

## **SECTION 05 73 00 - HANDRAILS AND RAILINGS**

### **Part 1 – General**

#### **Section 1.01 SCOPE OF WORK**

- A. Architectural glass railings.

#### **Section 1.02 RELATED WORK**

- A. Section 32 90 00 - Planting.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 03 41 16 - Precast Concrete Slabs.
- D. Section 04 20 00 - Unit Masonry.
- E. Section 04 40 00 - Stone Assemblies.
- F. Section 05 12 16 - Fabricated Fireproofed Steel Columns.
- G. Section 05 15 19 - Stainless-Steel Wire Rope Assemblies.
- H. Section 08 83 13 - Mirrored Glass Glazing.
- I. Section 09 25 23 - Lime Based Plastering.
- J. Section 09 30 00 - Tiling.
- K. Section 09 65 13 - Resilient Base and Accessories.
- L. Section 09 68 16 - Sheet Carpeting.
- M. Section 09 90 00 - Painting and Coating.

#### **Section 1.03 REFERENCES**

- A. Aluminum Association (AA):
  - 1. AA ABH-21 Aluminum Brazing Handbook.
  - 2. AA ASD-1 Aluminum Standards and Data.
  - 3. AA DAF-45 Designation System for Aluminum Finishes.
  - 4. AA 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 Recommended Practice for Concrete Formwork.
- D. American Institute of Steel Construction (AISC):
  - 1. Manual of Steel Construction.
- E. American Iron and Steel Institute (AISI):
  - 1. Steel Products Manual; Stainless and Heat Resisting Steel.
  - 2. Code of Standard Practice.
- F. American National Standards Institute (ANSI):
  - 1. ANSI A21.1 Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.
  - 2. ANSI A58.1 Minimum Design Loads in Buildings and Other Structures.
  - 3. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities.
  - 4. ANSI A97.1 Safety Performance Specifications and Methods of Test for Safety Glazing Material used in Buildings.
  - 5. ANSI/NAAMM MBG 531 Metal Bar Grating Manual.
- G. ASTM International (ASTM):
  - 1. ASTM A 29 Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for.
  - 2. ASTM A 36 Carbon Structural Steel.
  - 3. ASTM A 47 Specification for Ferritic Malleable Iron Castings.
  - 4. ASTM A 48 Specification for Gray Iron Castings.
  - 5. ASTM A 53 Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless.
  - 6. ASTM A 108 Steel Bars, Carbon, Cold Finished, Standard Quality.
  - 7. ASTM A 123 Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
  - 8. ASTM A 167 Specification for Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 9. ASTM A 269 Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - 10. ASTM A 276 Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
  - 11. ASTM A 312 Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
  - 12. ASTM A 500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 13. ASTM A 512 Specification for Cold-Drawn Butt-weld Carbon Steel Mechanical Tubing.
  - 14. ASTM A 513 Specification for Electric-Resistance-Welded Carbon and Alloy Steel Tubing.
  - 15. ASTM A 554 Welded Stainless Steel Mechanical Tubing
  - 16. ASTM A 570 Specification for Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality.

