

SECTION 05520

THERMOPLASTIC RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Thermoplastic handrails and railings, including connectors, fasteners, and system required accessories.

1.2 RELATED SECTIONS

- A. Section 03410 - Plant Precast Structural Concrete.
- B. Section 05520 - Handrails and Railings: Handrails other than decorative handrails specified in this Section.

1.3 REFERENCES

- A. ASTM D 256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- B. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.
- C. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
- D. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- E. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating materials.
- F. ASTM D 792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- G. ASTM D 870 - Standard Practice for Testing Water Resistance of Coatings Using Water Immersion; 1992.
- H. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Humidity; 1994.
- I. ASTM D 2794 - Standard Test Method for Resistance of Organic Coatings to the Effect of Rapid Deformation (Impact); 1993.

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: Comply with loading capacity required by Code applicable in the jurisdiction of the Project.
- B. Physical Properties of Thermoplastic Tubing: As follows, when tested per standards referenced:
 - 1. Specific Gravity: 1.44 per ASTM D792.
 - 2. Compressive Strength: 8,100 psi (56 MPa) per ASTM D695.

3. Flexural Strength: 11,100 psi (76 MPa) per ASTM D790.
 4. Tensile Strength: 6,000 psi (41 MPa) per ASTM D638.
 5. Flexural Modulus: 406,000 psi (2799 MPa) per ASTM D790.
 6. Tensile Modulus: 355,000 psi (2448 MPa) per ASTM D638.
 7. IZOD Impact - Notched: 17 pound-force per inch per ASTM D256.
 8. Heat Deflection: 264 psi (2 MPa) per ASTM D648.
- C. Testing:
1. Provide compounds used in manufacture of railing components that have undergone extensive outdoor testing, for minimum of 24 consecutive months, in climates representing extremes encountered in continental United States as follows. Results of testing shall remain within parameters established for exterior applications by manufacturer of compound:
 - a. Arizona (hot and dry).
 - b. Florida (hot and wet).
 - c. New York (freeze/thaw, pollutants).
- D. Structural Performance of Top Rails and Supports:
1. Capable of withstanding a concentrated load of 200 pounds (90.6 kg), applied to top rail at any point and in any direction.
 2. Capable of withstanding a uniform load of 50 pounds per linear foot (74.3 kg/m) applied to the top rail horizontally with a simultaneous load of 100 pounds per linear foot (148.6 kg/m) applied vertically downward.
 3. Design need not provide for both concentrated and uniform loads to be applied concurrently.
- E. Structural Performance of Guardrail Infill:
1. Capable of withstanding a horizontal concentrated load of 200 pounds (90.6 kg), applied to a 1-foot (30.5 mm) square area at any point on infill.
 2. Infill is defined to include panels, intermediate rails, balusters, and other elements.
 3. Design need not provide for infill loads to be applied concurrently with top rail loads.
- F. Design Requirements:
1. Integrity of wall thickness: Do not compromise wall thickness at any location throughout system by milling, drilling, non-extruded fittings (crosses, tees, elbows, etc.) or other manufacturing or molding process.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. [[[Product Data](#)]]: For each type of product specified.
- C. Shop Drawings: Showing fabrication and installation of handrails and railings including plans, elevations, sections, details of components, and attachments to other Work, if required.
- D. Samples for Verification: Provide Samples of each type of exposed finish required, prepared on components indicated below that are of same thickness and metal indicated for final unit of Work. Where finishes involve normal color and texture variations, include Sample sets showing full range of variations expected.
1. 6-inch long sections of each distinctly different linear railing member including handrails, top rails, posts, and balusters.
 2. Brackets and/or miscellaneous attachment accessories.
- E. Product test reports from qualified independent test laboratory evidencing compliance of railing components and systems with requirements based on comprehensive testing of

current products.

