

ENGINEERING SPECIFICATION
PULTRUDED FIBERGLASS LADDERS

SECTION 06610

FIBERGLASS REINFORCED PLASTICS (FRP) FABRICATIONS

PULTRUDED SQUARE TUBE LADDERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This specification is for a pultruded fiberglass ladder system in compliance with OSHA 1910.23.

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

THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)
Code of Federal Regulations (CFR), Title 29, Section 1910.23

1.3 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR shall furnish shop drawings of the fabricated ladder 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 required 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. Ladder and associated components shall be 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 ladder side rails, rungs and ladder mounting brackets are to be FRP structural shapes manufactured by the pultrusion process. All 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 as 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 ladder components 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. The ladder side rail shall be 2" square tube with a wall thickness of 1/4" or greater. The rungs shall be 1-1/4" diameter pultruded structural shapes, continuously fluted to provide a non-slip surface. Rungs that are gritted as a secondary operation shall not be permitted. Ladder wall and floor mounts shall be fabricated from pultruded angles, 3/8" minimum thickness.
- H. Type 316 stainless steel bolts shall be provided for attaching wall and floor brackets to the ladder.
- I. All rungs shall be mechanically attached to the ladder rails with stainless steel spring pins.
- J. All ladders are to be integrally pigmented yellow. All wall and floor mount brackets shall be beige.
- K. Pultruded structural shapes used in the ladder system 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

2.3 PERFORMANCE REQUIREMENTS

- A. The completed ladder installation shall meet the load requirements set forth in OSHA 1910.23.

PART 3 - EXECUTION

3.1 FABRICATION

- A. All ladders shall be designed and laid out in strict accordance with OSHA 1910.23.
- B. All rungs shall penetrate the wall of the tube side rails and shall be connected to the rails with spring pins.
- C. Ladders shall be fully shop assembled.

3.2 INSTALLATION

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

END OF SECTION