

SECTION 05 52 13 – PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel handrails and guards fabricated from stock pipe and tube components.

1.2 SYSTEM DESCRIPTION

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - 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. 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.
 - 3. 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.
- C. Thermal Movements: Exterior handrails and railings shall allow for thermal movements resulting from changes in ambient and surface temperatures. Thermal movement shall prevent buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Design Requirements: Comply with ASTM E985, applicable portions of CBC 2013 and ICC/ANSI A117.1-2003 Section 505.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's literature for the following:
 - 1. Grout
 - 2. Anchoring cement
 - 3. Paint/Primer products.
- B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.
 - 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 masonry.
 - 2. Include structural analysis data indicating compliance with structural load requirements.
- C. Samples: Submit 6-inch long sections for each type of exposed finish required, prepared on material of same thickness and metal indicated for the Work.

- D. Product Test Reports: Submit reports from a qualified testing agency indicating handrails and railings comply with ASTM E 985, based on comprehensive testing of current products.
- 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.
- F. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- G. Welding certificates.
- H. Qualification Data: For professional engineer.
- I. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in fabricator's original protective wrapping. Protect finished surfaces with removable wrapping or coating which will not bond to handrail or railing when exposed to sunlight.
- B. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.6 PROJECT 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.

1.7 SCHEDULING

- A. Schedule installation so handrails and railings are mounted only on completed walls. Temporary supports shall satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS

- A. General: Provide metal with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, blemishes and other imperfections where exposed to view on finished units.

- B. Steel and Iron:
 - 1. Steel Pipe: ASTM A 53
 - a. Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 2. Tubing: ASTM A 500 (cold formed), 14 gauge tube, 1-1/2 inch o.d.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Brackets, Flanges, and Anchors: Same type of material and finish as supported rails, unless otherwise indicated.
 - 1. Provide end caps to match railing system where ends are not returned to walls.
- D. Wall Brackets:
 - 1. Wall brackets shall comply with requirements of Public Law 101-336 "The Americans with Disabilities Act (ADA)".
 - 2. Brackets: As selected by Architect, material to match handrails.

2.2 ACCESSORIES

- A. Fasteners:
 - 1. General:
 - a. Exposed fasteners shall match appearance of handrails and railings.
 - b. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 - 2. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
 - 3. Fasteners for Anchoring Handrails and Railings to Other Construction: Fasteners of type, grade, and class suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
 - a. Steel handrails, railings, and fittings: Plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 - 4. Fasteners for Interconnecting Handrail and Railing Components: Provide concealed fasteners fabricated from same metal as handrail and railings, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - 5. Cast-in-Place and Postinstalled Anchors: Fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- B. Primer: Comply with Section 09 91 00 "Painting."
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Zinc Clad II Plus: Sherwin Williams
 - b. Comparable product by one of the following:
 - 1) Benjamin Moore & Co.
 - 2) Dunn-Edwards Corporation.
 - 3) PPG Architectural Finishes, Inc.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

- E. Steel Sleeves: Preset steel sleeves, a minimum of 6 inches long with inside dimensions a minimum of 1/2 inch greater than outside dimensions of post, and steel plate forming bottom closure.

2.3 FABRICATION

- A. General: Fabricate handrails and 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 handrails and 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. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose.
 - 1. Continuously weld connections to obtain fusion without undercut or overlap.
 - 2. Remove flux immediately.
 - 3. Exposed Connections: Finish exposed welded surfaces so welding matches contours of adjoining surfaces and is smooth and blended with no visual roughness.
- E. Use concealed mechanical fasteners and fittings whenever possible. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.
- G. Provide inserts and other anchorage devices for connecting handrails and railings to masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- H. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- I. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation.
- J. Cut, reinforce, drill, and tap components, to receive finish hardware, screws, and similar items as indicated.
- K. Close exposed ends of handrail and railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch or less.
- M. Fillers: Provide fillers made from steel plate where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

- N. Exterior Locations:
 - 1. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or subject to moisture from condensation or other sources.
 - 2. Fabricate joints exposed to weather in a watertight manner.

2.4 FINISHES

- A. General:
 - 1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Steel Finish:
 - 1. Shop Primed:
 - a. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Shop prime steel surfaces, except the following:
 - 1) Surfaces embedded in concrete or mortar. extend priming of partially embedded members to a depth of 2 inches.
 - 2) Surfaces to be field welded.
 - b. Surface Preparation: Remove loose rust, loose mill scale, and spatter, slag, or flux deposits before shop coat of paint is applied. Remove oil, grease and similar contaminants in accordance with SSPC SP-1. Clean surfaces as required by primer manufacture and in accordance with SSPC SP-6.
 - c. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and to provide a uniform dry film thickness required by manufacturer. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - d. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - e. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
 - f. Paint erection marks on painted surfaces. Touch-up surfaces where welding, grinding of welds, joints, etc. are done in the field.
 - g. Paint shall be thoroughly dry before members are handled.
 - 2. Surfaces shall receive a field applied painted finish .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. 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

- A. General:
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
 - 3. Do not weld, cut, or abrade surfaces of handrail and 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.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- C. Adjust handrails and railings before anchoring to ensure alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners to secure handrails and railings and properly transfer loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components.
 - 1. Continuously weld connections to obtain fusion without undercut or overlap.
 - 2. Remove flux immediately.
 - 3. Exposed Connections: Finish exposed welded surfaces so welding matches contours of adjoining surfaces and is smooth and blended with no visual roughness.

3.4 ANCHORING POSTS

- A. Install posts in concrete using one of the following methods as approved by Architect:
 - 1. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:
 - 2. 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 nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Cover anchorage joint with flange of same metal as post after placing anchoring material.

- C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. Steel pipe railings: Weld flanges to post and bolt to metal supporting surfaces.

3.5 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
- B. Securely anchor brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.6 TOLERANCES

- A. Install posts and vertical members plumb within 1/8 inch of vertical. Install longitudinal members parallel with each other and to floor surfaces or slope of stairs to within 1/8 inch per 10 running feet.

3.7 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.8 PROTECTION

- A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. 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 05 52 13