

**SECTION 05 73 13**

**GLAZED DECORATIVE METAL RAILING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

A. Section Includes:

1. Manufactured glazed decorative metal railing as shown on drawings. See exterior

terrace in Transitional Living building.

2. Post-supported railings with glass infill.

**1.2 RELATED WORK**

A. Division 5 Section "Hot Dip Galvanizing" for finish and repair of steel components.

B. Division 7 Sections:

1. "Air Weather Barrier"

2. "Roof and Deck Insulation".

3. "SBS Modified Bituminous Membrane Roofing.

C. Security Glazing: Section 08 88 53.

D. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.

E. Division 32 Section Pedestal Set Precast Pavers.

**1.3 DEFINITIONS**

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided

floor areas, pedestrian guidance and support, visual separation, or wall protection.

**1.4 PERFORMANCE REQUIREMENTS**

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified

professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable

design working stresses of railing materials based on the following:

1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate

tensile strength divided by 1.95.

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

3. Steel: 72 percent of minimum yield strength.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the

following loads and stresses within limits and under conditions indicated.

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1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.

b. Concentrated load of 250 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.

3. Openings: Guardrail assemblies must not allow passage of a sphere 4 inches in

diameter.

D. 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.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material

surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals

and other materials from direct contact with incompatible materials.

F. Meet Americans with Disability Act Accessibility Guidelines and 2006 IBC requirements.

#### 1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND

SAMPLES.

B. Product Data: For the following:

1. Manufacturer's product lines of railings assembled from standard components.
2. Grout, anchoring cement, and paint products.

C. Calculations: Submit calculations for review by Resident Engineer. Show conformance with Performance Requirements under SYSTEM DESCRIPTION above. Show section moduli of primary load bearing members, and calculations of stresses and deflections for performance under design loading. Submittals may or may not be returned, and will not bear stamp of approval. See "Engineer" under QUALITY ASSURANCE below.

D. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

Include statement indicating cost for each product having recycled content.

E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

F. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

G. Samples for Verification: For each type of exposed finish required.

1. Fittings and brackets.

#### METAL RAILING

3. 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.

H. Calculations: Upon request, submit calculations for review by Architect. Show section moduli of primary load bearing members, and calculations of stresses and deflections for performance under design loading. Submittals, if requested, may or may not be returned, and will not bear stamp of approval.

I. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

Include statement indicating cost for each product having recycled content.

J. Qualification Data: For qualified testing agency.

K. Mill Certificates: Signed by manufacturers of products certifying that products furnished comply with requirements.

L. Welding certificates.

M. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

N. Preconstruction test reports.

#### 1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. Refer to Division 01 Section "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.

C. Engineer: Shop drawings and associated calculations required for structural design shall bear seal and signature of professional engineer registered in state in which Project is located and be under his direct supervision. Maintain calculations on file and submit to Resident Engineer; see "Calculations" under SUBMITTALS above.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

E. Preinstallation Conference: Conduct conference at Project site. Review sequencing of work with air weather barrier, insulation/roofing, and paver trades. See COORDINATION AND SCHEDULING below.

#### 1.7 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.

#### 1.8 COORDINATION AND SCHEDULING

A. Coordinate with air weather barrier, insulation/roofing, and paver Sections for sequencing of

work.

B. Schedule installation so wall attachments are made only to completed walls. Do not support

railings temporarily by any means that do not suit structural performance requirements.

**1.9 APPLICABLE PUBLICATIONS (LATEST EDITION UNLESS OTHERWISE NOTED)****A. American Society for Testing and Materials (ASTM):**

1. B 209 Aluminum and Aluminum Alloy Sheet and Plate.
2. B210 Aluminum Alloy Drawn Seamless Tubes
3. B221 Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
4. Others: Refer to Section 05 5000 - Metal Fabrications.

**B. American Welding Society (AWS):**

1. D1.1 Structural Welding Code - Steel.
2. D1.2 Structural Welding Code - Aluminum

**PART 2 - PRODUCTS****2.1 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.

**2.2 ALUMINUM**

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.

