

**SECTION 05521--CONNECTORAIL® NON-WELDED PIPE****GUIDE SPECIFICATIONS:**

These guide specifications are intended to be used as the basis for developing job specifications and must be edited to fit specific job requirements. Inapplicable provisions should be deleted, appropriate information should be provided in the blank spaces, and provisions applicable to the job should be added as necessary. Items that represent an option or choice are enclosed in brackets. Notes to specifiers are given in *Italics* directly following the paragraphs to which they apply.

**PART 1 - GENERAL****1.01 SUMMARY****A. WORK INCLUDED**

1. Furnish and install [aluminum] [bronze] [stainless steel] [nickel-silver] [pipe] railings and components.

**B. WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS**

1. Furnish [anchors] [fabrications] to be cast in concrete to Section [03001 B Concrete] [03300 B Cast-in-Place Concrete].
2. Furnish [anchors] [fabrications] for embedding in masonry to Section [04300 - Masonry Unit System] [ \_\_\_\_\_ ].
3. Furnish anchors for placement in [ \_\_\_\_\_ ] walls to Section [ \_\_\_\_\_ B \_\_\_\_\_ ].

**C. RELATED WORK**

1. Section 03001 - Concrete:
2. Section 03300 - Cast-in-Place Concrete;
3. Section 04300 - Unit Masonry Systems: Grout
4. Section 05030 - Metal Finishes:
5. Section 05510 - Metal Stairs: Handrailing at Stairs
6. Section 06100 - Rough Carpentry:
7. Section 08800 - Glazing: Glass; Plastic Glazing; Glazing Accessories
8. Section 09900 - Painting: Paint Finish

**1.02 REFERENCES**

*Include only reference standards that are to be indicated within the text of this section. Edit the following, adding and deleting as required for project and product selection.*

**A. Aluminum Association (AA)**

1. ABH-21 Aluminum Brazing Handbook
2. ASD-1 Aluminum Standards and Data
3. DAF-45 Designation System for Aluminum Finishes
4. SAA-46 Standards for Anodized Architectural Aluminum

**B. American Architectural Manufacturers Association (AAMA)**

1. AAMA 605.1 Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
2. AAMA 606.1 Voluntary Guide Specifications and Inspection Methods of Integral Color Anodic Finishes for Architectural Aluminum.
3. AAMA 607.1 Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
4. AAMA 608.1 Voluntary Guide Specifications and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum.

