

## **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 treads.
  - 2. Steel tube railings attached to metal stairs.
  - 3. Steel tube handrails attached to walls adjacent to metal stairs.

#### **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, 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. Prefilled metal-pan-stair treads.

2. Abrasive nosings.
  3. Shop primer products.
  4. Handrail wall brackets.
- B. 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.
- C. Delegated-Design Submittal: For stairs and railings, 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 014000 "Quality Requirements," to design stairs and 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.
  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: 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. 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.
  3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
    - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
  4. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
    - a. Component Importance Factor: 1.5.

## 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 A 36/A 36M.
- C. Steel Tubing for Railings: ASTM A 500/A 500M (cold formed) or ASTM A 513/A 513M.
- D. Steel Pipe for Railings: 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.
- E. 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.
- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

## 2.3 ABRASIVE NOSINGS

- A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Safety Tread Co., Inc.
    - b. Amstep Products.
    - c. Armstrong Products, Inc.
    - d. Balco, Inc.
    - e. Granite State Casting Co.
    - f. Nystrom, Inc.
    - g. Upnovr, Inc.
    - h. Wooster Products Inc.
  - 2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
  - 3. Nosings: Square-back units, 3 inches wide, without lip.
  - 4. Nosings: Two-piece units, 3 inches wide, with subchannel for casting into concrete.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

- C. 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 B 633 or ASTM F 1941/F 1941M, 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 A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- D. 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 E 488/E 488M, conducted by a qualified independent testing agency.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941/F 1941M, Class Fe/Zn 5, unless otherwise indicated.

## 2.5 MISCELLANEOUS MATERIALS

- A. Handrail Wall Brackets: Cast nickel-silver, aluminum, bronze, or stainless steel, center of rail 3-1/8 inches from face of wall.
  - 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. Blum, Julius & Co., Inc.
    - b. The Wagner Companies., R&B Wagner, Inc.
- B. Welding Electrodes: Comply with AWS requirements.
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
- D. Prefilled Concrete Treads:
  - 1. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete

with minimum 28-day compressive strength of 3000 psi and maximum aggregate size of 1/2 inch unless otherwise indicated.

## 2.6 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 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:
    - a. Building Stair: Finish #1 - No evidence of welded joint, as shown in NAAMM AMP 521.
- 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.

## 2.7 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for:
  1. Architectural Class for Building Stairs.
- B. Stair Framing:
  1. At Building Stairs, fabricate stringers of steel rectangular tubes.
    - 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 plate, channel, or rectangular tube 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 or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
  4. 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. Steel Sheet: Uncoated, cold-rolled steel sheet for interior applications Building Stair).
  2. 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.
  3. Shape metal pans to include nosing integral with riser.
  4. Attach abrasive nosings to risers of stairs in stairwell.
  5. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
  6. 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 at Building Stairs.

## 2.8 FABRICATION OF STAIR RAILINGS

- A. Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.
  1. Rails and Posts: 1-5/8-inch diameter top and bottom rails and posts.
  2. Picket Infill at Building Stairs: 1/2-inch to 3/4-inch round or square pickets spaced less than 4 inches clear.
- B. Welded Connections: Fabricate railings with welded connections.
  1. Cope components at connections to provide close fit, or use fittings designed for this purpose.
  2. Weld all around at connections, including at fittings.
  3. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  4. Obtain fusion without undercut or overlap.
  5. Remove flux immediately.
  6. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for:
    - a. At Building Stairs: Finish #1 - No evidence of welded joint as shown in NAAMM AMP 521.
- C. Form changes in direction of railings as follows:
  1. By bending or by inserting prefabricated elbow fittings.
  2. By flush bends or by inserting prefabricated flush-elbow fittings.
  3. By radius bends.
  4. By inserting prefabricated elbow fittings.
- D. For changes in direction made by bending, use 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 railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
  1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.



- G. Connect posts to stair framing by direct welding unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
  - 1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
  - 2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
  - 3. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

## **2.9 FINISHES**

- A. Finish metal stairs after assembly.
- B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- C. 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.
1. Grouted Baseplates: Clean concrete-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.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. 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.
- E. 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.

### **3.3 INSTALLING RAILINGS**

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
1. Space posts at spacing indicated or, if not indicated, as required by design loads.
  2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.

3. Align rails so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.
4. Secure posts and rail ends to building construction as follows:
  - a. Anchor posts to steel by welding or bolting to steel supporting members.
  - b. Anchor handrail ends to masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.

B. Attach handrails to wall with wall brackets.

1. Locate brackets at spacing required to support structural loads.
2. Secure wall brackets to building construction as required to comply with performance requirements, or as follows:
  - a. For hollow masonry anchorage, use toggle bolts.

### **3.4 REPAIR**

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

**END OF SECTION 055113**