SECTION 05 51 00 - METAL STAIRS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section Includes: This Section specifies prefabricated metal stairs and railings.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete

B. Section 05 10 00 - Structural Steel

C. Section 05 50 00 - Metal Fabrications

1.3 REFERENCE STANDARDS:

A. ASTM International (ASTM), latest versions:

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
4. ASTM A513 - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
5. ASTM A786 - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
6. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened and Bake Hardenable.
7. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

B. American Welding Society (AWS):

1. AWS D1.1 Structural Welding Code - Steel.
2. AWS D1.3 Structural Welding Code - Sheet Steel.

C. American National Standards Institute (ANSI):

1. ANSI A117.1 Accessible and Usable Buildings and Facilities Standards.

D. The Society for Protective Coatings (SSPC):

1. SSPC-SP3 Power Tool Cleaning.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays. Comply with Section 01 32 00 – Construction Progress Documentation if applicable.

B. Sequencing: Sequence work of this section in accordance with Section 01 32 00 – Construction Progress Documentation if applicable.

C. Scheduling: Schedule work of this Section in accordance with Section 01 32 00 – Construction Progress Documentation if applicable.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:
   a. American Institute of Steel Construction (AISC) Certified firm having 10 years' experience manufacturing components similar to or exceeding requirements specified in scope of project.
   b. Having sufficient capacity to produce and deliver required materials without causing delay in work.
2. Installer: Acceptable to manufacturer.

1.6 ACTION SUBMITTALS

A. General: Submit listed submittals in accordance with Contract Conditions and Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit specified products as follows:

1. Manufacturer's product data.
2. Manufacturer's installation instructions.

C. Structural Calculations and Shop Drawings: Indicate information on shop drawings as follows:

1. Stair plans, elevations, details, methods of installation and anchoring.
   a. Show members, sizes and thickness, anchorage locations and accessory items.
   b. Furnish setting diagrams for anchorage installation as required.
   c. Include calculations stamped by a structural engineer registered in the jurisdiction in which the project is located.

D. Samples: Submit as follows:

1. Two samples, minimum size 6 inches (152 mm) square, representing actual product, finish and patterns for each finished tread product specified.

1.7 INFORMATION SUBMITTALS

A. General: Submit listed submittals in accordance with Contract Conditions and Section 01 33 00 - Submittal Procedures.

B. Manufacturer's Instructions: Submit manufacturer's storage and installation instructions.

C. Source Quality Control: Submit documentation verifying that components and materials specified in this Section are from single manufacturers.

D. Qualification Statements:

1. Submit certificate verification that manufacturer is American Institute of Steel Construction (AISC) Certified for Standard Steel Building Structures.
2. Submit letter of verification for Installer's Qualifications.

2.1 DELIVERY, STORAGE & HANDLING

A. Delivery and Acceptance Requirements:

1. Deliver material in accordance with Section 01 60 00 - Product Requirements and in accordance with manufacturer's written instructions.
2. Deliver materials in manufacturer's original packaging with identification labels intact and in sizes to suit project.

B. Storage and Handling Requirements:

1. Store materials protected from exposure to harmful weather conditions and at temperatures recommended by manufacturers.

C. Packaging Waste Management:

1. Separate waste materials for reuse and recycling in accordance with Section 01 73 00 Execution.
2. Remove packaging materials from site and dispose of at appropriate recycling facilities.
3. Collect and separate disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate onsite bins for recycling.
4. Fold metal and plastic banding; flatten and place in designated area for recycling.
5. Remove:

a. Pallets from site and return to supplier or manufacturer.

PART 2 - PRODUCTS

2.1 METAL STAIRS

1. Provide sections and geometry meeting the construction documents.
2. Single Source Responsibility: Provide components and materials specified in this section from a single American Institute of Steel Construction (AISC) Certified manufacturer.

A. Description:

1. Regulatory Requirements:
   a. In accordance with Section 01 40 00 Quality Requirements.
2. Sustainability Characteristics:
   a. In accordance with general project requirements.
3. Compatibility:
   a. Ensure components and materials are compatible with specified accessories and adjacent materials.

B. Design Criteria:

1. Structural Performance of Stairs: Stairs shall withstand the following structural loads without exceeding the allowable design working stress of materials, including anchors and connections. Apply each load to produce the maximum stress in each component:
   a. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 psf (4.8 kN/m2) and concentrated load of 300 lbf (1.33 kN) applied on an area of 4 square inches (2581 square mm). Concentrated and uniform loads need not be assumed to act concurrently.
   b. Stair Framing: Capable of withstanding stresses resulting from loads specified, in addition to stresses resulting from railing system loads.
   c. Limit Deflection of Treads, Platforms and Framing Members: To L/240.
2. Structural Performance of Handrails and Railings: Handrails and railings shall withstand the following structural loads without exceeding the allowable design working stress of materials, including handrails, railings, anchors and connections.
   a. Top Rail of Guardrail: Capable of withstanding a concentrated load of 200 lbf (0.89 kN) applied in any direction and a uniform load of 50 psf (2.39 kN/m2) applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.

