

**SECTION 05 51 00**  
**METAL STAIRS**

SPEC WRITER NOTES:

1. Delete between // // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
2. Occupational Safety and Health Administration (OSHA) requires a stair to areas where a mechanic must go up or down different levels to service equipment.
3. Use either open riser or industrial stair to roof where not accessible, to other than building service personnel.
4. See OSHA Section 1910.24, Fixed Industrial stair.
5. Design industrial stair or open riser stairs for maximum angle 50 degrees or less to horizontal when used to service equipment.
6. Consider open riser stairs with grate treads on exterior service areas.
7. Do not use "ships ladders" or spiral stairs.

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies steel stairs with railings.
- B. Types:
  1. Closed riser stairs with concrete filled treads and platforms.
  2. Industrial stairs: Closed // and open // riser stairs.

**1.2 RELATED WORK**

- A. //Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements. //
- B. Section 03 30 00, CAST-IN-PLACE CONCRETE: Concrete fill for treads and platforms.
- C. Section 05 50 00, METAL FABRICATIONS: Wall handrails and railings for other than steel stairs.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. // Sustainable Design Submittals, as described below:
  1. // Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.// //

- C. Shop Drawings: Show design, fabrication details, installation, connections, material, and size of members.
- D. Fabrication qualifications.
  - a. Installer qualifications.
  - b. Calculations.
- E. Welding qualifications.

#### **1.4 QUALITY ASSURANCE**

- A. Fabricator: A firm with a minimum of three (3) years' experience in type of work required by this section. Submit fabricator qualifications.
- B. Installer: A firm with a minimum of three (3) years' experience in type of work required by this section. Submit installer qualifications.
- C. Calculations: Provide professionally prepared calculations and certification of performance of this work, signed and sealed by a Professional Engineer registered in the state where the work is located. Perform structural design of the stair including supports for the metal stair frame. Indicate how Design Criteria as specified have been incorporated into the design.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M and AWS D1.3/D1.3M.

#### **1.5 APPLICATION PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.
- B. American Society of Mechanical Engineers (ASME):
  - B18.2.1-12.....Square, Hex, Heavy Hex, and Askew Head Bolts  
and Hex, Heavy Hex, Hex Flange, Lobed Head, and  
Lag Screws (Inch Series)
  - B18.2.3.8M-81(R2005)....Metric Heavy Lag Screws
  - B18.6.1-81(R2008).....Wood Screws (Inch Series)
  - B18.6.3-13.....Machine Screws, Tapping Screws, and Metallic  
Drive Screws (Inch Series)
  - B18.6.5M-10.....Metric Thread Forming and Thread Cutting  
Tapping Screws
  - B18.6.7M-10.....Metric Machine Screws
  - B18.22M-81(R2010).....Metric Plain Washers
  - B18.21.1-09.....Washers: Helical Spring-Lock, Tooth Lock, and  
Plain Washer (Inch Series)

## C. ASTM International (ASTM):

A36/A36M-19.....Structural Steel  
A47/A47M-99e1R2018).....Ferritic Malleable Iron Castings  
A48/A48M-03(R2016).....Gray Iron Castings  
A53/A53M-20.....Pipe, Steel, Black and Hot-Dipped Zinc-Coated  
Welded and Seamless  
A123/A123M-17.....Zinc (Hot-Dip Galvanized) Coatings on Iron and  
Steel Products  
A153/A153M-16a.....Zinc Coating (Hot-Dip) on Iron and Steel  
Hardware  
A307-14e1.....Carbon Steel Bolts, Studs and Threaded Rod  
60,000 PSI Tensile Strength  
A653/A653M-20.....Steel Sheet, Zinc Coated (Galvanized) or Zinc  
Alloy Coated (Galvannealed) by the Hot-Dip  
Process  
A786/A786M-15.....Rolled Steel Floor Plates  
A1008/A1008M-20.....Steel, Sheet, Cold-Rolled, Carbon, Structural,  
High-Strength, Low-Alloy  
A1011/A1011M-18.....Steel, Sheet and Strip, Strip, Hot-Rolled  
Carbon, Structural, High-Strength, Low-Alloy

## D. American Welding Society (AWS):

D1.1/D1.1M-15.....Structural Welding Code-Steel  
D1.3/D1.3M-18.....Structural Welding Code-Sheet Steel