- F. Weathering performance data substantiating product performance.
- G. Research Reports or evaluation reports of model code organization acceptable to authorities having jurisdiction that evidence railing system's compliance with building code in effect for Project.
- H. Qualification Data: For firms and persons specified in Quality Assurance Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of architects and owners, plus other information specified.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firm that has produced types of handrail and railing systems required for not less than 10 years, with not less than 5 similar projects that have been successful use for not less than 5 years.
- B. Installer Qualifications: Minimum 2 years' experience in successful installation of stair and railing systems of type specified or trained by manufacturer.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Where handrails are indicated to fit other construction, check actual dimensions of other construction by actual field measurements before fabrication. Indicate recorded measurements on approved Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Advanced Products, LLC dba AVCON Railing, which is located at: 1915 Swarthmore Avenue; Lakewood, NJ 08701; Toll Free Tel: 800 RAILING (724-5464); Tel: 732-286-9496; Fax: 732-286-0526; Email: ; Web: www.AVCON.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 PRODUCTS

- A. Classic Series:
 - 1. Daytona.
 - 2. Malibu.
 - 3. Cape Cod.
 - 4. Harbor Master 1-8 lines.
- B. Original Series:
 - 1. Sentry.
 - 2. Protector.
 - 3. Cavalier.
 - 4. Continental 1-8 lines.
- C. Railing Infill Type:
 - 1. Pickets: 1 inch (25 mm) tubing OD.
 - 2. Horizontal Rails: 2 inch (51 mm) tubing OD.

3. Glass: 3/8 inch (9 mm) thick.
4. Trespa Panel: 3/8 inch (9 mm) thick.
5. Decorative Panel: Decorative infill panel.

- D. Railing Height:
1. Height: 6 inches (152 mm).
 2. Height: 12 inches (305 mm).
 3. Height: 24 inches (610 mm).
 4. Height: 36 inches (914 mm).
 5. Height: 42 inches (1067 mm).
 6. Height: 48 inches (1219 mm).

2.3 MATERIALS

- A. Tubing Components: Tubing consists of high-impact, outdoor weather-resistant tubing components fabricated from acrylonitrile styrene acrylate (ASA), specially formulated with specific stabilizers and modifiers for strength, durability, ultraviolet light protection, and with inhibitors for expansion and contraction.
1. Use compounds that have undergone testing demonstrating that resins are dimensionally stable, fade resistant, and retentive of key physical engineering properties, and that support color retention and stability, mechanical property retention including impact, and tensile strength.

2.4 COMPONENTS

- A. Top, Intermediate, and Bottom Rails:
1. Rails: 2 inch outside diameter tubing with nominal wall of 5/16 inch (8 mm).
 2. Posts: 2 inch outside diameter tubing with nominal wall of 5/16 inch (8 mm).
 3. Posts: Larger diameter steel pipe reinforcing, alternately reducing wall thickness of thermoplastic tubing, maintaining 2 inches outside diameter.
- B. Wall Mounted Handrail and Handgrip Portion of Handrail:
1. Handrail: 2 inch (51 mm) OD diameter tubing with nominal wall thickness of 5/16 inch (8 mm).
 2. Handrail: 1-1/2 inch (38 mm) OD diameter tubing with nominal wall thickness of 5/16 inch (8 mm).
- C. Guardrail Infill System: Consists of intermediate rail balusters with 1-1/16 inch (27 mm) OD tubing and nominal wall thickness of 5/32 inch (4 mm).
1. Aluminum Reinforcement: Reinforce vertical balusters in Daytona railing heights in excess of 42 inches (1067 mm).
 2. Steel Reinforcement: Reinforce vertical balusters in excess of 36 inches (914 mm) in height with internal metal stiffener.
 3. Steel Pipe Reinforcement: Provide standard weight schedule 40 Galvanized or Stainless Steel pipe, ASTM A53, Type F, at the following locations:
 - a. Railing posts and top horizontal rail of styles that do not contain balusters.
 4. Rail Reinforcement: Reinforce horizontal rails (exclusive of radius railing) where balusters are inserted, reinforce with heavy gauge extruded aluminum designed to allow insertion of the balusters.
- D. Post Mounting Flange Plate: Minimum of 5/16 inch (8 mm) thick Stainless Steel, pre drilled for fasteners
1. Provide for the following mounting configuration:
 2. Surface mounted flange plate.
 3. Core mount.

4. Fascia mount.
5. Weld mount.

2.5 ACCESSORIES

- A. Brackets, Flanges, and Fittings: Same material as primary railing components.
- B. Anchors and Inserts: Galvanized or stainless steel, expansion type; capable of withstanding structural design loads specified.
- C. Screws: Galvanized or stainless steel, 18-8 alloy, non-magnetic.
- D. Balcony Separators: Manufacturer's aluminum fasteners designed to hold separation panels between 1/4 inch (6 mm) and 5/16 inch (8 mm) thick.
- E. Grout: Non-shrink Portland cement-based hydraulic grout, mixed and applied per manufacturer's instructions; no gypsum grout allowed.