**C. American Concrete Institute (ACI)**

1. ACI 347-78 Recommended Practice for Concrete Formwork

**D. American Iron and Steel Institute (AISI)**

1. Steel Products Manual; Stainless and Heat-Resisting Steel.

**E. American National Standards Institute (ANSI)**

1. A21.1 Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.

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2. A58.1 Minimum Design Loads in Buildings and Other Structures.
  3. A117.1 Accessible and Usable Buildings and Facilities.
  4. Z97.1 Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings.
- F. American Society for Testing and Materials (ASTM)
1. A 29 Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for.
  2. A 47 Specification for Ferritic Malleable Iron Castings.
  3. A 269 Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  4. A 276 Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
  5. A 312 Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
  6. A 500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  7. A 512 Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing.
  8. A 743 Specification for Corrosion-Resistant Iron Chromium, Iron Chromium- Nickel, and Nickel Base Alloy Castings for General Application.
  9. B 26 Specification for Aluminum-Alloy Sand Castings.
  10. B 43 Specification for Standard Sizes of Seamless Red Brass Pipe.
  11. B 221 Specification for Aluminum-Alloy Bars, Rods, Wires, Shapes and Tubes.
  12. B 429 Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
  13. B 455 Specification for Copper-Zinc-Lead Alloy (Leaded Brass) Extruded Shapes.
  14. B 483 Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.
  15. B 584 Specification for Copper Alloy Sand Castings for General Applications.
  16. C 509 Specification for Cellular Elastometric Pre-Formed Gasket and Sealing Material.
  17. C 595 Specification for Blended Hydraulic Cements.
  18. C 1048 Standard Specification for Heat Treated Glass Kind HS, Kind FT-Coated and Uncoated.
  19. D 635 Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
  20. D 1730 Recommended Practices for Preparation of Aluminum and Aluminum Alloy Surfaces for Painting.
  21. D 1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
  22. E 84 Test Method for Surface Burning Characteristics of Building Materials.
  23. E 894 Standard Test Methods for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
  24. E 935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
  25. E 985 Specification for Permanent Metal Railing Systems and Rails for Buildings.
- G. Copper Development Association (CDA)
1. Standards Handbook, Wrought Copper and Copper Alloy Mill Products, Part 2 - Alloy Data.
  2. Standards Handbook, Cast Copper and Copper Alloy Products, Part 7 - Alloy Data.
  3. Copper, Brass and Bronze Design Handbook for Architectural Applications.
- H. General Service Administration (GSA), Federal Specifications (FS)
1. DD-G 1403 Glass, Plate (Float), Sheet, Figured, and Spandrel (Heat Strengthened and Fully Tempered).
  2. QQ-C-390 Copper Alloy Castings.
  3. QQ-S-766 Stainless Steel, Class 302 or 304.
  4. TT-P-645 Primer, Paint, Zinc Chromate, Alkyd Type.
- I. Military Specifications (MIL)
1. MIL-A-46104 Aluminum Alloy Extruded Rod, Bar, and Shapes, 7001.
  2. MIL-P-1144 Pipe, Corrosion Resistant, Stainless Steel, Seamless or Welded.
  3. MIL-P-25995 Pipe, Aluminum Alloy, Drawn or Extruded.
  4. MIL-R-36516 Rail, Restraint.
- J. National Association of Architectural Metal Manufacturers (NAAMM)
1. Metal Finishes Manual
  2. Pipe Railing Manual

- 3. Stair Manual
- K. National Fire Protection Association (NFPA)
  - 1. 101 Life Safety Code
- L. National Ornamental and Miscellaneous Metals Association (NOMMA)
  - 1. Metal Rail Manual
- M. National Institute of Building Sciences
  - 1. Metric Guide for Federal Construction

### **1.03 SYSTEM DESCRIPTION**

*Check governing codes for requirements.*

- A. Structural Requirements
  - 1. [Handrail and wall rail] [Guardrail] assemblies and attachments shall withstand a minimum concentrated load of \_\_\_\_\_ pounds applied horizontally or vertically down at any point on the top rail.

OR

- 1. [Handrail and wall rail] [Guardrail] assemblies and attachments shall withstand a minimum uniform load of \_\_\_\_\_ pounds per foot applied [vertically down] [and] [horizontally], but not simultaneously on the top rail.
- 2. Design Guardrail intermediate rails, balusters, and panel fillers for a uniform load of not less than \_\_\_\_\_ pounds per square foot over the gross area of the guard of which they are part. Reactions due to this loading need not be added to the loading specified for the main supporting members of the guardrails.

### **1.04 SUBMITTALS**

- A. Product Data
  - 1. Submit manufacturers engineering data and installation instructions under provisions of Section [01300] [01340].
- B. Shop Drawings
  - 1. Submit shop drawings and product data under provisions of Section [01300] [01340].
  - 2. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.
- C. Samples
  - 1. Furnish [ \_\_\_\_ ] samples of [ \_\_\_\_ ].

### **1.05 QUALITY ASSURANCE**

- A. QUALIFICATIONS
  - 1. Furnish references listing projects of similar size and scope.
- B. REGULATORY REQUIREMENTS
  - 1. Components and installation are to be in compliance with state and local code authorities.
  - 2. Components and installation are to follow current ADA and CABO/ANSI guidelines.
- C. CERTIFICATIONS
  - 1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.
  - 2. Furnish certification that components were installed in accordance to manufacturers engineering data to meets the specified design loads.
- D. PRE-INSTALLATION MEETING
  - 1. Prior to the beginning of work, conduct a pre-job conference at the job site.
  - 2. Provide seven calendar days advance written notice ensuring the attendance by competent authorized representatives of the fabricator, building owners representative, architect, and subcontractors whose work interfaces with the work of this Section.
  - 3. Review the specifications to determine any potential problems, changes, scheduling, unique job site conditions, installation requirements and procedures and any other information pertinent to the installation.
  - 4. Record the results of the conference and furnish copies to all participants.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.
- B. Storage on site:
  - 1. Store material in a location and in a manner to avoid damage. Stack in a way to prevent bending.
  - 2. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.
- C. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURER**

