

SECTION 05 51 13 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide the work of this Section in accordance with requirements of the Contract Documents.
- B. This Section includes, but is not limited to:
 - 1. Preassembled steel stairs with concrete-filled treads.
 - a. Exterior Locations: Exposed steel shall have galvanized.
 - b. Interior Locations: Factory primed and painted in accordance with Section 09 90 00 Painting.
 - 2. Steel tube railings post and pickets attached to metal stairs.
 - a. Exterior Locations: **RLG-06** Exposed steel shall be galvanized.
 - 3. Steel tube railings with posts attached to metal stairs.
 - a. Interior Locations: **RLG-07** Factory primed and painted in accordance with Section 09 90 00 Painting.
 - 4. Steel tube handrails attached to walls adjacent to stairs.
 - a. Exterior Locations **HR-01**: Exposed steel shall be galvanized.
 - b. Interior Locations **HR-02**: Factory primed and painted in accordance with Section 09 90 00 Painting.
- C. Related Sections:
 - 1. Division 03, Section 03 30 00 "Cast-In-Place Concrete" for concrete fill for stair treads.

1.2 PREINSTALLATION MEETINGS

- A. Review shop and field quality control testing procedures, including Special Inspections, which are different than Quality Control testing.

1.3 COORDINATION

- A. Do not install enclosing or concealing construction until after welds have been inspected, and tested and corrections have been made to defective applications.
- B. 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.
- C. Coordinate installation of anchorages for metal stairs and railings.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For metal pan stairs and the following:
2. Welded-wire mesh.
 - a. Abrasive nosings.

B. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:
 - a. Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
 - b. Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.
 - 1) Include statement indicating costs for each product having recycled content.
 - c. Regional Materials: For products that are required to comply with requirements for regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.
 - 1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.
2. Indoor Environmental Quality, Low Emitting Materials: Building Products must be tested and compliant with the California Department of Public-Health (CDPH) Standard Method V1.1-2010 or v1.2 2017, using the applicable exposure scenario.
 - a. For paints, and coatings, wet applied, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure for Architectural Coatings or the South Coast Air Quality Management District (SCAQMD) Rule 1113-2011.
 - b. Adhesives and Sealants: For wet applied on-site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005, and rule amendment date of January 7, 2005.

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.

D. Fabrication Engineering and Design Data Submittal: Submit for stairs and railings to verify compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified manufacturer/fabricator, and professional engineer's experience with providing engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Welding Certificates and Procedures: Submit for record written data on the materials, welding procedures and qualifications of welders in accordance with requirements of AWS D1.1 and the Building Code.
- C. Sustainable Design Submittals:
 - 1. Building Product Disclosure and Optimization - Environmental Product Declarations
 - a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.
 - 2. Building Product Disclosure and Optimization - Material Ingredients
 - a. Material Ingredient Reporting: Submit documentation confirming chemical inventory of products to at least 0.1 % (1000ppm) with at least one of the following:
 - 1) Submit published manufacturer inventory of ingredients identified by name and Chemical Abstract Service Registration Number (CASRN)
 - 2) Submit documentation that product has been certified as Cradle-to-Cradle v3 at the Bronze Level or better
 - 3) Submit Declare product label indicating that all ingredients have been disclosed down to 1000 ppm or designated as Red List Free or Declared
 - 4) Living Product Challenge
 - 5) Product Lens Certification
 - 6) USGBC approved program.
 - b. Material Ingredient Optimization: Submit documentation confirming chemical inventory of products to at least 0.01 % (100ppm) and/or that has a compliant material ingredient optimization report with at least one of the following:
 - 1) Submit GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
 - 2) Submit third-party verified documentation that product has been certified as Cradle-to-Cradle v3 at the Bronze Level or better
 - 3) Submit third-party verified Cradle to Cradle v3 Material Health certificate at the Bronze Level or better
 - 4) Submit third-party verified Declare product label indicating that all ingredients have been disclosed down to 100 ppm
 - 5) Submit third-party verified documentation that product is Living Product Challenge certified with a Red List Free or LBC Red List Free Declare label.
 - 6) Submit documentation that product has a manufacturer prepared action plan with material inventory to at least 1000 ppm.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator/Installer with a minimum five (5) consecutive year experience in the successful fabrication and installation of steel stair and railing systems of the type indicated for this project.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located, and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of metal pan stairs that are similar to those indicated for this Project in material, design, and extent.
- C. Welding Qualifications: Qualify procedures and personnel including shop welders, field welders, welding operators and tackers for the following periods of effectiveness according to the following:
 - 1. Welding Standards
 - a. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - b. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 - 2. Certification and qualification, including period of effectiveness of welding personnel shall be as specified by AWS D1.1. Certification shall remain in effect for duration of work provided welders are continuously engaged in performing the type of welding for which they are certified, unless welders fail to perform acceptable welding, as determined by the Independent Special Inspection Agency (IIA). Certification and re-certification of welding personnel is subject to verification by the Testing Agency. Re-testing for re-certification will be the Contractor's responsibility.
- D. Reference Standards: Except as governed by requirements of local building codes, provide metal pan stair in accordance with applicable requirements and recommendations of the following organizations and standards:
 - 1. American Institute of Steel Construction (AISC): Code of Practice for Structural Steel Buildings, and Bridges". Where a conflict exists between the AISC Code of Standard Practice and the Contract Documents, the Contract Documents shall govern.
 - 2. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members".
 - 3. National Association of Architectural Metal Manufacturers (NAAMM):
 - a. "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) Fire Stairs: Commercial class
 - 2) Decorative Stair: Architectural class
 - b. "Metal Stairs Manual".
 - c. "Pipe Railing Manual".
 - d. "Metal Finishes Manual"
 - 4. Industrial Fasteners Institute (IFI): IFI "Fastener Standards".