17. ASTM A 575 Specification for Steel Bars, Carbon, Merchant Quality, M Grades.
  18. ASTM A 582 Free Machining Stainless and Heat Resisting Steel Bars.
  19. ASTM A 743 Specification for Corrosion-Resistant Iron Chromium, Iron Chromium-Nickel, and Nickel Base Alloy Castings for General Application.
  20. ASTM A1264-1 Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems
  21. ASTM B 43 Specification for Standard Sizes of Seamless Red Brass Pipe.
  22. ASTM B 62 Specification for Composition Bronze or Ounce Metal Castings.
  23. ASTM B 209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.
  24. ASTM B 210 Specification for Aluminum and Aluminum Alloy Drawn Seamless Tubes.
  25. ASTM B 211 Aluminum and Aluminum Alloy Bar, Rod and Wire
  26. ASTM B 221 Specification for Aluminum-Alloy Bars, Rods, Wires, Shapes and Tubes
  27. ASTM B 241 Specification for Aluminum and Aluminum Alloy Seamless Pipe and Seamless Extruded Tube.
  28. ASTM B 429 Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
  29. ASTM B 455 Specification for Copper-Zinc-Lead Alloy (Leaded Brass) Extruded Shapes.
  30. ASTM B 483 Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.
  31. ASTM B 584 Specification for Copper Alloy Sand Castings for General Applications.
  32. ASTM C 595 Specification for Blended Hydraulic Cements.
  33. ASTM C 1036 Standard Specification for Flat Glass.
  34. ASTM C 1048 Standard Specification for Heat Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
  35. ASTM C 1172 Standard Specification for Laminated Architectural Flat Glass.
  36. ASTM D 1730 Recommended Practices for Preparation of Aluminum and Aluminum Alloy Surfaces for Painting.
  37. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.
  38. ASTM E 894 Standard Test Methods for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
  39. ASTM E 935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
  40. ASTM E 985 Specification for Permanent Metal Railing Systems and Rails for Buildings.
  41. ASTM E 1300 Standard Practice for Determining Load Resistance of Glass in Buildings.
  42. ASTM E 1481 Terminology of Railing Systems in Rails for Buildings.
  43. ASTM E 2353 Standard Test Methods for Performance of Glass in Permanent Glass Railing Systems, Guards & Balustrades.
  44. ASTM E 2358 Standard Specification for Performance of Glass in Permanent Glass Railing Systems, Guards & Balustrades.
- H. American Welding Society (AWS):
1. AWS Specifications for Welding Rods and Bare Electrodes.
- I. Americans with Disabilities Act Standards for Accessible Design (ADASAD).
- J. 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.
- K. 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. FS-TT-P-641 Primer Coating, Zinc Dust/Zinc Oxide (for Galvanized Surfaces).
  5. FS-TT-P-645 Primer, Paint, Zinc Chromate, Alkyd Type.
  6. FS-TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.
- L. Green Globes System
- M. International Code Council (ICC):
1. International Building Code (IBC).
  2. International Residential Code (IRC).
- N. Iron and Steel Society (ISS):
1. Steel Products Manual
    - a. Sheet Steel.
    - b. Stainless and Heat Resisting Steels.
- O. Military Specifications (MIL):
1. MIL-A-46104 Aluminum Alloy Extruded Rod, Bar, and Shapes, 7001.
  2. MIL-C-5688 Pre-Stretching and Proof-Testing of Wire Rope Assemblies.
  3. MIL-P-1144 Pipe, Corrosion Resistant, Stainless Steel, Seamless or Welded.
  4. MIL-P-25995 Pipe, Aluminum Alloy, Drawn or Extruded.
  5. MIL-R-36516 Rail, Restraint.
  6. MIL-W-87161 Wire Strand, Non-flexible, for Aircraft Control, Oil Free Condition.
- P. National Association of Architectural Metal Manufacturers (NAAMM):
1. NAAMM/NOMMA Metal Finishes Manual.
  2. Pipe Railing Manual.
  3. Metal Stair Manual.

- Q. National Association of Home Builders (NAHB):
  - 1. NAHB Model Green Home Building Guidelines.
- R. National Association of Home Builders' Research Center (NAHBRC):
  - 1. NAHBRC Review of Fall Safety of Children Between the Ages of 18 Months and 4 Years in Relations to Guards and Climbing in the Built Environment.
- S. National Fire Protection Association (NFPA):
  - 1. NFPA 101 Life Safety Code.
- T. Institute of Building Sciences:
  - 1. Metric Guide for Federal Construction.
- U. U.S. Green Building Council:
  - 1. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System.

#### **Section 1.04 SUBMITTALS**

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Submit shop drawings and product data.
  - 1. Show sections and plans of stairs, dimensions and assembly of components.
    - a. Railings.
    - b. Handrail.
    - c. Brackets.
    - d. Reinforcements.
    - e. Anchors.
    - f. Welded and bolted connections.
  - 2. Show field connections.
  - 3. Provide setting diagrams for installation of anchors, location of pockets, weld plates for attachment of rails to structure, and blocking for attachment of wall rail.
  - 4. Indicate required field measurements.
  - 5. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.
- C. Submit manufacturer's installation instructions.
- D. Samples:
  - 1. Submit duplicate samples of railing showing style and finish. One approved sample will be returned to Contractor.
  - 2. Submit sample(s) of \_\_\_\_\_
  - 3. Certificates:
    - a. Furnish manufacturer's certification that materials meet specification requirements.
    - b. Furnish certification and calculations by an engineer registered in the state where the project is located showing that safety requirements are met.

#### **Section 1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2-year experience installing similar products.
- C. Regulatory Requirements:
  - 1. Components and installation shall be in accordance with state and local code authorities.
  - 2. Components and installation shall comply with current ADASAD or ICC/ANSI A117.1 guidelines.
- D. 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 the manufacturer's engineering data to meet the specified design loads.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship is approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.

#### **Section 1.06 PRE-INSTALLATION MEETINGS**

- A. Convene minimum two weeks prior to starting work of this section.
- B. 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 owner's 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.

#### **Section 1.07 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. Stacking shall be done in a way, which will 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.
3. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

#### **Section 1.08 PROJECT CONDITION**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

#### **Section 1.09 SEQUENCING**

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
- B. Ensure that field preparation of Work of this section is completed in time to prevent interruption of construction progress.
  1. Field measuring for weld plates, sleeves and insert locations.
  2. Field measuring.
  3. Anchors or inserts for terrazzo or precast concrete.