2.6 FABRICATION

- A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of members, post spacing, and anchorage, but not less than those required to support structural loads.
- B. Pre-assemble railing systems in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembling and coordinated installation.
- C. Posts:
 1. Post Assembly: Fabricate from one continuous length of tubing running continually from deck-mounting surface to top of railing assembly. Provide posts without seams, joints, or other interruptions.
 2. Angle Posts: Fabricate from reinforced tubing located between horizontal railing members and designed to allow for continuous flow of horizontal railing members. Design intermediate post members to fit snugly on horizontal rails, free from seams and joints.
- D. Non-Welded Connections: At horizontal railing members, fabricate system for connection of sections by means of railing manufacturer's specially designed dual lock connector. Size connector to accommodate inside diameter of exterior railing member. Once connected, make final connection using 1/8 inch (3 mm) diameter stainless steel sleeve pin placed in appropriate sized pre-drilled hole. Once installed, fill hole with non-shrink silicone.
- E. Expansion Joint: Provide for an expansion joint to top horizontal rail where sections are field joined. Incorporate internal sleeve that is independent of outer tubing or internal steel.
 1. Color of Expansion Sleeve: Match outer tubing color.
 2. Provide for color coordinated "Expansion Rings" at joint of same color and material.
- F. Expansion Collars: Where appropriate, incorporate use of expansion collars at points where rails terminate at posts, top horizontal rail, or both. Obtain approval of local authority prior to use.
- G. Provide inserts and other anchorage devices for connection handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loading imposed by handrail and railing systems. Coordinate anchorage devices with supporting structure.

2.7 FINISHES

- A. Thermoplastic Finish and Color: Smooth finish in color as selected by Architect from Manufacturer's stocking color choices.
 - 1. Color: Selected by Architect from manufacturer's standard color selections.
 - 2. Color: Black.
 - 3. Color: White.
 - 4. Color: Gray.
 - 5. Color: Brown.
 - 6. Color: Custom color.
- B. Base Flange Plate Coatings: Based on ASTM B633 for coatings applied to iron and steel.
 - 1. Type 2: With colored chromate conversion coatings.
 - 2. Classification Number: Fe/Zn 25.
 - 3. Minimum Thickness: 25 micrometers.
 - 4. Service Condition: SC 4 Exposure to harsh conditions, or subject to frequent exposure to moisture, cleaners, and saline solutions, plus likely damage by denting, scratching, or abrasive wear.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that reinforcement and anchoring devices are the correct type, have been located correctly, and have been installed properly.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Coordinate drawings, diagrams, templates, instruction, and directions for installation of anchors, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete as masonry construction.
 - 1. Manufacturer shall supply all integral hardware for connection of handrail and railing to each other.
 - 2. Provide hardware needed to connect handrail or railing to adjoining structures. Coordinate delivery of such items to Project site.

3.3 INSTALLATION GENERAL

- A. Fit sections accurately together.
- B. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack. Do not cut or abrade surfaces of handrails and railing components.
- C. Install handrails and railings systems to comply with railing manufacturer's instructions.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railings to existing construction.

3.4 INSTALLATION - POSTS

- A. Adjust handrails and railing systems prior to anchoring to ensure matching alignment. Space posts at intervals indicated but not greater than that required by design loading.

- B. Anchor posts in concrete by core drilling holes not less than 4 inches (102 mm) deep and 1 inch (25 mm) greater than outside diameter of post. Clean holes of loose material and insert posts. Fill annular space between post and concrete with non-shrink, non-metallic grout as specified in Part 2 above, mixed and poured to comply with anchoring material manufacturer's directions.
- C. Anchor posts onto mounting surface by means of railing manufacturer's recommended method, including specified mounting or other means of anchorage as determined by railing manufacturer.

3.5 CLEANING

- A. Remove manufacturer's protective covering from exposed surfaces not more than 24 hours after installation in hot and humid climates and before final inspection.
- B. Clean surfaces as required, following procedures and employing cleaning materials as recommended by accessories manufacturer.

3.6 PROTECTION

- A. Protect installed products from damage by subsequent construction activities, until completion of Project.
- B. Field repair of damaged product finishes is limited to surface scratch repairs only. Use manufacturer's suggested field repair procedure only. Replace products that have been structurally damaged by subsequent construction activities.

END OF SECTION