- A. Railing [pipe] and components shall be as manufactured and distributed by JULIUS BLUM & CO., INC., of Carlstadt, New Jersey (800) 526-6293, for its CONNECTORAIL® System.

**2.02 MATERIALS AND FINISHES**

- A. Aluminum:
  - 1. Extruded Pipe: Alloy 6063-T52 meeting ASTM B 221
  - 2. Drawn Pipe: Alloy 6063-T832 meeting ASTM B 483
  - 3. Reinforcing Bars: Alloy 6061-T6 meeting ASTM B 221
  - 4. Extruded Bars, Shapes, and Mouldings : Alloy 6063-T52 meeting ASTM B 221
  - 5. Extruded Posts: Alloy 6063-T6 meeting ASTM B 221
  - 6. Castings: Almag 35 meeting ASTM B 26
  - 7. Extruded Toe Board: Alloy 6063-T52 meeting ASTM B 221 and the safety requirements of ANSI A21.1
  - 8. Finish (refer to NAAMM Metal Finishes Manual):
    - a. Anodized finish shall be [AA-M10-C22-A31 (204R1)] [provided in accordance with AA-M \_\_ -C \_\_ -A \_\_ and shall meet requirements of AAMA (606.1) (607.1) (608.1)]
    - b. Painted finish shall be \_\_\_\_\_ type and \_\_\_\_\_ color and meet the requirements of AAMA 605.1 specification for high performance organic coatings.
- B. Stainless Steel: Type 304 (18-8)
  - 1. Tubing: ASTM A 269
  - 2. Bars, Shapes, and Mouldings: ASTM A 276
  - 3. Finish: [Ornamental Grade, AISI No. 4] [AISI No. \_\_\_\_].
  - 4. [\_\_\_\_\_]
- C. Copper Alloys:
  - 1. Drawn Pipe: C23000 (Red Brass) meeting ASTM B 43
  - 2. Castings: [C86500 meeting ASTM B 584 for sand castings] [Nickel-Silver]
  - 3. Extrusions: [C38500 (Architectural Bronze) meeting ASTM B 455] [C79800 (Nickel-Silver)]
  - 4. Finish (refer to NAAMM Metal Finishes Manual):
    - a. Mechanical: [M32-Medium Satin] [M \_\_ - \_\_\_\_\_]
    - b. Chemical: C \_\_ -
    - c. Coating: [Clear Organic: O \_\_ - \_\_\_\_\_] [Laminated: L \_\_ - \_\_\_\_\_] [Wax: \_\_\_\_\_] [Oil: \_\_\_\_\_]

**2.03 RAILING SYSTEM**

- A. Material shall conform to 2.02. \_\_ and be finished in accordance with 2.02.
- B. Railing system shall be [permanently anchored] [removable].
- C. Rails [and Posts]
  - 1. Fabricate rails [and posts] from [(anodized) (painted) aluminum, 6063-T52] [stainless steel] [bronze] [nickel-silver] [pipe] [tube] with nominal size of [1-1/4] [1-1/2] inches ([1.660] [1.900] inches outside diameter), Schedule [5] [10] [40] ([.062] [.109] [.140] [.145] [.146] [.150] inch wall). [Provide post

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reinforcement of ([1.360-] [1.427-] [1.600-] [1.667-] inch diameter solid aluminum reinforcing bar (1.750-inch diameter by .120-inch wall stainless steel tube)).

