

SECTION 05 51 00 – METAL STAIRS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Pre-assembled steel stairs with concrete-filled, precast concrete, grating or steel diamond treads as specified in the project drawings.
2. Square or round steel tube guard railings and handrails as specified in the project drawings.

B. Related Sections:

1. Section 033000, "Cast in Place Concrete" for treads and landings.
2. Section 055000, "Metal Fabrications" for metal treads and nosings installed at locations other than in metal stairs.
3. Section 055213, "Pipe and Tube Railings" for pipe and tube railings.

C. Reference Standards

1. ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1
2. American Institute of Steel Construction
Manual of Construction
Code of Standard Practice
3. American Iron and Steel Institute AISI 121, Standard Definitions for Use in the Design of Steel Structures.
4. American National Standards Institute ANSI A117.1, Accessible and Usable Buildings and Facilities Standards.
5. ASTM International (formally American Standards for Testing & Materials)
 - A6 Specification for General Requirements for Rolled Structural Steel
 - A36 Specification for Carbon Structural Steel
 - A47 Specification for Steel Sheet, Aluminum Coated by the Hot Dip Process

- A53 Specification for Pipe, Steel, Black & Hot Dipped, Zn Coated, Welded & Seamless
- A123 Specification for Zinc (Hot Dipped Galvanized) coatings on Iron & Steel
- A153 Specification for Zinc (Hot Dipped Galvanized) on Iron & Steel hardware
- A283 Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
- A513 Specification for Electric Resistance Welded Carbon and Alloy Mechanical Tubing
- A526 Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process
- A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- A786 Specification Hot-Rolled Carbon, Low-Alloy, High-Strength Low Alloy and Alloy Steel Floor Plates
- A1008 Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy and High-Strength Low Alloy with Improved Formability
- A1011 Specification for Steel, Sheet & Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy & High Strength Low-Alloy with Improved Formability & Ultra High Strength
- E894 Test Method for Anchorage of Permanent Metal Railing and Rails for Buildings
- E935 Test Method for Performance of Permanent Metal Railing and Rails for Buildings

6. International Code Council (ICC), International Building Code (IBC).

7. National Fire Protection Association, NFPA-101, Life Safety Code.

8. National Association of Metal Manufacturers

- AMP 500-06, Metal Finishes Manual
- AMP 510-92, Metal Stair Manual
- MBG 531-09, Metal Bar Grating Manual

9. Society for Protective Coatings (SSPC):

- SSPC-PC3 Power Tool Cleaning
- SSPC Paint 20 Zinc Rich Coating
- SSPC Paint 25 Zinc Oxide, Alkyd, Linseed Oil Primer for Use over Hand Cleaned Steel
- SSPC-SP 2 Hand Tool Cleaning
- SSPC-SP 3 Power Tool Cleaning
- SSPC-SP6 Commercial Blast Cleaning

10. Local construction codes and guidelines enforced by Authority Having Jurisdiction (AHJ)

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. 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.
- C. Coordinate locations of hanger rods, struts, column legs, etc. with other work so that they do not encroach on required stair width and are within the fire-resistance rated stair enclosure.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:
 - 1. Metal floor plate treads
 - 2. Metal pan stair treads (prefilled)
 - 3. Precast concrete treads
 - 4. Non-slip aggregates and non-slip-aggregate finishes
 - 5. Abrasive nosings
 - 6. Paint products
 - 7. Erection drawings (hard or electronic copies)
- B. Shop Drawings: Include plans, elevations, sections, details and attachments to other work.
- C. Samples for Initial Selection: As requested for products involving selection of color, texture or design.
- D. Samples for Verification: For each type and finish of nosing and tread.
- E. Engineering calculations and stamped construction documents, both stamped by an engineer or architect licensed in the state of project implementation.
- F. Leadership in Energy and Environmental Design (LEED) Submittals:

Product data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding Certificates
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

- C. Product test reports: Based on tests performed by qualified agency.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Shall have produced stairs, platforms and railing systems for not less than 5 years or provide other acceptable evidence of being capable of acceptably manufacture the project stairs railings and platform systems.
- B. Installer Qualifications: Shall have installed stairs, platforms and railing systems for not less than 5 years or provide other acceptable evidence of being capable of acceptably manufacture the project stairs railings and platform systems.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel" or AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel", as applicable.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

Lapeyre Stair Inc.
5117 Toler St.
Harahan, LA 70123
Phone: 1-800-535-7631 or 504-733-6009
Fax: 504-733-4393
Email: LS.SALES@LAPEYRESTAIR.COM
Web: www.LAPEYRESTAIR.COM

2.2 PERFORMANCE REQUIREMENTS

- A. Design: Design shall be performed by a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs.
- 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 of 100 pounds per square foot (psf)
 - 2. Concentrated load of 300 pounds applied over an area of 4 in².
(Design need not assume uniform loads and concentrated loads act concurrently)
 - 3. Stair framing shall be capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 4. Deflections of treads, platforms, and framing members shall be limited as per IBC-2009 section 1604.3.1 (i.e. L/360 for Live Load or L/240 for Dead Load + Live Load)

- 5. Design for other loads such as wind, snow or seismic shall be per IBC-2009, as specified in the project specifications or drawings.
- C. Structural Performance of Tops of Railings or Guards:
 - 1. Uniform load of 50 pounds per linear foot (plf) applied in any direction
 - 2. Concentrated load of 200 pounds applied in any direction
 (Design need not assume uniform loads and concentrated loads act concurrently)
- D. Structural Performance of Infill of Guards
 - 1. Concentrated load of 50 pounds applied horizontally on an area of 1 ft².
 (Infill load and other loads need not be assumed to act concurrently).
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections and other detrimental effects.

2.3 METALS

- A. Provide metal surfaces with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed work, provide materials without seam marks, rolled trade names or blemishes.
- B. Steel Plates, Shapes and Bars shall be ASTM A36/A36M or A992.
- C. Steel Tubing (square or round) shall be ASTM A513 or A500 Grade B.
- D. Rolled-Steel Floor Plate shall be ASTM A786/A786M rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- E. Steel Bars for Grating Treads shall be ASTM A36/A36M or steel strip ASTM A1011/A1011M or ASTM A1018/A1018M.
- F. Uncoated, Cold-Rolled Steel Sheet shall be ASTM A1008/A1008M (commercial steel, Type B or Structural Steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.
- G. Uncoated, Hot-Rolled Steel Sheet shall be ASTM A1011/A1011M (commercial steel, Type B or Structural Steel, Grade 30 (Grade 205), unless another grade is required by design loads.
- H. Galvanized Steel Sheet shall be ASTM A653/A653M, G90 (Z275) coating (commercial steel , Type B or Structural Steel , Grade 33 (Grade 230), unless another grade is required by design loads.
- I. Expanded Metal (Carbon Steel) shall be ASTM F1267 Type I (expanded), Class 1 (uncoated).

- J. Woven-Wire Mesh shall be Intermediate-crimp, square pattern, 2-inch woven-wire mesh, made from 0.135 nominal diameter wire complying with ASTM A510 (ASTM A510M).

2.4 ABRASIVE NOSINGS

Note: All Abrasive Nosings are to be provided by and installed by the Installation Contractor.

- 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. Configuration shall be cross hatched units 3 inches wide without lip or cross hatched angle shaped units, same depth as bar grating treads and 1 to 1-1/2 inches wide.

- 1. Acceptable Manufacturers, subject to compliance with requirements

American Safety Tread Co. Inc.
 Balco, Inc.
 Barry Pattern & Foundry Co. Inc.
 Granite State Casting Co.
 Safe-T-Metal Company Inc.
 Wooster Products Inc.
 Other Manufacturers with Client approval

- B. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide or a combination of both. Units shall be solid abrasive type without ribs. Nosings shall be square back units, 3 inches wide, without lip or two piece units 3 inches wide, with sub-channel for casting into concrete. Fabricate units in lengths necessary to accurately fit opening or conditions.

- 1. Acceptable Manufacturers, subject to compliance with requirements

ACL Industries Inc.
 American Safety Tread Co. Inc.
 Amstep Products
 Armstrong Products Inc.
 Balco, Inc.
 Granite State Casting Co.
 Wooster Products Inc.
 Other Manufacturers with Client approval

- C. Details: Provide anchors for embedding units in concrete, either integral or applied to units as standard with manufacturer. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.5 FASTENERS

Note: All Fasteners are to be provided by the Stair Manufacturer. Installation of fasteners shall be by the installation contractor.

- 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. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A or A325 High Strength Bolts, with hex nuts, ASTM A563/A563M; and where indicated, flat washers. Dimensions shall be per ANSI B18.2.1, B18.2.2 and B18.22.1 as applicable.
- C. Anchor Bolts: ASTM F1554 Grade 36 of dimensions indicated; with nuts A563/A563M; and where indicated, flat washers. Dimensions shall be per ANSI B18.2.1, B18.2.2 and B18.22.1 as applicable.
- D. Post Installed Anchors: Torque controlled expansion anchors or chemical anchors capable of withstanding 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, conducted by a qualified independent testing agency. Carbon steel anchor components are to be zinc plated per ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated. Stainless Steel anchor components are to be Alloy Group 1 or Group 2, per ASTM F593/A594, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Shop Primers shall comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting".
- B. Universal Shop Primer shall be fast-curing, lead and chromate free, universal modified alkyd primer complying with MPI #79 and compatible with topcoat. (Use primer containing pigments that make it easily distinguishable from zinc-rich primer).
- C. Shop Primer for Galvanized Steel shall be formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Bituminous Paint shall be cold applied asphalt emulsion complying with ASTM D1187/1187M.

- E. Concrete Materials and Properties shall comply with the requirements in Section 033000 "Cast in Place Concrete" for normal weight, air entrained, ready mix concrete with a minimum 28-day compressive strength of 3,000 psi unless otherwise indicated.
- F. Non-slip Aggregate Concrete Finish shall be factory packaged abrasive aggregate made from fused aluminum oxide grits or crushed emery; rustproof and non-glazing, unaffected by freezing, moisture, or cleaning materials.
- G. Welded Wire Reinforcement shall be per ASTM A185/A185M, 6 inches by 6 inches, W1.4 by W1.4, unless otherwise indicated.
- H. Welding rods and bare electrodes shall be selected according to AWS D1.1 and AWS specifications for welded metal alloys.

2.8 FABRICATION GENERAL

- A. Complete stair assemblies shall be provided, including metal framing, hangers, struts, column legs, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure. Components shall be joined by welding unless otherwise noted. Connections that maintain the structural value of the joined components shall be used.
- B. Stairs shall be pre-assembled in the shop to the 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. Clearly mark units for reassembly and coordinated installation.
- D. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work. Form exposed work with accurate angles, surfaces and straight edges.
- E. Welded connections are 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 weld 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 Type 3 welds: partially dressed weld with spatter removed.

- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use carriage bolts unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.9 STEEL FRAMED STAIRS

- A. Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510 "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of steel plates or channels. Provide closures for exposed ends of channel stringers.
 - 2. Construct platforms of steel plate of channel or other structural members as needed to comply with performance requirements.
 - 3. Stringers shall be welded to headers. Framing members shall be welded to stringers and headers.
 - 4. Where stairs are enclosed by gypsum board assemblies, shaft wall assemblies, etc., provide column legs, hanger rods/struts to support landings from floors above or below. Locate such supports where they will not encroach on required stair width and will be within the fire-resistance rated stair enclosure.
 - 5. Where masonry wall support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Lapeyre Stair Quiet Grip™ Stairs: Factory-applied polyurethane, slip-resistant coating on metal plate treads and platform covers. Attach covers to sub-treads and sub-platforms with countersunk screws and sound-dampening adhesive. Form treads, risers, and platforms to configurations shown on project drawings from sheet steel needed to comply with performance requirements, but not less than 0.067 inch.
 - 1. Slip resistance: Not less than 47 Wet PTV
 - 2. Form treads with integral nosing matching treads

2.8 STAIR RAILINGS

- A. Comply with applicable requirements of Section 055213 "Pipe and Tube Railings"

1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
 2. Connect posts to stair framing by direct welding unless otherwise indicated.
- B. Steel Tube Railings: 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. Rails and Posts shall be 1-1/2 inch square or 1-1/4 inch diameter schedule 40 top and bottom rails. Posts shall be 1-1/2 inch square or 1-1/4 inch diameter schedule 40. Handrails shall be 1-1/2 inch diameter by 0.095 inch. Other shapes and sizes that meet the performance requirements may be substituted as indicated on the design documents.
 2. Guard infills shall meet the performance requirements and shall be as indicated on the design documents.
- C. Railings shall be fabricated with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including fittings, unless otherwise indicated on design documents. Connect posts to stair framing by direct welding unless otherwise indicated.
- D. 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 bucking, twisting, cracking, or otherwise deforming components. Close exposed ends of railing members as required with prefabricated fittings.
- E. Close exposed ends of railing members as required with prefabricated fittings. 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. Cap handrail return if exposed.
- F. Provide wall brackets, end closures, flanges and miscellaneous fittings for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

2.9 FINISHES

- A. Finish metal stairs after assembly. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- 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 properties. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion. 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

Note: All planning, coordination and execution regarding the erection of the stair(s) are to be performed by the Project Coordinator.

3.1 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 connections.
- 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 weld to 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 AWS D1.1, D1.3 and in "Fabrication, General" section.
- G. Place and finish concrete till for treads and platforms per Section 033000 "Cast in Place Concrete". Placement and finishing of concrete is the responsibility of the stair installer.

Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

3.2 INSTALLING METAL STAIR 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. Use non metallic, cut off flush with edge of bearing plate before packing with grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as indicated on design drawings or as follows:
 - 1. Anchor posts to steel by welding directly to structural steel members.
 - 2. Anchor posts to concrete via baseplates anchored bolted to concrete or via embedding into the concrete.
 - 3. Anchor ends of guards to concrete and masonry with welded end flanges anchored bolted to concrete.
- B. Attach handrails to wall with wall brackets. Use brackets with pre-drilled holes for exposed bolt anchorage. Provide bracket with 2-1/4 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or at spacing required to support structural loads. Secure wall brackets to building or guard as required to comply with performance requirements.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint. Paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113, "Exterior Painting", Section 099123 "Interior Painting" and/or Section 099600 "High Performance Coatings."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 055100