

SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Preassembled steel stairs with concrete-filled and precast terrazzo treads.
2. Railings attached to metal stairs.
3. Handrails attached to walls adjacent to metal stairs.
4. Railing gates at the level of exit discharge.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs and railings.
  1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
  2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.
- D. Schedule installation of railings so wall attachments are made only to completed walls.
  1. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal pan stairs and the following:
  1. Perforated metal.
  2. Prefilled metal-pan-stair treads.
  3. Abrasive nosings.
  4. Shop primer products.
  5. Nonslip-aggregate concrete finish.

6. Abrasive-coating finish to formed-metal stairs.
7. Handrail wall brackets.
8. Grout.

B. Sustainable Design Submittals:

1. Product Data: 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.
2. Environmental product declaration.
3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.
5. Indicate profile and dimensions of precast terrazzo treads.
6. Indicate profile and dimensions of epoxy-resin-filled treads.

D. Delegated-Design Submittal: For stairs, railings and precast terrazzo treads, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
  1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
  2. Protect steel members and packaged materials from corrosion and deterioration.

3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
  - a. Repair or replace damaged materials or structures as directed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014516 "Contractor Quality Control," to design stairs, railings, including attachment to building construction.
- B. Structural Performance of Stairs: Metal stairs shall withstand 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/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Structural Performance of Railings: Railings, including attachment to building construction, shall withstand 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. (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. 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. Infill load and other loads need not be assumed to act concurrently.

### 2.2 METALS

- A. Metal Surfaces: 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 A36/A36M.
  1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Steel Tubing for Railings: ASTM A500/A500M (cold formed) or ASTM A513/A513M.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
  2. Provide galvanized finish for exterior installations and where indicated.
- D. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Woven-Wire Mesh: Intermediate-crimp, square pattern, 2-inch (50-mm) woven-wire mesh, made from 0.135-inch (3.5-mm) nominal-diameter steel wire complying with ASTM A510/A510M.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25] <Insert value> percent.
- F. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.
1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- G. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

### 2.3 ABRASIVE NOSINGS

- A. Cast-Metal Units: Cast aluminum, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. American Safety Tread Co., Inc.
    - b. Balco; a CSW Industrials Company.
    - c. Barry Pattern & Foundry Co., Inc.
    - d. Safe-T-Metal Company, Inc.
  2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
  3. Configuration: Cross-hatched units, 3 inches (75 mm) wide without lip.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
- D. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

## 2.4 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.
  - 1. Select fasteners for type, grade, and class required.
- B. 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.
- C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
  - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.
- E. Post-Installed Anchors: Torque-controlled expansion anchors or 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 E488/E488M, conducted by a qualified independent testing agency.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594 (ASTM F836M).

## 2.5 MISCELLANEOUS MATERIALS

- A. Handrail Wall Brackets: Cast aluminum, center of rail 2-1/2 inches (63.5 mm) from face of wall.
- B. Welding Electrodes: Comply with AWS requirements.
- C. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish system indicated.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 ASTM A780/A780M and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- G. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.
- H. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.6 PRECAST TERRAZZO TREADS

- A. Precast Terrazzo Stair Treads: Epoxy terrazzo units cast in maximum lengths possible. Comply with manufacturer's written instructions for fabricating precast terrazzo units in sizes and profiles indicated.
1. Provide precast terrazzo treads that comply with Section 096623 "Resinous Matrix Terrazzo Flooring".

2.7 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. Assemble stairs and railings in shop to greatest extent possible.
1. Disassemble units only as necessary for shipping and handling limitations.
  2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
  2. 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 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 to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 - Completely sanded joint with some undercutting and pinholes okay.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
  2. Locate joints where least conspicuous.
  3. Fabricate joints that will be exposed to weather in a manner to exclude water.
  4. Provide weep holes where water may accumulate internally.

2.8 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
1. Fabricate stringers of steel channels.
    - a. Stringer Size: As required to comply with "Performance Requirements" Article.
    - b. Provide closures for exposed ends of channel and rectangular tube stringers.
    - c. Finish: Shop primed.
  2. Construct platforms of steel channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
    - a. Provide closures for exposed ends of channel and rectangular tube framing.
    - b. Finish: Shop primed.
  3. Weld stringers to headers; weld framing members to stringers and headers.
  4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below.
    - a. 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.
- 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 (1.7 mm).
1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
  2. Steel Sheet: Uncoated, cold-rolled steel sheet unless otherwise indicated.
  3. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
  4. Attach risers and subtreads 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.
  5. Shape metal pans to include nosing integral with riser.
  6. Attach abrasive nosings to risers.
  7. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
  8. Provide epoxy-resin-filled treads, reinforced with glass fibers, with non-slip-concrete aggregate finish to tread surface.
  9. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
    - a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.
- D. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.097 inch (2.5 mm).

1. Steel Sheet: Uncoated, hot-rolled steel sheet unless otherwise indicated.
2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

## 2.9 FABRICATION OF STAIR RAILINGS

- A. Comply with applicable requirements in Section 055213 "Pipe and Tube Railings." and Section 057300 "Decorative Metal Railings."

## 2.10 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
  1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
  2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with 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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
  1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 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.

1. 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.
    1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.
      - a. Clean bottom surface of plates.
      - b. Set plates for structural members on wedges, shims, or setting nuts.
      - c. Tighten anchor bolts after supported members have been positioned and plumbed.
      - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
      - e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
        - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
        - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
  - 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.
    1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
    2. 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.
    3. Comply with requirements for welding in "Fabrication, General" Article.
  - F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
    1. Install abrasive nosings with anchors fully embedded in concrete.
    2. Center nosings on tread width.
  - G. Install precast concrete treads with adhesive supplied by manufacturer.
  - H. Install precast terrazzo treads according to manufacturer's written instructions.
- 3.3 REPAIR
- 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.
    1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055113