### **PART 2 - PRODUCTS**

#### **Section 2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: R & B Wagner, Inc (Wagner Companies) located at: 10600 W. Brown Deer Rd.; Milwaukee, WI 53224; Toll Free Tel: 888-243-6914; Tel: 414-214-0444; Fax: 414-214-0450; Email: [request info \(RFQ@mailwagner.com\)](mailto:requestinfo@rwbwagner.com); Web: [www.wagnerarchitectural.com](http://www.wagnerarchitectural.com) [www.shopwagner.com](http://www.shopwagner.com)

1. Schedule 40 1.9 Inch (48.2mm) diameter grade 316 satin stainless steel "Legato" post kits with mechanical fittings and attachment for field installation
2. 2" Square x 0.25" wall. grade 316 Satin Stainless Steel "Legato" post kits with mechanical fittings and attachment for field installation
3. ½" x 2" Flat Blade Grade 316 Satin Stainless Steel "Legato" post kits with mechanical fittings and attachment for field installation
  - a. Infill: ½ inch thick tempered laminated safety glass panels
    - i. Colour (Clear or (Tint)
    - ii. Exposed glass edges (Architect to specify – See section 08 8000)
  - b. Clamps: (Square) or (Round)
  - c. Clamps: (Flat Arm)
  - d. Clamps: (Single Point Spider)
4. Shop fabricate such that no jobsite welding, grinding or cutting is required.
5. Finish: Brushed satin stainless steel #4 finish
6. Post height: (36 inch – 914mm) or (42 inch – 1067mm) or (Custom height – specify size)
7. Post Configurations:
  - a. End Post Surface Mount
  - b. End Post Fascia Mount
  - c. End Post Embed Mount
  - d. Mid Post Surface Mount
  - e. Mid Post Fascia Mount
  - f. Mid Post Embed Mount
- B. Heavy duty bottom flange with snap on decorative flange cover
- C. Substitutions: Not permitted.
- D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

#### **Section 2.02 STRUCTURAL REQUIREMENTS**

- A. Delete if not required. Railing assembly shall withstand a minimum concentrated load of 200 pounds (91 kg) applied vertically downward or horizontally in any direction, but not simultaneously, at any point at the top of the guard or handrail.
- B. Railing assembly shall withstand a minimum uniform load of 50 pounds per foot (76 kg/meter) applied horizontally or vertically downward, but not simultaneously, on the guard or handrail.
- C. Guard intermediate rails, balusters, panel fillers, cable infill, or posts shall be designed for a uniform load of not less than 50 pounds per square foot (248 kg/sq. meter) applied horizontally 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 guard.

#### **Section 2.03 MATERIALS AND FINISHES**

- A. Stainless Steel:
  1. Type 302.
  2. Type 304.
  3. Type 316.
  4. Type 316L.
  5. Type 304L.
  6. Bar: ASTM A 167.

7. Pipe and Tubing: ASTM A 269.
  8. Pipe and Tubing: ASTM A 312.
  9. Finish: Ornamental Grade, AISI No. 4.
  10. Finish: AISI No. \_\_\_\_.
- B. Steel:
1. Pipe: ASTM A 53.
  2. Tubing: meeting ASTM A 500.
  3. Tubing: meeting ASTM A 501.
  4. Tubing: meeting ASTM A 512.
  5. Bars and Shapes: meeting ASTM A 36.
  6. Castings:
    - a. Malleable Iron meeting ASTM A 47.
    - b. Ductile Iron meeting ASTM A 47.
    - c. Grey Iron meeting ASTM A 47.
    - d. Malleable Iron meeting ASTM A 48.
    - e. Ductile Iron meeting ASTM A 48.
    - f. Grey Iron meeting ASTM A 48.
- C. Finish (Refer to NAAMM/NOMMA Metal Finishes Manual):
1. Surface Preparation: Remove loose scale, rust, grease, oil, moisture or other foreign materials to properly prepare the surface for subsequent coating application.
    - a. Remove mill scale, rust and dirt following SSPC SP2 for hand cleaning and SSPC SP3 for power tool cleaning.
  2. Galvanizing:
    - a. Products fabricated from shapes, plates, bars and strips shall be galvanized in accordance with ASTM A 123.
    - b. Sheet products shall be galvanized in accordance with ASTM A 525 and ASTM A 526.
    - c. Minimum coating weight \_\_\_\_ oz./sq. ft.
  3. Paint:
    - a. Minimum one coat of rust-inhibitive primer \_\_\_\_\_, [FS-TT-P-641 Zinc Dust-Zinc Oxide Primer Coating (for Galvanized Surfaces)] [FS-TT-P-645 Alkyd Type, Zinc Chromate, Paint Primer]
    - b. Painted finish shall be \_\_\_\_\_ type and \_\_\_\_\_ color.
  4. Touch up for Galvanized Surfaces: Use paint primer meeting FS-TT-P-645.
- D. Glass:
1. Fully tempered ASTM C 1048 Kind FT quality q3 conforming to the safety requirements of ANSI Z97.1
  2. Laminated, fully tempered, ASTM C 1172, with PVB interlayer.
  3. Laminated, heat strengthened, ASTM C 1172, with PVB interlayer.
  4. Laminated, fully tempered, ASTM C 1172, with rigid interlayer.
  5. Laminated, heat strengthened, ASTM C 1172, with rigid interlayer.
  6. Tint: None.
  7. Tint: Gray.
  8. Tint: \_\_\_\_\_.

