SECTION 05511 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preassembled steel stairs with [**concrete-filled**] [**precast concrete**] [**epoxy-resin-filled**] [**and**] [**abrasive-coating-finished formed-metal**] treads.
2. Industrial-type stairs with steel [**floor plate**] [**grating**] treads.
3. Steel tube railings attached to metal stairs[**and to walls adjacent to metal stairs**].

B. See Division 5 Section "Pipe and Tube Railings" for pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to [**L/240**] [**L/360**] <**Insert deflection ratio**> or 1/4 inch (6.4 mm), whichever is less.

B. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.

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

C. Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to [**ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."**] <**Insert applicable code requirement.**>

1.3 SUBMITTALS

A. Product Data: For metal stairs.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 COORDINATION

A. 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.

B. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METALS

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

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: [**ASTM A 500 (cold formed)**] [**or**] [**ASTM A 513, Type 5 (mandrel drawn)**].

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).

F. Iron Castings: Either gray iron, ASTM A 48/A 48M, Class 30, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

G. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170).

H. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205).

I. Expanded Metal, Carbon Steel: ASTM F 1267, Class 1 (uncoated).

J. Woven-Wire Mesh: Intermediate-crimp, 2-inch (50-mm) woven-wire mesh, made from 0.135-inch (3.5-mm) nominal diameter wire complying with ASTM A 510 (ASTM A 510M).

K. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

2.3 MISCELLANEOUS MATERIALS

A. Cast-Metal Abrasive Nosings: Cast gray iron, Class 20, with an integral abrasive finish.

1. [**Available**]Manufacturers:

a. American Safety Tread Co., Inc.
b. Balco Inc.
c. Barry Pattern & Foundry Co., Inc.
d. Granite State Casting Co.
e. Safe-T-Metal Co.
f. Wooster Products Inc.
g. <**Insert manufacturer's name.**>

2. Apply bituminous paint to concealed bottoms, sides, and edges of units set into concrete.

B. Extruded Abrasive Nosings: Extruded-aluminum units with abrasive filler.

1. [**Available**]Manufacturers:

a. ACL Industries, Inc.
b. American Safety Tread Co., Inc.
c. Amstep Products.
d. Armstrong Products, Inc.
e. Balco Inc.
f. Granite State Casting Co.
g. Wooster Products Inc.
h. <**Insert manufacturer's name.**>

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
3. Provide solid-abrasive-type units without ribs.
4. Apply clear lacquer to concealed bottoms, sides, and edges of units set into concrete.

C. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls.

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

E. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

F. Welded Wire Fabric: ASTM A 185, 6 by 6 inches (152 by 152 mm)--W1.4 by W1.4, unless otherwise indicated.

G. Precast Concrete Treads: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight concrete with a minimum 28-day compressive strength of 5000 psi (35 MPa) and a total air content of not less than 4 percent or more than 6 percent. Reinforce with galvanized, welded wire fabric, 2 by 2 inches (50 by 50 mm) by 0.062-inch- (1.6-mm-) diameter wire.

2.4 FABRICATION

A. [**Available**]Manufacturers:

1. Alfab, Inc.
2. American Stair, Inc.
3. Sharon Companies Ltd. (The).
4. <**Insert manufacturer's name.**>

B. Provide complete stair assemblies, including metal framing, hangers, struts,[**railings,**] clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding, unless otherwise indicated. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. At exposed connections, finish exposed welds smooth and blended.
2. Use connections that maintain structural value of joined pieces.
3. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
4. Form bent-metal corners to smallest radius possible without impairing work.
5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

C. Stair Framing: Fabricate stringers of steel [**plates**] [**channels**] [**plates or channels**]. Construct platforms of steel [**plate**] [**channel**] [**plate or channel**] headers and miscellaneous framing members.

1. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
2. Where stairs are enclosed by gypsum-board[**shaft-wall**] assemblies, provide hanger rods or struts to support landings from floor construction above or below.
3. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

D. 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 0.0677 inch (1.7 mm).

1. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
2. Provide epoxy-resin-filled treads, reinforced with glass fibers, with slip-resistant, abrasive surface.

E. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms from steel sheet of thickness needed to comply with performance requirements but not less than 0.0966 inch (2.5 mm). Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

F. Metal Floor Plate Stairs: Form treads and platforms from rolled-steel floor plate of thickness needed to comply with performance requirements but not less than [**1/4 inch (6.4 mm)**] [**3/16 inch (4.8 mm)**] [**1/8 inch (3.2 mm)**]. Form treads with integral nosing and back edge stiffener. Weld steel supporting brackets to stringers and weld treads to brackets.

G. Metal Bar-Grating Stairs: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."

1. Fabricate treads and platforms from steel grating with 1-1/4-by-3/16-inch (32-by-5-mm) bearing bars at 15/16 inch (24 mm) o.c. and crossbars at 4 inches (100 mm) o.c.
2. Fabricate treads and platforms from steel grating with 1-by-3/16-inch (25-by-5-mm) bearing bars at 11/16 inch (17 mm) o.c. and crossbars at 4 inches (100 mm) o.c.
3. Fabricate grating treads with rolled-steel floor plate nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

H. Steel 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 indicated loads.

1. Configuration: [**1-5/8-inch- (41-mm-) diameter**] [**1-1/2-inch- (38-mm-) square**] top and bottom rails, 1-1/2-inch- (38-mm-) square posts, and 1/2-inch- (13-mm-) square pickets spaced less than 4 inches (100 mm) clear.
2. Configuration: 1-1/2-inch- (38-mm-) square top and bottom rails and posts with infill panels made from [**expanded metal**] [**woven wire mesh in steel channel frames**].
3. Configuration: 1-1/2-inch- (38-mm-) square top, bottom, and intermediate rails and posts. Space intermediate rails less than [**12 inches (305 mm)**] [**21 inches (533 mm)**] clear.

4. Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose.
5. Form changes in direction of railings by bending or by inserting prefabricated fittings.
6. Form curves by bending members in jigs to produce uniform curvature without buckling.
7. Close exposed ends of railing members with prefabricated end fittings.
8. Provide wall returns at ends of wall-mounted handrails.
9. Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
10. Connect posts to stair framing by direct welding.

2.5 FINISHES

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

B. Hot-dip galvanize items indicated to be galvanized. Comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed products:

1. Exterior Stairs (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

D. Apply shop primer to uncoated surfaces of metal stair components. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.

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

D. Place and finish concrete fill for treads and platforms to comply with Division 3 Section "Cast-in-Place Concrete."

1. Install abrasive nosings with anchors fully embedded in concrete.

E. Install precast treads with adhesive supplied by manufacturer.

F. Attach handrails to wall with wall brackets.

1. Use type of bracket with [**flange tapped for concealed anchorage to threaded hanger bolt**] [**predrilled hole for exposed bolt anchorage**].

G. Adjusting and Cleaning:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05511