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.
 - 4. Handle in such a manner so as to protect surfaces and to prevent distortion of, and any other type of damage to, fabricated pieces.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fabrication Engineering and Design: Engage a qualified professional engineer, as defined in Section 01 33 16, "Fabrication Engineering Design Data," to design stairs and railings complying with requirements..
- 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. Loads:
 - a. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 - b. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
- 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.
- D. Low-Emitting Materials:

1. Architectural paints and coatings wet-applied inside the weather-proofing system must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. All paints and coatings wet-applied inside the weather-proofing system must have VOC content in compliance with the applicable VOC limits (g/L) found in tables in Division 01, Section 01 81 13 "Sustainable Design Requirements - LEED v4 BD+C."
3. Adhesives and Sealants wet-applied inside the weather-proofing system must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
4. All adhesives and sealants wet-applied inside the weather-proofing system must have VOC content in compliance with the applicable VOC limits (g/L) found in tables in Division 01, Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C."

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.
 1. Surface Flatness and Edges: For exposed Work provide materials which have been produced to the highest commercial standard for fire stairs and highest architectural standard for ornamental stairs for flatness with edges and corners sharp and true to angle or curvature as required.
 2. Alloys and Tempers: Provide the specific alloy which will weld and machine properly, and will finish to match the Architect's sample. Use the temper or hardness which will provide the greatest strength and durability, consistent with necessary forming, fabrication and finishing processes.
 3. Exposed Surfaces: 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.
- C. Steel Tubing for Railings and Guards: ASTM A500/A500M (cold formed).
- 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.
- E. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.
- F. Galvanized-Steel Sheet: ASTM A653/A653M, G90 (Z275) coating, either commercial steel, Type B, or structural steel, Grade 33 (Grade 230), unless another grade is required by design loads.

2.3 ABRASIVE NOSINGS

- A. Cast-Metal Units: Cast iron, 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:
 - a. Subject to compliance with requirements, provide products by the following:

- 1) American Safety Tread Co., Inc.
- 2) Balco, Inc.
- 3) Barry Pattern & Foundry Co., Inc.
- 4) Granite State Casting Co.
- 5) Safe-T-Metal Company, Inc.
- 6) Wooster Products Inc.

2. Abrasive Color: As selected by Architect from manufacturer's full color range.

- 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.

2.5 MISCELLANEOUS MATERIALS

- A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- B. Welded Wire Reinforcement: ASTM A185/A185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

2.6 FABRICATION, GENERAL

- A. General: Provide metal stairs and platforms of the design shown. Comply with specified "Performance Criteria". Include supplementary parts necessary to complete commercial and architectural metal stair work though not definitely shown or specified.
- 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.
 - 2. Use connections that maintain structural value of joined pieces.
- C. Preassembled Stairs: Assemble stairs 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.
- D. 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.

- E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Form exposed work true to line and level, with accurate angles and surfaces and straight edges.
- G. 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.
- H. 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.

2.7 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. Provide closures for exposed ends of channel and rectangular tube stringers.
 - 2. Construct platforms of steel channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
 - 4. Where stairs are enclosed by gypsum board and 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, subthead 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).
- 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).

2.8 FABRICATION OF PIPE AND TUBE RAILINGS FOR STAIRS

- A. Fabricate railings and guards 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- (41-mm-) diameter top and bottom rails and 1-1/2-inch- (38-mm-) square posts.
 - 2. Picket Infill: 1/2-inch- (13-mm-) round pickets spaced to prohibit the passage of a 4-inch (100-mm) diameter sphere.
 - 3. Intermediate Rails Infill: 1-5/8-inch- (41-mm-) diameter intermediate rails spaced less than 12 inches (305 mm).
- B. Welded Connections: Fabricate railings and guards 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. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 - Completely sanded joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.
- C. Form changes in direction of railings and guards as follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
 - 2. By inserting prefabricated elbow fittings.
- D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required.
 - 1. 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 and guard members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
- 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.
- I. 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.

2.9 FINISHES

- A. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings and conditions to which the stairs are to be attached and confirm that openings are square and in compliance with shop drawings and installation tolerances.
- B. 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.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare in place steel framing to receive stairs. If spray fireproofing is in place do not remove more than is necessary to accomplish the welded or bolted connections.

3.3 INSTALLATION OF METAL PAN STAIRS

- A. 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.
- 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.
- D. Place wire mesh in concrete and finish concrete fill for treads and platforms to comply with Section 03 30 00 "Cast-in-Place Concrete."
 - 1. Install abrasive nosings with anchors fully embedded in concrete.

3.4 INSTALLATION OF RAILINGS

- A. Adjust railing and guard 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.
 - 3. Secure posts, rail ends, and guard ends to building construction as follows:
 - a. Anchor posts to steel by welding to steel supporting members.
 - b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.
- B. Attach handrails to wall with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Secure wall brackets to building construction as required to comply with performance requirements.

3.5 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 LEED V4 compliant primer, compatible with primer used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION