

Decorative Metal Railings

Suggested Specifications | Section 057300 Decorative Metal Railings

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. This section includes:
 1. Stainless-steel decorative railings with stainless-steel wire-rope guard infill.
 2. Steel and iron decorative railings.
- B. Related Requirements:
 1. Section 055100 "Metal Stairs" for standard steel tube railings attached to metal stairs.
 2. Section 099600 "High-Performance Coatings" for surface preparation, priming, and painting of decorative metal railings.

1.3 Accessibility Requirements:

- A. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1-1/2 inches minimum.
- B. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1-1/4 inches minimum and 2 inches maximum.
- C. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.

1.4 Definitions

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.5 Coordination and Scheduling

- 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.
- B. Coordinate installation of anchorages for railings. 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 items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.6 Preinstallation Meetings

- A. Preinstallation Conference: Conduct conference at Project site.

1.7 Action Submittals

- A. Product Data: For the following:
 1. Manufacturer's product lines of railings assembled from standard components.
 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, and attachment details.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

- D. Samples for Verification: For each type of exposed finish required.
1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 2. Fittings and brackets.
 3. Welded connections.
 4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.8 Informational Submittals

- A. Qualification Data: For professional engineer responsible for delegated design.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- E. Preconstruction test reports.
- F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.9 Quality Assurance

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1 "Structural Welding Code – Steel."
 2. AWS D1.6 "Structural Welding Code – Stainless Steel."
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 Field Conditions

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

Part 2 – Products

2.1 Manufacturers

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Julius Blum & Co.
 2. Livers Bronze Co.
 3. R & B Wagner, Inc.
 4. Or approved equal.
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. See Section 016000 "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.2 Performance Requirements

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.
2. Steel: 72 percent of minimum yield strength.

C. Structural Performance: 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.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.

E. Seismic Performance: Where seismic resilience is required, provide railings, connections, and/or components identified in 055100.2.7. which will accommodate movement without permanent inelastic deformation.

2.3 Metals General

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
3. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
4. Provide extruded-aluminum brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

2.4 Stainless Steel

A. Tubing: ASTM A 554, Grade MT 304.

B. Pipe: ASTM A 312, Grade TP 304.

C. Castings: ASTM A 743, Grade CF 8 or CF 20.

D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.

E. Bars and Shapes: ASTM A 276, Type 304.

F. Wire Rope and Fittings:

1. Wire Rope: 7-by-19 wire rope made from wire complying with ASTM A 492, Type 316.
2. Wire-Rope Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

2.5 Steel and Iron

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre consumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- C. Bars: Hot-rolled, carbon steel complying with ASTM A 29, Grade 1010.
- D. Plates, Shapes, and Bars: ASTM A 36.
- E. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.

2.6 Fasteners

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Stainless-Steel Components: Type 304 stainless-steel fasteners.
 - 2. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
 - 3. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 - 4. Dissimilar Metals: Type 304 stainless-steel fasteners.
- B. Fasteners for Anchoring 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. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.7 Miscellaneous Materials

- A. Wood Rails: Clear, straight-grained hardwood rails secured to [recessed] [exposed] metal subrail.
 - 1. Species: Ash.
 - 2. Finish: Manufacturer's standard.
 - 3. Staining: Match Architect's sample.
 - 4. Profile: As indicated.
- B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- C. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.8 Fabrication

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

- B.** Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C.** Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machines waged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- D.** Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E.** Form work true to line and level with accurate angles and surfaces.
- F.** Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- G.** Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- H.** Connections: Fabricate railings with welded connections unless otherwise indicated.
- I.** Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
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 flux immediately.
 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
- J.** Form changes in direction as follows:
1. As detailed.
 2. By bending to smallest radius that will not result in distortion of railing member.
- K.** Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L.** Close exposed ends of hollow railing members with prefabricated end fittings.
- M.** 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.
- N.** Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.
- O.** Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- P.** Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.9 General Finish Requirements

- A.** Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B.** Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C.** Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D.** Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.10 Stainless-Steel Finishes

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- E. Sputter-Coated Finish: Titanium nitride coating deposited by magnetic sputter-coating process over indicated mechanical finish.

2.11 Steel and Iron Finishes

- A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, but galvanize anchors to be embedded in exterior concrete or masonry.
- B. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements of Section 099600 "High-Performance Coatings."
- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Shop prime uncoated railings with primers specified in Section 099600 "High-Performance Coatings."

PART 3 – Execution

3.1 Examination

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 Installation, General

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb 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 steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 Railing Connections

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 Anchoring Posts

- A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For stainless-steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
 - 2. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
- C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 Attaching Railings

- A. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.
- C. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.6 Cleaning

- A. Clean wood rails by wiping with a damp cloth and then wiping dry.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099600 "High-Performance Coatings."

3.7 Protection

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300