#### **Section 2.04 ARCHITECTURAL GLASS RAILING SYSTEM**

- A. Railing system shall be surface mounted.
  - B. Railing system shall be flush mounted.
  - C. Railing system shall be fascia mounted.
  - D. Rails: Fabricate rails from stainless steel Wagner No. \_\_\_\_\_
  - E. Posts: Fabricate posts from \_\_\_\_\_ inch outside diameter by \_\_\_\_\_ inch wall stainless steel tubing.
- F. Infill:
1. Glass: 1/2 inch (13 mm) tempered laminated glass mounted to posts with panel clips, Wagner No. \_\_\_\_\_
  2. \_\_\_\_\_ Glass: 1/2 inch (13 mm) tempered glass mounted to posts with panel clips, Wagner No. \_\_\_\_\_

#### **Section 2.05 FASTENERS**

- A. Mechanical fasteners used in the assembly of stainless steel or aluminum railings shall be manufactured from stainless steel.
- B. Exposed mechanical fasteners for use with bronze materials shall be manufactured from yellow brass.
- C. Cement: Hydraulic, ASTM C 595, factory prepared with accelerator.

#### **Section 2.06 HANDRAIL BRACKETS**

- A. Material: Aluminum.
- B. Material: Stainless steel.
- C. Fabrication: Cast.
- D. Fabrication: Extruded.
- E. Fabrication: Stamped.
- F. Fabrication: Machined.

#### **Section 2.07 FABRICATION**

- A. Form rail-to-end post connections and all changes in rail direction by miter elbows.
- B. Form rail-to-end post connections and all changes in rail direction by radius elbows.
- C. Cut material square and remove burrs from all exposed edges, with no chamfer.

- D. Make exposed joints butt tight and flush.
- E. Close exposed ends by use of appropriate end cap.
- F. For posts set in concrete, furnish matching sleeves or inserts not less than 5 inches long.
- G. Locate intermediate rails midway between top rail and finished floor or center line of tread.
- H. Locate intermediate rails equally spaced between top rail and finished floor or center line of tread.
- I. Verify dimensions on site prior to shop fabrication.

### **PART 3 EXECUTION**

#### **Section 3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### **Section 3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Supply items to be cast in concrete, embedded in masonry and placed in partitions.

#### **Section 3.03 METAL INTERACTION**

- A. When aluminum components come into contact with dissimilar metals, surfaces shall be kept from direct contact by painting the dissimilar metal with a heavy coat of a proper primer.
- B. When aluminum components come into contact with dissimilar metals, surfaces shall be kept from direct contact by painting the dissimilar metal with asphalt paint.
- C. When aluminum components come into contact with cement or lime mortar, exposed aluminum surfaces shall be painted with heavy bodied bituminous paint.
- D. When aluminum components come into contact with cement or lime mortar, exposed aluminum surfaces shall be painted with water-white methacrylate lacquer.
- E. When aluminum components come into contact with cement or lime mortar, exposed aluminum surfaces shall be painted with zinc chromate.

#### **Section 3.04 INSTALLATION**

- A. Install in accordance with shop drawings and manufacturer's instructions at locations indicated on the drawings.
- B. Erect work square and level, horizontal or parallel to rake of steps or ramp, rigid, and free from distortion or defects detrimental to appearance or performance.
- C. Expansion joints shall be provided as needed to allow for thermal expansion or contraction.

#### **Section 3.05 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/NOMMA Metal Finishes Manual.
- D. Finish shall not be removed from anodized aluminum.

#### **Section 3.06 REPAIR OF DEFECTIVE WORK**

- A. Remove stained or otherwise defective work and replace with material that meets specification requirements.
- B. Repair damaged finish as directed by Architect.
- C. Replace defective or damaged components as directed by Architect.

#### **Section 3.07 PROTECTION**

- A. Protect installed products until completion of project.