed ends of channel stringers.
   2. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
   3. Weld stringers to headers; weld framing members to stringers and headers.
   4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
   5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
   6. Provide provision to bolt aluminum handrails in place.
C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
   1. Steel Sheet: Uncoated cold-rolled steel sheet.
   2. Directly weld metal pans to stringers; locate welds on top of subtreads to be concealed by concrete fill. Do not weld risers to stringers.
   3. Shape metal pans to include nosing integral with riser.
   4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.4 FASTENERS

A. Fasteners for anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
   1. Framer construction: Prepare backing plate for mounting in wall.
   2. Exposed Fasteners: Flush countersunk screws or bolts consistent with design of railing.
B. Fasteners for Interconnecting Railing Components:
C. Provide concealed cast spigots and fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
D. Bolts, Nuts, and Washers: ASTM A325 or A307
E. Toggle Bolts: Tumble-wing type, FS-FF-B-588, type, class and style as required.
F. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
G. 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/E 488M, conducted by a qualified independent testing agency.
   1. Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5, unless otherwise indicated.

2.5 ALUMINUM MATERIALS

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
B. Extruded Bars Tubing: ASTM B 221, Alloy 6063-T5/T52.
C. Extruded Structural Pipe Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
D. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.
E. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.
F. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
G. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.

2.6 STEEL MATERIALS

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. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25, unless another grade is required by design loads; exposed.
D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.7 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
B. 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 1187M, formulated for 30-mil thickness per coat.
D. Aluminum to Steel Isolation Gaskets: Provide #15 asphalt impregnated felt gaskets between aluminum to steel bolted connections. Trim gasket tight to mounting base plate.
E. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
F. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.
G. Welding Materials: AWS D1.1/D1.1M; type required for welded materials.

2.8 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.
B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
C. Cut, drill, tap and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
E. Form exposed work with accurate angles and surfaces and straight edges.
F. Weld Connections: Cope components at connections to provide close fit or use fittings design for this purpose. Weld all around at connections including fitting.
   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 2 welds: partially dressed weld with spatter removed.
G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
H. Provide anchorage point to allow installation of aluminum handrails as indicted in the Pipe and Tube Railings specification.

2.9 RAILING FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads. Railings shall be fabricated by one manufacture.
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. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinated installation.
C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
D. Form work true to line and level with accurate angles and surfaces.
E. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   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.
   5. Form changes in directions by bending or utilizing prefabricated elbow fittings.
      a. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
F. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Form changes in directions by inserting prefabricated elbow fittings.
G. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
H. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

I. Close exposed ends of railing members with prefabricated end fittings.
J. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
L. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
M. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
O. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
P. Fillers: Provide fillers made from plate material, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.
Q. Fabricate system to accommodate railing anchor plates.
R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.10 FINISH

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Preparation for Shop Priming Stairs: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products.
C. Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
D. Provide exposed fasteners and brackets with a finish matching appearance matching the railings, unless indicated otherwise.
E. Steel Baked-Enamel or Powder-Coated Finish: AAMA 2604 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
F. Aluminum
   1. Clear Anodic Finish: Class II, Mechanical Finish, nonspecular as fabricated Chemical Finish, etched Anodic Coating, clear coating 0.4 mil or thicker complying with AAMA 611. Complying with manufacturer's written instructions for cleaning, preparing, pretreating and apply coating to exposed metal surfaces.

2.11 ENVIRONMENTAL

A. Recycled Content: Provide products with an average recycled content of metal products so 100% of postconsumer recycled content plus 50% of preconsumer recycled content is not less than 20 percent.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 INSPECTION

A. Examine the areas and conditions under which metal stair items are to be installed. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.3 PREPARATION

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

3.4 INSTALLING METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
F. Place and finish concrete fill for treads and platforms to comply with Specification Section "Cast-in-Place Concrete."
G. Provide structural hanger rod supports to structure for support of landings as required.

3.5 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.
B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
C. 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.