E. The National Association of Architectural Metal Manufacturers (NAAMM)  
Manuals:

MBG 531-17.....Metal Bar Gratings  
AMP521-01(R2012).....Pipe Railing Manual, Including Round Tube

## F. American Iron and Steel Institute (AISI):

S100-12.....Design of Cold-Formed Steel Structural Members

## G. National Fire Protection Association (NFPA):

101-18.....Life Safety Code

## H. Society for Protective Coatings (SSPC):

Paint 25(1997; E 2004)..Zinc Oxide, Alkyd, Linseed Oil Primer for Use  
Over Hand Cleaned Steel, Type I and Type II

## SPEC WRITER NOTES:

1. Verify that detail of stairs is shown on construction documents.
2. See NAAMM stair manual.

**PART 2 - PRODUCTS****2.1 DESIGN CRITERIA**

- A. Design stairs to support live load of 4.79 kN/square meter (100 pound force/ square feet) and a concentrated load of 1.33 kN (300 pound force) applied on an area of 2580 square mm (4 square inch).
  - 1. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Provide stair framing capable of withstanding stresses resulting from railing loads in addition to the loads specified above. Limit deflection of treads, platforms, and framing members to L/360 or 6.4 mm (1/4 inch), whichever is less.
- B. Provide structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.
- C. Design Grating treads in accordance with NAAMM Metal Bar Grating Manual.
- D. Design handrails and top rails of guards to support uniform load of not 0.73 kN/meter (50 pound force/feet) applied in any direction and a concentrated load of 0.89 kN (200 pound force) applied in any direction. Uniform and concentrated loads need not be assumed to act concurrently.
- E. Infill of guards to support concentrated load of 0.22 kN (50 pound force) applied horizontally on an area of 0.093 square meter (one square feet).
- F. Design fire stairs to conform to NFPA 101.

SPEC WRITER NOTE: Update material requirements to agree with applicable requirements (Types, grades, classes, and other related items) specified in the referenced Applicable Publications.

**2.2 MATERIALS**

- A. Steel Pipe: ASTM A53/A53M, Standard Weight, zinc coated.
- B. Steel Grating: Metal bar type grating NAAMM BG.
- C. Sheet Steel: ASTM A1008/A1008M.
- D. Structural Steel: ASTM A36/A36M.
- E. Steel Floor Plate: ASTM A786/A786M.
- F. Steel Decking: Form from zinc coated steel conforming to ASTM A653/A653M, with properties conforming to AISI S100 Specification for the Design of Cold-Formed Steel Structural Members.

- G. Steel Plate: ASTM A1011/A1011M.
- H. Iron Castings: ASTM A48/A48M, Class 30.
- I. Malleable Iron Castings: ASTM A47/A47M.
- J. // Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than // 30 // // // percent. //

### 2.3 FABRICATION GENERAL

- A. Fasteners:
  - 1. Conceal bolts and screws wherever possible.
  - 2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.
  - 3. Galvanized zinc-coated fasteners in accordance with ASTM A153/A153M and used for exterior applications or where built into exterior walls or floor systems. Select fasteners for the type, grade, and class required for the installation of steel stair items.
  - 4. Standard/regular hexagon-head bolts and nuts be conforming to ASTM A307, Grade A.
  - 5. Square-head lag bolts conforming to ASME B18.2.3.8M, ASME B18.2.1.
  - 6. Machine screws cadmium-plated steel conforming to ASME B18.6.7M, ASME B18.6.3.
  - 7. Wood screws, flat-head carbon steel conforming to ASME B18.6.5M, ASME B18.6.1.
  - 8. Plain washers, round, general-assembly-grade, carbon steel conforming to ASME B18.22M, ASME B18.21.1.
  - 9. Lockwashers helical spring, carbon steel conforming to ASME B18.2.1, ASME B18.2.3.8M.
- B. Welding:
  - 1. Structural steel, AWS D1.1/D1.1M, and sheet steel, AWS D1.3/D1.3M.
  - 2. Where possible, locate welds on unexposed side.
  - 3. Grind exposed welds smooth and true to contour of welded member.
  - 4. Remove welding splatter.
- C. Remove sharp edges and burrs.
- D. Fit stringers to head channel and close ends with steel plates welded in place where shown.
- E. Fit face stringer to newel post by tenoning into newel post, or by notching and fitting face stringer to side of newel where shown.
- F. Shop Prime Painting: // Shop prime steelwork with red oxide primer in accordance with SSPC Paint 25. //

