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SECTION 05 52 13

ALUMINUM HANDRAILS AND GUARDRAILS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aluminum handrail and guardrail assemblies
2. Steel handrail and guardrail assemblies where specified
3. Posts, rails, infill panels, and attachment hardware
4. ADA-compliant gripping surfaces

1.02 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete: Foundations, anchor placement, and blockouts.
- B. Section 04 20 00 - Unit Masonry: Attachment to masonry walls.
- C. Section 05 12 00 - Structural Steel Framing: Steel support framing where indicated.
- D. Section 07 62 00 - Sheet Metal Flashing and Trim: Interface flashing.
- E. Section 07 92 00 - Joint Sealants: Perimeter sealants.

1.03 REFERENCES

- A. The Aluminum Association (AA):

1. Aluminum Design Manual, Current Edition
- B. ASCE 7-22 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures
- C. International Building Code (IBC) 2021
- D. AWS D1.2/D1.2M - Structural Welding Code - Aluminum
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel
- F. ASTM Standards:
 1. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 2. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate
 3. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing
 4. ASTM A36 - Carbon Structural Steel
- G. AAMA Standards:
 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum
 2. AAMA 2604 - High Performance Organic Coatings on Aluminum Extrusions and Panels
 3. AAMA 2605 - Superior Performing Organic Coatings on Aluminum Extrusions and Panels
- H. Americans with Disabilities Act (ADA) Accessibility Guidelines

1.04 SYSTEM DESCRIPTION

- A. Performance Requirements:
 1. Design handrails and guardrails to withstand loads in accordance with IBC 2021 and ASCE 7-22.
 2. Handrails: 200 pounds applied in any direction at any point along the handrail.
 3. Guardrails: 200 pounds per linear foot applied horizontally at top rail, and 50 pounds per square foot applied to infill.
 4. Provide connections and anchorage capable of transferring loads to building structure.
- B. ADA Compliance:
 1. Handrail gripping surface shall comply with ADA accessibility guidelines.

2. Handrail cross-section shall be round with 1-1/4" to 2" outside diameter.
3. Provide extensions at top and bottom of stairs as required.

1.05 SUBMITTALS

- A. Product Data: Manufacturer's product information, specifications, and installation instructions for handrail and guardrail components.
- B. Shop Drawings: Include plans, elevations, sections, and details. Show:
 1. Layout and dimensions of handrail/guardrail assemblies
 2. Post locations and spacing
 3. Infill configuration and spacing
 4. Connection details to building structure
 5. Anchorage details
- C. Samples:
 1. Selection: Manufacturer's standard range of colors for finishes selected.
 2. Verification: 2-inch-square samples of each finish selected on the substrate specified.
- D. Design Data: Design calculations bearing the seal of a Registered Professional Engineer, licensed in the state where the project is located.
- E. Structural Certification: Provide Professional Engineer certification, sealed and signed by a licensed PE in the state where the project is located, certifying that the design meets or exceeds all applicable loadings (wind load, rain live load, dead load, snow load) for the specific project location in accordance with IBC 2021 and ASCE 7-22. Include reaction tables for Engineer of Record review.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 1. Minimum 10 years documented experience in design, fabrication, and installation of architectural aluminum systems.
 2. Manufacturer shall maintain engineering staff capable of producing project-specific designs and calculations.
 3. Manufacturer shall operate its own fabrication facility with direct control over quality.
- B. Installer Qualifications:
 1. Installation shall be performed exclusively by manufacturer's trained installation crews.

2. Third-party installation is not acceptable.
 3. Note: Alternative delivery arrangements may be available for programmatic accounts and special circumstances. Contact manufacturer.
- C. Fabrication Standards:
1. All structural connections shall be welded in accordance with AWS D1.2 (aluminum) or AWS D1.1 (steel).
 2. Welding shall be performed in manufacturer's shop by AWS-certified welders.
 3. Field welding is not permitted.
 4. Minimum 100% weld penetration on all structural welds.
- D. Field Measurements:
1. Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of work.
 2. Contractor may provide field measurements during submittal stage in lieu of manufacturer field visit.
- E. Pre-Installation Conference:
1. Conduct pre-installation conference with Architect, Contractor, and manufacturer's installer.
 2. Review installation procedures, sequencing, and coordination with other trades.

1.07 COORDINATION

- A. Coordinate work of this section with work of other sections including concrete, masonry, structural steel, waterproofing, and sealants.
- B. Verify structural adequacy of supporting construction with Structural Engineer of Record prior to fabrication.
- C. General Contractor Responsibilities:
1. Provide blocking in wall structure as indicated on approved shop drawings prior to installation (wall-mounted systems).
 2. Install foam blockouts per manufacturer's requirements (freestanding systems).
 3. Pour concrete foundations to manufacturer's specifications.
 4. Ensure protection of installed systems from other construction activities through Substantial Completion.
 5. Foundation and footing design is not included in this section.