D. Attachment of aluminum railing to steel stair stringer, provide base plate welded to railing post and provide through bolts compatible with design loads.
E. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets 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.
   4. For steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
   5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
   6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.
F. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
G. 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.
H. Corrosion Protection: Coat concealed surfaces that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
I. Adjust railings before anchoring to ensure matching alignment at abutting joints.
J. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.
K. Fit exposed connections together to form tight, hairline joints.
L. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.
M. Do not store handrails at jobsite.

3.6 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. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Painting Specification Section.
D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 WASTE MANAGEMENT

A. Collect cutoffs and scrap and place in designated areas for recycling.
B. Coordinate with manufacturer and local recycler for take-back program or recycling. Set aside scrap to be returned to manufacturer for recycling into new product.

END OF SECTION

SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the General Conditions, Supplementary Conditions, Drawings, Specifications and the Sections included under Division 1, General Requirements and References are included as a part of this Section as though bound herein.

1.2 SUMMARY

A. Section Includes:
   1. Provide labor, material, services and equipment necessary to furnish and install work as indicated and as specified herein, which includes, but is not limited to:
      a. Aluminum pipe tube railings and accessories.

1.3 REFERENCES

A. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
B. ASTM B210 – Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
C. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
D. ASTM B241/A241M – Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
E. ASTM B483 – Standard Specification for Aluminum and Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.
F. ASTM E935 – Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
G. ASTM E985 – Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
H. AAMA 607.1 – Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
I. AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.
J. AWS – Structural Welding Code.
K. ACSE 7 – Wind Loads.
L. FBC – Florida Building Code.

1.4 ACTION SUBMITTALS

A. Product Data: For the railings, brackets and items indicated.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
C. Samples: For each type of exposed finish required.
D. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
   1. Fittings and brackets.
   2. Indicate method of connecting members at intersections.
E. Assembled sample of railing system, made from full-size components, including handrail. Sample need not be full height.

1. Show connection of members at intersections.

F. Delegated-Design Submittal: Submit design calculations, analysis data and shop drawings indicating compliance with dedicated design and performance requirements signed and sealed by the qualified Florida registered professional engineer responsible for their preparation.

G. Recycle: Submit manufacturer's documentation substantiating the following requirements for materials for each type provided under work of this section for recycled content:
   1. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
   2. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
   3. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
   4. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.

H. Local/Regional Materials: Submit manufacturer's documentation substantiating the following requirements for materials extracted/harvested and manufactured within a 500 mile radius from the project site. Not less than 20 percent of building materials (by cost) shall be regional materials. Unless otherwise indicated, submit the following for each type of product provided under work of this section for locations:
   1. Sourcing Location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
   2. Manufacturing Location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
   3. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
   4. Product Component(s): Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

1.5 INFORMATION SUBMITTALS

A. Welder current certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

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

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS - "Structural Welding Code."

C. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

1.7 MOCKUP

A. Provide a non-installed mockup consisting of a complete 4'-0" long full height section consisting of a mounting post, intermediate post, linear railing members, handrails, top rails, balusters, attached fittings and bracket all in the finish required.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.
B. Coordination installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.9 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on performance requirements.
B. 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.
C. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.
D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
E. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity, horizontal, uniform and concentrated loads and stresses within limits and under conditions indicated as indicated by applicable codes.
F. Delegated-Design: Provide delegated design services including calculations and shop drawings for railings and load bearing items to comply with performance requirements, applicable code requirements and design criteria signed and sealed by an engineer registered in the State of Florida.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer shall be one of the following in each category however products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product and acceptance is provided by the Architect in writing prior to bidding.
   1. Aluminum Pipe and Tube Railings:
      a. Petersen Metals.
      b. Tri Tech Handrails.
      c. Tuttle, A Dant Clayton Division

2.2 ALUMINUM RAILING

A. Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand design loads.
   1. Handrails, Rails, and Posts: 1-1/2-inch outside diameter, schedule 40 minimum.
   2. Picket Infill: 1/2-inch 0.083" thick minimum round pickets spaced 4 inches o.c.
   3. Lower Rails: 1-1/2-inch, schedule 40 minimum.
B. Railing Welded Connections: Fabricate railings with welded connections.

C. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
   1. For railings, provide cast aluminum fittings, t-brackets, escutcheons, wall brackets, fasteners, and sleeves.
   2. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
   3. Fasteners for Interconnecting Railing Components: Provide concealed spigots and fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2.3 FASTENERS

A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
   1. Frame construction: Prepare backing plate for mounting in wall.
   2. Exposed Fasteners: Flush countersunk screws or bolts consistent with design of railing.
B. Bolts, Nuts, and Washers: Type 304 stainless steel.
C. Toggle Bolts: Type 304 stainless steel.
D. Anchor Bolts: Type 304 stainless steel.
E. Post-Installed Chemical Anchors: Epoxy chemical set hot-dipped alloy steel B7 conforming to ASTM A193 of dimensions required to comply with delegated design and flat washers. Chemical 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.
F. Post-Installed Torque-controlled 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/E 488M, conducted by a qualified independent testing agency.
   1. Interior: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5, unless otherwise indicated.
   2. Exterior: Alloy stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).
G. Provide adjustable brackets and flanges, with aluminum inserts for casting in concrete where indicated.

2.4 MATERIALS

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
B. Extruded Bars Tubing: ASTM B 221, Alloy 6063-T5/T52.
C. Extruded Structural Pipe Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
   1. Provide Standard Weight (Schedule 40) pipe minimum, unless otherwise indicated.
D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.
E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.
G. Brackets, Flanges and Anchors: Cast or formed metal of same type of material and finish as supported rails unless indicated otherwise.

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

2.5 MISCELLANEOUS MATERIALS

A. Welding Materials: AWS type required for welded materials, provide metal type as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
B. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M, formulated for 30-mil thickness per coat.
D. Aluminum to Steel Isolation Gaskets: Provide #15 asphalt impregnated felt gaskets between aluminum to steel bolted connections. Trim gasket tight to mounting base plate.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads. Railings shall be fabricated by one manufacture.
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. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinated installation.
C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
D. Form work true to line and level with accurate angles and surfaces.
E. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
    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.
    5. Form changes in directions by bending or utilizing prefabricated elbow fittings
        a. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
    6. Connect members where required with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
F. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
H. Close exposed ends of railing members with prefabricated end fittings.

I. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
K. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
L. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.
M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage and space devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
N. Fillers: Provide fillers made from plate material, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.
O. Fabricate system to accommodate railing anchor plates.

2.7 FINISH

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.
B. Aluminum Surfaces: Sections shall be free of scratches and other serious surface blemishes and chemically cleaned.
C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
D. Provide exposed fasteners and brackets with a finish matching the railings, unless indicated otherwise.
E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
F. Color Anodic Finish: Class I, AA-M12C22A42/A44 Mechanical Finish, nonspecular as fabricated Chemical Finish, etched Anodic Coating, integrally colored or electrolytically deposited color coating 0.07 mil or thicker complying with AAMA 611. Complying with manufacturer's written instructions for cleaning, preparing, pretreating and apply coating to exposed metal surfaces.
    1. Color: As selected by Architect from full range of industry colors and color densities.

2.8 ENVIRONMENTAL

A. Recycled Content: Provide products with an average recycled content of metal products so 100% of postconsumer recycled content plus 50% of preconsumer recycled content is not less than 20 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.
B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack. 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.
   1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
C. Corrosion Protection: Coat concealed surfaces that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
B. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

3.4 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
B. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
   1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
C. 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.

3.5 ADJUSTING AND CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

3.6 PROTECTION

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

3.7 WASTE MANAGEMENT

A. Collect cutoffs and scrap and place in designated areas for recycling.
B. Coordinate with manufacturer and local recycler for take-back program or recycling. Set aside scrap to be returned to manufacturer for recycling into new product.

END OF SECTION