1. // Hot dip galvanize steelwork as indicated in accordance with ASTM A123/A123M. Touch up abraded surfaces and cut ends of galvanized members with zinc-dust, zinc-oxide primer, or an approved galvanizing repair compound. //
- G. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 0.8 mm (1/32 inch), and bend metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.
- H. Continuously weld corners and seams in accordance with the recommendations of AWS D1.1/D1.1M. Grind smooth exposed welds and flush to match and blend with adjoining surfaces.
- I. Form exposed connections with hairline joints that are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type indicated or, if not indicated, use Phillips flathead (countersunk) screws or bolts.
- J. Provide and coordinate anchorage of the type indicated with the supporting structure. Fabricate anchoring devices, space as indicated and required to provide adequate support for the intended use of the work.
- K. Use hot-rolled steel bars for work fabricated for bar stock unless work is indicated or specified as fabricated from cold-finished or cold-rolled stock.
- L. // Soffit Clips: Provide clips with holes for attaching metal furring for gypsum wallboard soffits. //

SPEC WRITER NOTES:

1. Provide guard railings not less than 1067 mm (42-inches) high.
2. Use not less than two railings on industrial stairs.

#### 2.4 RAILINGS

- A. Fabricate railings, including handrails, from steel pipe.
  1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.
  2. Wall handrails are provided under Section 05 50 00, METAL FABRICATIONS.
- B. Return ends of handrail to wall and close free end.
- C. Provide standard terminal castings where fastened to newel.

- D. Space intermediate posts not over 1828 mm (6 feet) on center between end post // or newel post //.
- E. Fabricate handrail brackets from cast malleable iron.
- F. Provide standard terminal fittings at ends of post and rails.

SPEC WRITER NOTES:

1. Use closed riser stairs accessible to public and patients.
2. Design treads to receive rubber treads with riser sloped to meet tread nosing.

## 2.5 CLOSED RISER STAIRS

- A. Provide treads, risers, platforms, railings, stringers, headers and other supporting members.
- B. Fabricate pans for treads and platforms, and risers from sheet steel.  
// Fabricate pans for platforms from steel decking where shown. //
- C. Form risers with sanitary cove.
- D. Fabricate stringers, headers, and other supporting members from structural steel.
- E. Construct newel posts of steel tubing having wall thickness not less than 5 mm (3/16-inch), with forged steel caps and drops.

SPEC WRITER NOTES:

1. Show Platform and tread type. Add risers when required.
2. Do not exceed 50 degrees slope to floor per OSHA 1910.24. Preferred 177 mm (7 inch) maximum riser and 280 mm (11 inch) minimum tread.

## 2.6 INDUSTRIAL STAIRS

- A. Provide treads, platforms, railings, stringers and other supporting members as shown.
- B. Treads and platforms of checkered steel floor plate:
  1. Turn floor plate down to form nosing on treads and edge of platform at head of stairs.
  2. Support tread and platforms with angles welded to plate.
  3. Do not leave exposed fasteners on top of treads or platform surfaces.
  4. // Provide flat sheet steel risers for stairs with steel plate treads where shown //.
- C. Treads and platforms of steel grating:

1. Fabricate steel grating treads and platforms in accordance with requirements of NAAMM MBG 531-09.
2. Provide end-banding bars, except where carrier angle are used at tread ends.
3. Support treads by use of carrier plates or carrier angle. Use carrier plate end banding bars on exterior stairs.
4. Provide abrasive nosing on treads and edge of platforms at head of stairs.
5. Provide toe plates on platforms where shown.

**PART 3 - EXECUTION**

**3.1 STAIR INSTALLATION**

- A. Provide columns, hangers, and struts required to support the loads imposed.
- B. Perform job site welding and bolting as specified for shop fabrication.
- C. Set stairs and other members in position and secure to structure as shown.
- D. Install stairs plumb, level and true to line.
- E. Provide steel closure plate to fill gap between the stringer and surrounding wall. Weld and apply primer, ready to accept paint finish.

**3.2 RAILING INSTALLATION**

- A. Install standard terminal fittings at ends of posts and rails.
- B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.
- C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3658 mm (1/8-inch in 12 feet).
- D. Set posts plumb and aligned to within 3 mm in 3658 mm (1/8-inch in 12 feet).

**3.3 FIELD PRIME PAINTING**

- A. // Touch-up abraded areas with same primer paint used for shop priming.//
- B. // Touch up abraded galvanized areas.//

- - - E N D - - -