

SECTION 05510
METAL STAIRS

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

- A. The general provisions of the Contract, including General and Supplementary Conditions and Division 1 - General Requirements, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section specifies the metal stair assembly for extending Stairs No. 6 and No. 7, and includes the following:
1. Preassembled steel stairs with concrete-filled treads.
 2. Handrails and railings attached to metal stairs.
 3. Handrails attached to walls adjacent to metal stairs.
 4. Modification of existing stairs and railings at top landing of stair which is to be extended.
- B. Section also includes handrails at stair No. 8.
- C. Related Work Specified in Other Sections:
1. Concrete fill for stair treads and platforms: Section 03310, "Cast-in-Place Concrete"
 2. Pipe and tube handrails and railings at locations other than metal stairs: Section 05500, "Metal Fabrications."
 3. Resilient floor covering on stairs and stair landings: Section 09650.
 4. Field painting of stairs, railings and handrails: Section 09900.

1.03 PERFORMANCE REQUIREMENTS

- A. Provide metal stairs capable of withstanding the following structural loads without exceeding allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs. In the design of the stair, assume that the building structure only provides vertical (not horizontal) support for the stair.
1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m) or a concentrated load of 300 lbf (1.33 kN) on an area of 4 sq. in. (25.8 sq. cm), whichever produces the greater stress.
 2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
 3. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

- B. Provide handrails and railings capable of withstanding structural loading conditions of Section 4.4 of ASCE 7-95, as summarized below, without exceeding the allowable design working stress of materials for handrails, railings, anchors, and connections.
1. Handrail assemblies and guardrail system shall be designed to resist a load of 50 lbf/ft. (pound-force per linear foot)(730 N/m) applied in any direction at the top and to transfer this load through the supports to the structure.
 2. Handrail assemblies and guardrail system shall be able to resist a single concentrated load of 200 lbf (890 N) applied in any direction and at any point along the top, and have attachment devices and supporting structure to transfer this loading to appropriate structural elements of the building. This load need not be assumed to act concurrently with the load specified in subparagraph 1.
 3. Intermediate rails (all those except the handrail), balusters, and panel fillers shall be designed to withstand a horizontally applied normal load of 50 lb (0.22 kN) on an area not to exceed 1 ft. square (305 mm square) including openings and space between rails. Reactions due to this loading are not required to be superimposed with those of subparagraphs 1 and 2.

1.04 SUBMITTALS

- A. Product Data: For metal stairs and the following:
1. Prefilled metal-pan stair treads.
 2. Paint products.
 3. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal stairs and gate. Include plans, elevations, sections, and details of metal stairs, gate and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
1. Include structural calculations for all members and connections signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by the same firm.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the state of Maine and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal

stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.

- C. Fabricator Qualifications: A firm experienced in producing metal stairs similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code—Steel," and AWS D1.3, "Structural Welding Code—Sheet Steel."

1.06 COORDINATION

- A. 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.
- B. Field Measurement: Measure existing stairs before fabricating continuing runs or new handrails and railings. Show actual dimensions on Shop Drawings.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- D. Uncoated, Cold-Rolled Steel Sheet: Commercial quality, complying with ASTM A 366/A 366M; or structural quality, complying with ASTM A 611, Grade A, unless another grade is required by design loads.
- E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- F. Stainless Steel Tubing: ASTM A 554, Grade MT 304.
- G. Stainless Steel Pipe: ASTM A 312/A 312M, Grade TP 304.

2.02 FASTENERS

- A. General: 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. Select fasteners for type, grade, and class required.
- B. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed

in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.03 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers or cold-applied asphalt emulsion complying with ASTM D 1187.

2.04 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 CONCRETE FILL AND REINFORCING MATERIALS

- A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless higher strengths are indicated.

2.06 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, handrails, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 1. Join components by welding, unless otherwise indicated.
 2. Use connections that maintain structural value of joined pieces.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
 1. Architectural class.
- C. Shop Assembly: Preassemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.

- E. Ease exposed edges to a radius of approximately **1/32 inch (1 mm)**, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Welding: 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. Weld exposed corners and seams continuously, unless otherwise indicated. Finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.07 STEEL-FRAMED STAIRS

- A. Stair Framing: Fabricate stringers of structural-steel channels, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 - 1. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods to support landings from floor construction above. Locate hanger rods within stud space of shaft-wall construction.
 - 2. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- B. Metal Risers, Subtread Pans, and Subplatforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than **0.0677 inch (1.7 mm)**.
 - 1. Steel Sheet: Uncoated cold-rolled steel sheet, unless otherwise indicated.
 - 2. Directly weld metal pans to stringers; locate welds on side 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.

2.08 STEEL TUBE HANDRAILS AND RAILINGS

- A. General: Fabricate handrails and 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: 1-1/2-inch-square top and bottom rails, 1-1/2-inch-square posts, and 1/2-inch-square pickets spaced not more than 4 inches clear.
 2. Handrails: Fabricate handrails from 1-1/2 inch O.D. round stainless steel pipe or tubing.
 3. Gate: Form gate from steel tube of same size and shape as top rails. Provide with hinges for fastening to wall and overlapping stop with rubber bumper to restrict gate to opening in the direction of egress.
- B. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
1. At tee and cross intersections, cope ends of intersecting members to fit contour of tube to which end is joined, and weld all around.
- C. Form changes in direction of handrails and rails by flush radius bends, or by inserting prefabricated flush elbow fittings.
- D. Form simple and compound curves by bending members in 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.
- E. Close exposed ends of handrail and railing members with prefabricated end fittings.
- F. 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 (6 mm)** or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting railings and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.
- H. Fillers: Provide fillers made from steel plate, 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.
- I. Provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.09 FINISHES

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

- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed products:
 - 1. Interiors (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."
- D. Apply shop primer to prepared surfaces of metal stair components, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- 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 from 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. Field Welding: 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.
 - 1. Finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.02 INSTALLING METAL STAIRS

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 INSTALLING RAILINGS AND HANDRAILS

- A. Adjust handrails and 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. Secure posts and railing ends to building construction as follows:
1. Anchor posts to steel by welding directly to steel supporting members.
 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Provide bracket 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. Secure wall brackets to building construction as follows:
1. Use type of bracket with predrilled hole for exposed bolt anchorage.
 2. For hollow masonry anchorage, use toggle bolts.
 3. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.04 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

END OF SECTION 05510