C. Standard Stair and Rail System:

1. Manufacturer's standard prefabricated, pre-engineered straight run stair and landing system, consisting of hot rolled steel sheet stringers, risers, treads, landings, fasteners/supports and railings.
    a. Stringers:
        1) Channel with side mounted prefabricated railings.
        2) Minimum thickness or gage as determined by structural design calculations, structural grade steel plate or channel.
2. Risers: Closed riser, minimum 14 gage (1.9 mm) hot rolled mild diamond steel sheet, sloped maximum 1 1/2 inches (38.1 mm) and conforming to Americans with Disabilities Act (ADA) nosing requirements.
3. Treads:
    a. Exterior: Open bar grating.
4. Mid Landings:
    a. Exterior: Open bar grating as specified on drawings.
5. Fasteners and Supports: Sized by the manufacturer to meet structural design criteria. If hanger rod connections are applicable to any of the landing connections, they shall be a minimum of 5/8 inch (15.9 mm) diameter steel rod, with actual size based on stair load.
6. Manufacturer's standard welded steel tube railing system complying with the following requirements:
    a. Rails: 1 1/2 inches (38.1 mm) diameter x 13 gage (2.3 mm) minimum round steel tube, continuous multi-strand type, equally spaced with not more than 3 15/16 inches (100 mm) clearance between strands and with a minimum extension per code at top and bottom risers. Wrap rail continuously past space between flights to form guardrail as required by building code. Terminate rail ends with radiused returns, newel posts or safety terminations approved by local code. Provide not less than 1 1/2 inches (38.1 mm) clearing between rail and wall.
    b. Fabrication:
        1) Use preformed or prefabricated bends.
        2) Butt weld tee and cross intersections in tubing. Cope and weld intersections in pipe. Miter elbows.
        3) Mechanically fasten internal sleeves and fittings.
        4) Provide minimum 12 gage (2.7 mm) welded steel plate closures or hemispherical closure fittings on all exposed rail ends.
7. Rail System: Provide rail system. Comply with details indicated on Drawings.
    a. Standard 34-inch (864 mm) height handrail system with 42-inch (1067 mm) guardrails at landings and openings.
        1) Rail Type: Full mesh panel rail, Picket style rail, 5-Line sweep rail, or Perforated panel rail.
    b. Standard 36-inch (914 mm) height handrail system with 42-inch (1067 mm) guardrails at landings and openings.
        1) Rail Type: Full mesh panel rail, Picket style rail, 6-Line sweep rail, or Perforated panel rail.

c. Standard 42-inch (1067 mm) height guard rail system with 34-inch (864 mm) ADA Grab and with 42-inch (1067 mm) guardrails at landings and openings.
   1) Rail Type: Full mesh panel guard rail with handrail, Picket style guard rail with handrail, 7-Line sweep guard rail with handrail, or Perforated panel guard rail with handrail.

8. Wall Handrails: Match stair handrails. Provide manufacturer's standard pressed steel wall brackets with anchors suitable for supporting construction.

D. Materials:

1. Steel Shapes and Plates: To ASTM A36.
2. Steel Pipe: To ASTM A53 Type E or S, Grade B.
3. Steel Tubing:
   a. Structural Use: To ASTM A500, Grade B or C.
   b. Non-Structural Use: To ASTM A513, hot rolled or coiled rolled (mill option).
4. Steel Sheet:
   a. Structural Use: To ASTM A1011 (hot rolled).
   b. Non-Structural Use: To ASTM A786, ASTM A1008.
5. Fasteners: As recommended by manufacturer.
6. Welding Rods: In accordance with AWS code and AWS filler metal specifications for material being welded.
7. Primer: HAPS-free, solvent-based, rust inhibitive primer containing less than 3.5 lb/gal (1.6 kg/L) Volatile Organic Compounds (VOC) and compatible with conventional alkyds topcoats.

E. Fabrication:

1. Use same material and finish as parts being joined. Use stainless steel between dissimilar metals and non-corrosive fasteners at exterior connections or joints.
2. Provide fasteners of sufficient strength to support connected members and loads, and to develop full strength of parts fastened or connected.
3. Construct stairs and rails with all components necessary for support and anchorage, and for a complete installation.

Finishes

4. Rails and Stair Components: Completely remove oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter from steel surface in accordance with SSPC SP3.
5. Shop Primer: Immediately after fabrication and cleaning, spray apply primer to dry film thickness recommended by the primer manufacturer, but not less than 2.0 mil thickness. Apply one coat High Solids Red Oxide Anticorrosive primer meeting SSPC-15 Paint.

2.2 ACCESSORIES

A. Anchor bolts, clip angles, hanger rods, hardware and incidental materials required for complete installation, as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrates previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer's instructions prior to metal stair and railing installation.

1. Inform Architect of unacceptable conditions immediately upon discovery.
2. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from Architect.

3.2 PREPARATION

A. Ensure structure or substrate is adequate to support metal stairs and railings.

3.3 INSTALLATION

A. Coordinate installation of metal stairs and railings in accordance with Section 01 73 - Execution.

B. Coordinate metal stairs and railings work with work of other trades for proper time and sequence to avoid construction delays.

C. Install stairs, landings and handrails in accordance with manufacturer's instructions. Install square, plumb, straight and true to line and level, with neatly fitted joints and intersections.

1. Do not cut or alter structural components without written authorization.
2. Field welding and joining shall conform to AWS D1.1 and AWS D1.3.
3. Grind all exposed welds smooth and touch-up shop-primed areas with same primer as used by manufacturers.

3.4 ADJUSTING

A. Adjust components and systems for correct function and operation in accordance with manufacturer's written instructions. Coordinate with Section 01 73 00 - Execution.

3.5 CLEANING

A. Perform cleanup in accordance with Section 01 77 00 - Closeout Procedures and Section 01 78 23 – Operation and Maintenance Data.

B. Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 73 00 - Execution.

C. Waste Management:

1. Coordinate recycling of waste materials with Section 01 73 00 Execution.
2. Collect recyclable waste and dispose of or recycle field generated construction waste created during demolition, construction or final cleaning.
3. Remove recycling containers and bins from site.

END OF SECTION 05 51 00