B. Extruded Bars and Shapes, Including Extruded Tubing: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5/T52.

C. Drawn Seamless Tubing: **ASTM B 210 (ASTM B 210M)**, Alloy 6063-T832.

D. Plate and Sheet: **ASTM B 209 (ASTM B 209M)**, Alloy 5005-H32 Alloy 6061-T6.

E. Die and Hand Forgings: **ASTM B 247 (ASTM B 247M)**, Alloy 6061-T6.

F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

**2.3 STAINLESS STEEL****2.4 STEEL AND IRON**

A. Tubing: ASTM A 500 (cold formed) or ASTM A 501 (hot formed).

B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

**2.5 GLASS AND GLAZING MATERIALS**

A. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials.

1. Glass Color: Clear

2. Thickness: As indicated on Drawings.

3. Heat Soak glass as Specified in Section 08 88 53 - Security Glazing.

## **2.6 FASTENERS**

A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Aluminum Components: Type 304 or Type 316 stainless-steel fasteners.

2. Stainless-Steel Components: Type 316 stainless-steel fasteners.

3. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

4. Dissimilar Metals: Type 316 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 otherwise indicated.

1. Provide Robertson flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Anchors, General: Anchors capable of sustaining, 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 E 488, conducted by a qualified independent testing agency.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group **2**

(A4) stainless-steel bolts, ASTM F 738M, and nuts, ASTM F 836M.

## **2.7 MISCELLANEOUS MATERIALS**

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

C. Shims: Provide one of the following in thicknesses as needed. Provide in widths as required to compressive strength of substrate is not exceeded at maximum design force of railing assembly.

1. High-Density Plastic Strips: Multimonomer, nonleaching plastic.
2. Metal: Stainless steel sheet.
- D. Other: As required for a complete installation.

## 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.

1. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

2. Use connections that maintain structural value of joined pieces.

3. Provide temporary marking on units for reassembly and coordination with shop drawings.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)** unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. 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.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections:

1. Railing: Fabricate with non-welded connections unless otherwise indicated.

2. Steel Stanchion Assemblies: Fabricate with welded connections.

H. Welded Connections for Steel Stanchion Assemblies:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Continuously weld joints.

I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.

Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:

1. Mitered corner.

K. Close exposed ends of hollow 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 rail and wall is 1/4 inch or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

N. 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.

O. Stanchion Assembly: For removable railing posts, fabricate slip-fit stanchions from steel tube or bar whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged. Weld to base plate.

1. Base Plate: Fabricate square steel plate not less than ¼ inch thick with 4 drilled mounting holes.

## **2.9 GLAZING PANEL FABRICATION**

A. General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.

B. Infill Panels: Provide tempered glass panels.

## **2.10 GENERAL FINISH REQUIREMENTS**

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. 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.

C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

## **2.11 ALUMINUM**

A. Provide clear anodized finish in compliance with Section 05 05 13 - Shop-Applied Coatings for Metal.

## **2.12 STEEL AND IRON FINISHES**

A. Galvanized Stanchions:



1. Hot-dip galvanize stanchion assemblies after fabrication.
2. Comply with Section 05 05 15, Hot Dip Galvanizing.

### **PART 3 - EXECUTION**

#### **3.1 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. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

#### **3.2 RAILING CONNECTIONS**

- A. Non-Welded Connections: Use mechanical joints for permanently connecting railing components.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

#### **3.3 ATTACHING STANCHIONS**

- A. Attach stanchions to concrete structure with specified anchors in accurate locations. Minimum 4 per stanchion. Drill size and depth as recommended by anchor manufacturer.
- B. Attach stanchions to existing concrete structure to meet PERFORMANCE REQUIREMENTS.
- C. Shim to plumb as required with specified load-bearing material.

#### **3.4 ATTACHING RAILINGS**

- A. Anchor railing to stanchions to meet PERFORMANCE REQUIREMENTS and meet intent of drawings. Anchoring method to be concealed from view.

#### **3.5 INSTALLING GLASS PANELS**

A. Post-Supported Glass Railings: Install assembly to comply with railing manufacturer's written instructions and with requirements in other Part 3 articles. Erect posts and other metal railing components, then set factory-cut glass panels. Do not cut, drill, or alter glass panels in field.

Protect edges from damage.

### **3.6 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**