1.08 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty covering structural integrity, water tightness, and workmanship for a minimum of one (1) year from date of Substantial Completion.

B. Finish Warranty:

1. AAMA 2605 (70% PVDF/Kynar 3-coat): 20-year warranty against chalk, fade, crack, or peel.
2. AAMA 2605 (70% PVDF/Kynar 2-coat): 10-year warranty against chalk, fade, crack, or peel.
3. AAMA 2604 (High-Performance Powder Coat): 5-year warranty against chalk, fade, crack, or peel.
4. AAMA 611 Class I Anodize (Clear): 10-year warranty against excessive pitting or coating failure.
5. AAMA 611 Class I Anodize (Color): 5-year warranty against excessive fading or coating failure.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original protective packaging with identification labels.
- B. Store materials in clean, dry location protected from weather, moisture, and construction debris.
- C. Handle materials to prevent damage to finishes and profiles.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Jackson Williams, Division of Colored Metal Products, Inc., Shelby, North Carolina, Tel: (704) 482-7943.

B. Substitutions: Comparable products of other manufacturers will be considered under standard substitution procedures. Substitution requests must include documentation demonstrating compliance with all specification requirements including manufacturer qualifications.

2.02 MATERIALS

- A. Aluminum Components: ASTM B221, Alloy 6063-T6.
- B. Steel Components (where specified):
1. Tubing: ASTM A500, Grade B minimum.
 2. Plate: ASTM A36.

C. Top Rail: Round profile for ADA-compliant gripping surface.

1. 1-1/4" to 2" outside diameter.

D. Posts: Square or round profile as indicated.

1. Spacing per engineering, typically 4 to 6 feet on center.
2. Wall thickness: 0.125" minimum for aluminum, 0.120" minimum for steel.

E. Infill Options:

1. Vertical pickets: Maximum 4" clear spacing per IBC.
2. Horizontal rails: As indicated on drawings.
3. Aluminum mesh panels.
4. Glass panels (by others, this section provides frame only).
5. Cable rail systems.

F. Base Plates: Welded steel or aluminum base plates for surface mounting.

G. Fasteners: 300 series stainless steel for exposed locations; aluminum or 18-8 stainless steel for concealed locations.

2.03 FABRICATION

A. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.

B. Welding: In accordance with AWS D1.2 (aluminum) or AWS D1.1 (steel). Make welds smooth and uniform. Perform suitable edge preparation to assure 100% penetration.

C. Post Construction: Factory weld base plates to posts. Grind welds smooth where exposed to view. Field welding is not permitted.

D. Picket Attachment: Factory weld or mechanically attach pickets to rails. Maximum 4" clear spacing between pickets per IBC requirements.

2.04 FINISHES

A. Aluminum Finishes:

1. Class II Clear Anodic Finish: AA-M12C22A31, complying with AAMA 611. Anodic coating 0.4 to 0.7 mils thick.
2. Class I Clear Anodic Finish: AA-M12C22A41, complying with AAMA 611. Anodic coating 0.7 mils or thicker.
3. Class I Color Anodic Finish: AA-M12C22A42/A44, complying with AAMA 611.

4. Baked-Enamel Finish: Complying with AAMA 2603. Minimum dry film thickness of 1.5 mils.
 5. High-Performance Organic Coating (AAMA 2604): 50% PVDF resin-based coating system.
 6. Fluoropolymer Coating (AAMA 2605): 70% PVDF (Kynar 500/Hylar 5000) resin-based coating.
- B. Steel Finishes:
1. Hot-dip galvanized per ASTM A123 with powder coat finish.
 2. Powder coat: Polyester or TGIC polyester, minimum 2.5 mils dry film thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify building structure and supporting construction are ready for handrail/guardrail installation.
- B. Verify anchor and blocking locations match approved shop drawings.
- C. Report discrepancies to Architect and General Contractor before proceeding.

3.02 INSTALLATION

- A. Install handrails and guardrails in accordance with manufacturer's instructions and approved shop drawings.
- B. Install plumb, level, true to line, and at correct elevation.
- C. Secure base plates to structure using specified anchors. Minimum anchor embedment per engineering.
- D. For wall-mounted handrails, secure brackets to blocking or structural backing at maximum 4'-0" on center unless otherwise indicated.
- E. Provide ADA-compliant extensions at top and bottom of stairs as required.
- F. Verify picket spacing does not exceed 4" clear at any point.

3.03 CLEANING

- A. Clean all components promptly after installation using mild soap and water.
- B. Remove construction debris and protective coverings.
- C. Do not use abrasive cleaners or solvents that may damage finish.

3.04 PROTECTION

- A. Protect materials during and after installation from damage by other trades.
- B. Replace components damaged after installation.

END OF SECTION 05 52 13