- D. Posts
  1. Fabricate posts from [anodized] [painted] aluminum 6063-T832 pipe with a nominal size of [1-1/4] [1-1/2] inches, ([1.660] [1.900] inches outside diameter). Schedule [10] [40] ([.109-] [.140-] [.145-] inch wall). Provide post reinforcement of [1.360-] [1.427-] [1.600-] [1.667-] inch diameter solid aluminum reinforcing bar.
- E. Fittings
  1. Fittings shall be of wrought material of [aluminum] [stainless steel] [bronze] [nickel-silver]. Tee-fittings and elbows that are fabricated from more than one piece shall be of welded construction with no weld marks visible when the fitting is installed.
- F. Connector Sleeves
  1. Internal connector sleeves shall be of extruded aluminum.
- G. Mounting Flanges
  1. [Floor] [Cover] [Roof railing] flanges shall be of [cast] [aluminum] [bronze] [stainless steel] [nickel-silver].
  2. Heavy-duty floor flange shall be of cast aluminum with a solid aluminum reinforcing bar.
  3. Facia flanges shall be of [aluminum] [bronze] [stainless steel] with a solid aluminum reinforcing bar.
- H. Toe Board
  1. Toe Board shall be of extruded aluminum; BLUM No. 6446.

### 2.04 FASTENERS

- A. Mechanical Fasteners:
  1. CONNECTORAIL®
    - a. RHMS 1/4"-20 x 1" SEMS with lock washer, stainless steel.
    - b. 1/4"-20 x [21/2"] [3"] RHMS with lock nut, stainless steel.
    - c. [A25-140] [A25-200] internally threaded tubular rivets, aluminum.
    - d. 3/8" x 3" sleeve anchor bolt, cadmium-plated steel.
    - e. Machine screws used to mount facia flanges to stringers shall be of [stainless] [galvanized] [cadmium-plated] steel, 3/8-inch diameter.

### 2.05 HANDRAIL BRACKETS

- A. [Aluminum] [bronze] [stainless steel] [nickel - silver]; [cast] [extruded] [machined]: BLUM No.

### 2.06 FABRICATION

- A. Form [rail-to-end post connections and] all changes in rail direction by [miter] [radius] elbows.
- B. Cut material square and remove burrs from all exposed edges, with no chamfer.
- C. Make exposed joints tight and flush.
- D. Close exposed ends of [pipe] [handrail] with appropriate end cap.
- E. For posts set in concrete, furnish matching sleeves or inserts not less than 5 inches long.
- F. Locate intermediate rails [midway] [equally spaced] between top rail and finished floor or center line of tread.
- G. Verify dimensions on site prior to shop fabrication.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Supply items to be [cast in concrete] [embedded in masonry] [placed in partitions].
- B. Verify anchor installation and other site conditions are acceptable.

### 3.02 DISSIMILAR METALS

- A. Paint bronze, nickel-silver, and aluminum components that come into contact with dissimilar metals with [a heavy coat of a proper primer] [asphalt paint].
- B. Paint exposed aluminum components that come into contact with cement or lime mortar, with [heavy-bodied bituminous paint] [water-white methacrylate lacquer] [zinc chromate].

**3.03 INSTALLATION**

- A. Install in accordance with shop drawings [and manufacturers instructions].
- B. Erect work [square and level,] [horizontal or parallel to rake of steps or ramp,] [and] free from distortion or defects detrimental to appearance or performance.
- C. Provide expansion joints as needed to allow for thermal expansion or contraction.

**3.04 CLEANING**

- A. As installation is completed, wash thoroughly using clean water and soap; rinse with clean water.
- B. Do not use acid solution, steel wool, or other harsh abrasives.
- C. If stain remains after washing, remove finish and restore in accordance with NAAMM Metal Finishes Manual.
- D. Finish must not be removed from anodized aluminum. Return component to anodizer for re-anodizing.

**3.05 REPAIR OF DEFECTIVE WORK**

- A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

END THIS SECTION