



SPECIAL PROVISIONS

FOR

ORNAMENTAL RAILING

Johnson County

STP-U-1557(638)--70-52

Effective Date

December 17, 2013

**THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING
MODIFICATIONS. THESE ARE SPECIAL PROVISIONS AND SHALL PREVAIL OVER THOSE
PUBLISHED IN THE STANDARD SPECIFICATIONS.**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Aluminum decorative railings with stainless-steel, wire-rope guard infill.
 - 2. Stainless-steel decorative railings with stainless-steel, wire-rope guard infill.

1.02 DEFINITIONS

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.

1.03 MEASUREMENT AND PAYMENT

- A. Basis of Measurement: The number of lineal feet of Ornamental Railing shall be measured from centerline to centerline of end posts as shown in plans.
- B. Basis of Payment: For the number of lineal feet of Ornamental Railing constructed and measured, the Contractor will be paid the contract unit price per lineal foot. These payments shall be full compensation for furnishing all material and for construction of Ornamental Railing as provided herein.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with applicable requirements of the Iowa DOT Standard Specifications for Highway and Bridge Construction, Series 2012, and all local and state codes and ordinances.
- B. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified Professional Engineer licensed in the State of Iowa, using performance requirements and design criteria indicated.
- C. 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.
- D. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - Uniform load of 50 pounds/feet applied in any direction.
 - 2. Concentrated load of 200 pounds/feet applied in any direction.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Infill of Guards:
 - Concentrated load of 50 pounds/feet applied horizontally on an area of 1 square foot.
 - Infill load and other loads need not be assumed to act concurrently.
 - 5. 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.
 - 6. Temperature Change: 120°F, ambient; 180°F, material surfaces.

8. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
9. Source Limitations: Obtain each type of railing from single source from single manufacturer.
10. Product Options: Information on contract documents establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including structural analysis, preconstruction testing, field testing, and in-service performance.
11. Do not modify intended aesthetic effects, as judged solely by Engineer, except with Engineer's approval. If modifications are proposed, submit comprehensive explanatory data to Engineer for review.
12. Product Options: Plans indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated.
13. Welding Qualifications: Qualify procedures and personnel according to the following:

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

E. PRECONSTRUCTION TESTING

Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on laboratory mockups. Payment for these services will be made by Contractor. Retesting of products that fail to meet specified requirements shall be done at Contractor's expense.

1. Build laboratory mockups at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.
2. Test railings according to ASTM E 894 and ASTM E 935.
Notify Engineer seven days in advance of the dates and times when laboratory mockups will be tested.

1.05 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of railings assembled from standard components.
2. Grout, anchoring cement, and paint products.
3. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
4. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

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

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Welded connections.
4. Brazed connections.
5. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill.
6. Show method of finishing members at intersections.
7. Samples need not be full height.

- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified Professional Engineer licensed in the State of Iowa responsible for their preparation.
- D. Qualification Data: For qualified professional engineer, testing agency
Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- E. Welding certificates.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- G. Preconstruction test reports.
- H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups as shown on plans.
 - 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 MATERIALS

2.01 MANUFACTURERS

- A. The ornamental railing system shall be aluminum post and rail with a stainless steel cable rail or stainless steel post and rail, with a stainless steel cable rail as detailed in the contract documents and manufactured by the following approved manufacturers, subject to compliance with requirements:
 - 1. Ultra-tec Cable Railing
 - Contact: The Wagner Companies
P.W. Box 423
Butler, WI 53007
414-214-0444
414-365-8025 (fax)
 - 2. Cable-Rail
 - Contact: Feeney Architectural Products
2603 Union Street
Oakland, CA 94607
Toll Free: (800) 888-2418
Phone: (510) 893-9473
Fax: (510) 893-9484
 - 3. Sightlines Architectural Cable Systems
 - 1620 Central Ave N.E.
Suite 159
Minneapolis MN 55413
Phone: 952.470.0824
Fax: 612-789-0614
 - 4. Approved Equal

2.02 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.
- C. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
- D. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
- E. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
- F. Provide extruded-aluminum brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

2.03 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312/A 312M, Grade TP 304.
- C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
- E. Bars and Shapes: ASTM A 276, Type 304.
- F. Wire Rope and Fittings:
 - 1. Wire Rope: 1-by-19 wire rope made from wire complying with ASTM A 492, Type 316.
 - 2. Wire-Rope Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

2.04 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Aluminum Components: Type 316 stainless-steel fasteners.
 - 2. Stainless-Steel Components: Type 316 stainless-steel fasteners.
 - 3. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
 - 4. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 - 5. Dissimilar Metals: Type 316 stainless-steel fasteners.
 - 6. 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.
 - 7. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise.

8. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
9. 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.
10. Post-Installed Anchors: Torque-controlled expansion anchors.
11. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.05 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly.
- C. Disassemble units only as necessary for shipping and handling limitations.
- D. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- E. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged.
- F. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes.
- G. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- H. Cut, drill, and punch metals cleanly and accurately.
- I. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
- J. Remove sharp or rough areas on exposed surfaces.
- K. Form work true to line and level with accurate angles and surfaces.
- L. Fabricate connections that will be exposed to weather in a manner to exclude water.
- M. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- N. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- O. Connections: Fabricate railings with welded or nonwelded connections unless otherwise indicated.
- P. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

- Q. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
- R. Obtain fusion without undercut or overlap.
- S. Remove flux immediately.
- T. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- U. Welded Connections: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- V. 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.
 - 2. Form changes in direction as follows:
 - a. As detailed.
 - b. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
 - c. By bending to smallest radius that will not result in distortion of railing member.
 - 3. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
 - 4. Close exposed ends of hollow railing members with prefabricated end fittings.
 - 5. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
 - 6. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.
Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 7. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

2.06 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.
- D. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples.
- E. 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.

- F. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- G. STAINLESS-STEEL FINISHES
 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 3. Run grain of directional finishes with long dimension of each piece.
 4. Directional Satin Finish: No. 4.
 5. Dull Satin Finish: No. 6.
 6. Satin, Reflective, Directional Polish: No. 7.
 7. Mirrorlike Reflective, Nondirectional Polish: No. 8.
 8. When polishing is completed, passivate and rinse surfaces.
 9. Remove embedded foreign matter and leave surfaces chemically clean.
 10. Sputter-Coated Finish: Titanium nitride coating deposited by magnetic sputter-coating process over indicated mechanical finish.

PART 3 EXECUTION

3.01 PREPARATION

- A. Pre-installation Conference: Conduct conference at Project site.
- B. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
- C. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- D. Coordinate installation of anchorages for railings.
- E. Furnish setting plans, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- F. 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.

3.02 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings.
- C. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- D. 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.
- E. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

- F. 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.
- G. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- H. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- I. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.03 INSTALLATION, RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components.
- B. Use wood blocks and padding to prevent damage to railing members and fittings.
- C. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- D. Welded Connections: Use fully welded joints for permanently connecting railing components.
- E. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- F. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement.
- G. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.04 INSTALLATION, ANCHORING POSTS

- A. Leave anchorage joint exposed with 1/8 inch buildup, sloped away from post.
- B. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum railings, attach posts as indicated using fittings designed and engineered for this purpose.
 - 2. For stainless-steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

3.05 INSTALLATION, ATTACHING RAILINGS

Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: Contracting Authority will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work.

- C. Railings will be tested according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.
- D. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Engineer and will comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 CLEANING

Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

3.08 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer.
- B. Remove protective coverings at time of Substantial Completion.
- C. Restore finishes damaged during installation and construction period so no evidence remains of correction work.
- D. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.