

# SECTIONS 05715 & 05720

## MONUMENTAL STAIRS

### CUSTOM RAILINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This section includes the following:
  - 1. Ornamental railings fabricated from custom shapes.
  - 2. Glass railing systems
  - 3. Monumental Stairs
  
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Division 5 Section "Metal Fabrications" for metal fabrications made from heavy-gage ferrous metal for nonornamental purposes.
  - 2. Division 5 Section "Sheet Metal Fabrications" for metal fabrications made from sheet metal.
  - 3. Division 5 Section "Ornamental Handrails and Railings" for ornamental metal handrails fabricated from stock components.

##### 1.2 PERFORMANCE REQUIREMENTS FOR HANDRAIL AND RAILING SYSTEMS

- A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  - 1. Aluminum: AA "Specifications of Aluminum Structures."
  - 2. Copper Alloys: Use a safety factor of 1.65 applied to minimum yield strength of alloy, as published in CDA "Standards Handbook, Part 2—Alloy Data, Wrought Copper and Copper Alloy Mill Products."
  - 3. Stainless Steel: ASCE "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
  - 4. Cold-Formed Structural Steel: AISI "Specification for the Design of Cold-Formed Steel Structural Members."
  - 5. For fully tempered glass in glass-supported railing systems, use a safety factor of 4.0 applied to the applicable modulus of rupture listed under "Mechanical Properties" in AAMA Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."
  
- B. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E 985 for structural performance based on testing performed according to ASTM E 894 and E 935 or provide engineering calculations to validate structural performance at the handrails and guardrail system.

- C. Structural Performance of Handrails and Railing Systems: Engineer, fabricate and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated.
    - a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
    - b. Uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 50 lbf (890 N) applied at any point and in any direction.
    - b. Uniform load of 50 lbf per linear foot (730 N/m) applied in any direction.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 50 lbf (890 N) applied to 1 sq. ft. (0.09 sp. M) at any point in the system, including panels, intermediate rails, balusters, or other elements composing the infill area.
    - a. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress of guard.
  4. Glass-Supported Railing Systems: Capable of withstanding loads indicated for top rails and infill areas of guardrail systems, with each section of top rail or handrail supported by a minimum of 3 glass panels or by another means so that it remains in place should any 1 panel fail.
- D. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
1. Temperature Change (Range): 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.

### 1.3 PERFORMANCE REQUIREMENTS FOR MONUMENTAL STAIRCASES

- A. General: In engineering monumental staircase to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:
  - 1. Hot formed structural steel: AISI "Specification for the design of hot-formed steel structural members."
- B. Structural performance of Monumental Staircase: Design, engineer, fabricate and install monumental staircase to comply with NAAMM recommended live load of 100 pounds per square foot or alternatively 300 pound minimum concentrated load.
- C. A primary design frequency higher than 8.0 Hz for the stair structure to reduce vibration from walking excitation.
- D. Structural performance of building: Provide engineering calculations of top and bottom moment connections to enable "Building Engineer" to properly design structural reinforcement for the building to carry the loads of the monumental staircase structure.

### 1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each product used in ornamental metalwork, including finishing materials and methods.
- C. Prepare handrail and railing systems shop drawings under the supervision of a qualified professional engineer. Shop drawings shall show fabrication and installation of ornamental metalwork including plans, elevations, details of components, and attachments to other units of Work. Indicate materials and profiles of each ornamental metalwork member, fitting, joinery, finishes, fasteners, anchorages, and accessory items.
  - 1. Include setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as unite of Work of other sections.
  - 2. For installed products indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparations.
- D. Prepare monumental stair shop drawings under the supervision of a qualified professional engineer. Shop drawings shall show fabrication and installation of monumental staircase including plans, elevations, details of materials, and attachments to building structural. Indicate materials and profiles of each member including welding type.
  - 1. Include setting drawings, and directions for installation of anchor bolts and other anchorages to be installed to support the stair structure.
  - 2. Include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.
  - 3. Include analysis data of top and bottom moment connections sealed and signed by the qualified professional engineer who was responsible for their preparation.

- E. Patterns, models or plaster castings made from proposed patterns for each design of custom casting required.
- F. Samples for initial selection in the form of manufacturer's color charts consisting of actual units or sections of units showing the range of colors expected and other finish characteristics available for each item indicated below.
  - 1. Ornamental metal work composed of color-or acid etched components.
  - 2. Ornamental metalwork items with a based-enamel coating.
  - 3. Ornamental metalwork items with a high-performance coating.
- G. Samples for verification of each profile and pattern of fabricated metal and each type of metal finish required, prepared on metal of same thickness and alloy indicated for final unit of Work. Where finished materials involve normal color and texture variations, include sample sets composed of two or more units showing the expected range of variations.
  - 1. Include 6-inch- (150-mm-) long samples of linear shapes.
  - 2. Include 6-inch- (150-mm-) square samples of plates.
  - 3. Include full-size samples of castings and forgings.
    - a. For custom castings, submit samples of previous work to show quality of finish, ability to reproduce detail, and color of cast metal.
- H. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- I. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

## **1.5 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Firm with five years experience in successfully producing ornamental metalwork and monumental staircases similar to that indicated for this Project and with sufficient production capacity to produce required units without delaying the Work.
- B. Installer Qualifications: Arrange for installation of ornamental metalwork specified in this Section by the same firm that fabricated it. Arrange for fabrication and installation of any monumental stairs and monumental stair railings by the same company.
- C. Organic-Coating Applicator Qualifications: Firm experienced in successfully applying organic coatings of type indicated to aluminum extrusions and equipped with the following:
  - 1. A multistage cleaning and pretreatment system capable of complying with test requirements of AAMA standard referenced for type of coating indicated.
  - 2. Spray equipment required to apply a uniform coating.
  - 3. A preventive-maintenance program and good record-keeping.
- D. Anodic Finisher Qualifications: Firm experienced in successfully applying anodic finishes of type indicated, employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

- E. Welding Standards: Comply with applicable provisions of AWS D1.1 “Structural Welding Code—Steel” and AWS D1.2 “Structural Welding Code—Aluminum.”
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and , if pertinent, has undergone recertification.
- F. Engineer Qualifications: Professional engineer experienced in providing engineering services of the kind indicated that have resulted in the installation of assemblies similar to this Project in material, design, and extent and that have a record of successful in-service performance.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section “Project Meetings.”