

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.01A, entitled "Related Documents."

1.02 SUMMARY

- A. This Section includes the following:
1. Preassembled steel stairs with concrete-filled treads.
 2. [Preassembled steel stairs with precast concrete treads.](#)
 3. Steel pipe railings attached to metal stairs.
 4. Steel pipe handrails attached to walls adjacent to metal stairs.
 5. Steel pipe handrails attached to walls adjacent to ramps.
 6. Cane detection rail.
- B. Related Sections include the following:
1. Division 01 Section "Sustainable Design Requirements."
 2. Division 03 Section "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
 3. [Division 05 Section "Decorative Metal Railings" for decorative metal railings installed with metal stairs.](#)
 4. [Division 06 Section "Sheathing" for plywood sheathing installed with metal stairs.](#)
 5. Division 09 Section "Painting" for field finishing metal stairs and railings.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: 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.
 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.
- C. 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 and Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. 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" and the Connecticut State Building Code.

1.04 SUBMITTALS

- A. Product Data: For metal stairs and the following:
1. Paint products.
 2. Grout.
 3. [Precast concrete treads.](#)
- B. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:
1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
 2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
 3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Provide templates for anchors and bolts specified for installation under other Sections.
 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Welding certificates.
- E. Qualification Data: For professional engineer, licensed in the State of Connecticut.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for railings.
1. Test railings according ASTM E 894 and ASTM E 935.
- G. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- 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. Preassembled Stairs: Commercial class.
- C. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. 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. 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

2.01 METALS, GENERAL

- 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.

2.02 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

2.03 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.
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Bolts: ASME B18.2.1.
- F. Plain Washers: Round, ASME B18.22.1.
- G. Lock Washers: Helical, spring type, ASME B18.21.1.
- H. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, 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.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.04 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. 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.
- C. 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.
- D. Concrete Materials: Furnished and installed by Division 03 Section "Cast-in-Place Concrete."

2.05 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.

1. Join components by welding, unless otherwise indicated.
 2. Use connections that maintain structural value of joined pieces.
- 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, 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 true to line and level with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
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 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. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.06 STEEL-FRAMED STAIRS

- A. Stair Framing:
1. [Fabricate stringers of steel channels and tubes as indicated on Drawings.](#)
 - a. Provide closures for exposed ends of channel stringers.
 2. Weld stringers to headers; weld framing members to stringers and headers.
- B. Metal-Pan Stairs: Form risers and subreads pans to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.0677 inch.
1. Steel Sheet: Uncoated cold-rolled steel sheet.
 2. Directly weld metal pans to stringers; locate welds on top of subreads where they will be concealed by concrete fill. Do not weld risers to stringers.
 3. Attach risers and subreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
 4. Shape metal pans to include nosing integral with riser.

2.07 STEEL TUBE RAILINGS

- A. General: 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: As indicated.
- ~~B. Woven Wire Mesh Infill Panels: Fabricate infill panels from woven wire mesh crimped into stainless steel metal U-channel frames.~~
- ~~1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:
 - ~~a. McNichols; Square Welded Wire Mesh.~~~~
 - ~~2. Woven Wire Mesh: Intermediate crimp, square pattern, woven wire mesh, Type 304 stainless steel, 0.120 inch thick (11 gauge).~~
 - ~~3. Edge panels with 1 inch U-shaped channels made from stainless steel sheet, not less than 12 gauge.~~
 - ~~4. Make wire mesh and frames from plain steel.~~
 - ~~5. Orient wire mesh with wires horizontal and vertical.~~
 - ~~6. Pattern: 2 x 2 inches, 89% open area.~~
- C. 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.
- D. Form changes in direction of railings as follows:
1. By bending.
- E. 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.
- 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 or less.
- G. 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. Connect posts to stair framing by direct welding unless otherwise indicated.
 2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
 3. Wall Brackets: Steel. Provide minimum clearance of 1-1/2- inches from bottom of handrail to top of horizontal projection of the bracket, and minimum 1-1/2- inches clear from wall to edge of handrail.
 - a. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:

1) The Wagner Companies; Handrail Bracket, No. RB14025.

- 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.

2.08 PRECAST CONCRETE TREADS

A. Precast Concrete Treads:

1. Basis of Design Product: Subject to compliance with requirements, provide the following, or equal:
 - a. Wausau Tile, Inc.; Fully Supported Tread.
2. Thickness: 2 inches.
3. Color: As selected by Architect from manufacturer's full range.
4. Finish: Ground and polished.

B. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.

C. Reinforcement: Galvanized, welded-wire reinforcement, 2 by 2 inches by 0.062-inch- diameter steel wire; comply with ASTM A1064/A1064M, except for minimum wire size.

D. Abrasive Inserts: Silica sand and epoxy.

1. Lines: Two.
2. Color: As selected by Architect from manufacturer's full range.

E. Sealer: Colorless, pure acrylic water repellent sealer. Sealer to maintain natural look of concrete surface with no glaze or gloss, darkening or color change.

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. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

- D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. 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 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. Field Welding: Comply with the following requirements:
 - 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. At exposed connections, 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. Place and finish concrete fill for treads and platforms by Division 03 Section "Cast-in-Place Concrete."
- H. [Install precast concrete treads with adhesive supplied by manufacturer.](#)

3.02 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- 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 STEEL TUBE RAILINGS

- A. Attach handrails to wall with wall brackets. Locate brackets at spacing required to support structural loads, not more than 48" o.c. Secure wall brackets to building construction as follows:
 - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
 - 2. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 3. For hollow masonry anchorage, use toggle bolts.
 - 4. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed steel 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 dry film thickness.

3.05 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.

END OF SECTION