

ENGINEERING SPECIFICATION

**PULTRUDED FIBERGLASS
GUARDRAIL AND HANDRAIL**

SECTION 06610

FIBERGLASS REINFORCED PLASTICS (FRP) FABRICATIONS

PULTRUDED TUBE GUARDRAIL AND HANDRAIL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This specification is for a pultruded fiberglass railing system in compliance with IBC and OSHA 1910.29.

1.2 REFERENCES

- A. The publications listed below (latest revision applicable) form a part of this specification to the extent referenced herein. The publications are referred to within the text by the designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) Test Methods:

ASTM D-638-Tensile Properties of Plastics

ASTM D-790-Flexural Properties of Unreinforced and Reinforced Plastics

ASTM D-2344-Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short Beam Method

ASTM D-495-High Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation

ASTM D-696-Coefficient of Linear Thermal Expansion for Plastics

ASTM E-84-Surface Burning Characteristics of Building Materials

INTERNATIONAL CODE COUNCIL, INC.
The International Building Code

THE OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION (OSHA)
Code of Federal Regulations (CFR), Title 29, Section 1910.29

1.3 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR shall furnish shop drawings of all fabricated railings and accessories in accordance with the provisions of this Section.
- B. The CONTRACTOR shall furnish manufacturer's shop drawings clearly showing material sizes, types, styles, part or catalog numbers, complete details for the fabrication of and erection of components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes, and connection details.
- C. The CONTRACTOR shall submit the manufacturer's published literature including structural design data, structural properties data, corrosion resistance tables, certificates of compliance, test reports as applicable, and design calculations for systems not sized or designed in the

contract documents, sealed by a Professional Engineer.

- D. The CONTRACTOR may be requested to submit sample pieces of each item specified herein for acceptance by the ENGINEER as to quality and color. Sample pieces shall be manufactured by the method to be used in the WORK.

1.4 QUALITY ASSURANCE

- A. All items to be provided under this Section shall be furnished only by manufacturers having a minimum of ten (10) years of experience in the design and manufacture of similar products and systems. Additionally, if requested, a record of at least five (5) previous, separate, similar successful installations in the last five (5) years shall be provided.
- B. Manufacturer shall offer a 3 year limited warranty on all FRP products against defects in materials and workmanship.

1.5 PRODUCT DELIVERY AND STORAGE

- A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be crated or boxed separately and noted as such to facilitate their movement to a dry indoor storage facility.
- B. Storage of Products: All materials shall be carefully handled to prevent them from abrasion, cracking, chipping, twisting, other deformations, and other types of damage. Adhesives, resins and their catalysts are to be stored in dry indoor storage facilities between 70 and 85 degrees Fahrenheit (21 to 29 degrees Celsius) until they are required.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Guardrail and/or Handrail system to be as manufactured by

Bedford Reinforced Plastics, Inc.
One Corporate Drive, Suite 106
Bedford, PA 15522. USA
(814) 623-8125 Phone
(814) 623-6032 Fax
Website: <https://bedfordreinforced.com>

2.2 GENERAL

- A. All posts and rails are to be FRP structural shapes manufactured by the pultrusion process. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions specified in the Contract Documents.
- B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

- C. Resins shall be {*ISO, non-fire retardant isophthalic polyester used to produce NSF Standard 61 certified shapes*; ISOFR, fire retardant isophthalic polyester; *VE, non-fire retardant vinyl ester used to produce NSF Standard 61 certified shapes* or VEFR, fire retardant vinyl ester, (*choose one*)} with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties as required.
- D. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.
- E. All pultruded structural shapes shall be further protected from ultraviolet (UV) attack with 1) integral UV inhibitors in the resin and 2) a synthetic surfacing veil to help produce a resin rich surface.
- F. All FRP products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test, (except for non-fire retardant isophthalic polyester and vinyl ester NSF Standard 61 certified shapes).
- G. Top and mid rails for guards are to be 1.75" x 0.125" (44.4 mm x 3.2 mm) wall square tube, the posts are to be 2.125" x 0.1875" (53.9 mm x 4.8 mm) wall square tube and kick plate is to be 5/8" deep x 4" wide with two reinforcing ribs. Offset rail used as handrail to be 1.5" x 0.25" (38.1 mm x 6.4 mm) wall round tube.
- H. The completed railing installation shall meet the following load requirements with a minimum factor of safety of 2.0:
- Concentrated Load: 200 lb (891 N) applied in any direction at any point on the rail.
- Uniform Load: 50 lb/lf (730.5 N/m) applied in any direction on the rail.
- Loads are assumed not to act concurrently.
- I. All rails, posts, and kick plates are to be integrally pigmented yellow.
- J. Pultruded structural shapes used in the railing systems are to have the minimum longitudinal mechanical properties listed below:

Property	ASTM Method	Value	Units
Tensile Strength	D-638	30,000 (206)	psi (MPa)
Tensile Modulus	D-638	2.5 x 10 ⁶ (17.2)	psi (GPa)
Flexural Strength	D-790	30,000 (206)	psi (MPa)
Flexural Modulus	D-790	1.8 x 10 ⁶ (12.4)	psi (GPa)
Flexural Modulus (Full Section)	N/A	2.8 x 10 ⁶ (19.3)	psi (GPa)
Short Beam Shear	D-2344	4,500 (31)	psi (MPa)
Shear Modulus (Full Section)	N/A	4.5 x 10 ⁵ (3.1)	psi (GPa)
Coefficient of Thermal Expansion	D-696	7.0 x 10 ⁻⁶ (12.6 x 10 ⁻⁶)	in/in/°F (cm/cm/°C)
Flame Spread	E-84	25 or less	N/A

- K. All fasteners used in the railing system are to be stainless steel.

PART 3 - EXECUTION

3.1 FABRICATION

- A. The post/rail connection for guards is to be fabricated such that the rails are unbroken and continuous through the post without the use of packs or splices. The mid rail is to be installed through the post at a prepared hole made to fit the outside dimensions of the rail. The top rail is to fit into a machined, u-shaped pocket formed into top of the post such that the rail is located at the center of the post. All exposed post corners are to be ground smooth to eliminate sharp edges. The rails are to be fastened to the post using stainless steel rivets. The offset handrail is to be fabricated such that the rail is continuous. No sharp, protruding edges are to remain after assembly of the railing system. Spacing of the posts and offset handrail supports shall not exceed 6'-0" (1.83 m).
- B. The bases of the posts are to be attached according to the contract drawings. The bases of the posts are to be reinforced to a minimum height of 8.5" (216 mm). The offset handrails are to be attached to guards or walls with brackets.
- C. When required, rails for guards are to be spliced using a 9" (228.6 mm) length of 1.5" x 1/8" (38.1 mm x 3.2 mm) FRP square tube mechanically fastened into place using spring pins. Rail for offset handrail is to be spliced using a 5" (127 mm) length of 1" (25.4 mm) FRP round rod.

3.2 INSTALLATION

- A. Contractor shall be required to install guardrail and handrail in strict accordance with manufacturer's instructions.
- B. Follow manufacturer's instructions when cutting or drilling fiberglass products. Provide adequate ventilation.

END OF SECTION