

**SPEC NO: ADD-200000-225028-2**  
**SPECIFICATION FOR FIBRETEK GLASSFIBRE REINFORCED**  
**PLASTIC PRODUCTS AND FABRICATION**

**1. GENERAL**

**1.1 CONTENTS**

This specification covers the following GRP Products:

- GRP Handrail System (Square Box)

**1.2 RELATED DOCUMENTS**

- Fibretek Specifications for profiles
- Contract Drawings
- Contract Specifications

**1.3 SCOPE OF WORK**

To supply material necessary to install glass reinforced plastic (GRP) handrails for walkways and structures as shown on the drawings and as specified herein.

**1.4 QUALITY ASSURANCE**

- 1.4.1 A reputable and qualified manufacturer of proven ability that has regularly engaged in the manufacture and installation of GRP systems shall furnish the material covered by this specification.
- 1.4.2 Substitution of any component or modification of system shall be made only when approved by the Architect or Engineer.
- 1.4.3 Fabrication Qualifications: Firm experienced in successfully producing GRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
- 1.4.4 Products are manufactured in accordance with procedure manuals and quality inspection sheets.

**1.5 DESIGN CRITERIA**

- 1.5.1 The design of GRP products shall be in accordance with governing building codes and standards as applicable.

## **1.6 SUBMITTALS**

- 1.6.1 Shop drawings of all GRP handrails shall be submitted to the Engineer for approval.
- 1.6.2 Manufacturer's catalogue data showing:
  - 1. Dimensions, spacing and construction of handrail
  - 2. Materials of construction
- 1.6.3 Detail shop drawings shown:
  - 1. Dimensions of handrails
  - 2. Sectional assembly
  - 3. Location and identification mark
- 1.6.4 Samples of each type of handrail system proposed shall be submitted for approval prior to placement of purchase orders.

## **1.7 SHIPPING AND STORAGE INSTRUCTIONS**

- 1.7.1 All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.
- 1.7.2 All materials and equipment necessary for the fabrication and installation of the handrails shall be stored before, during and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage due to over exposure to the sun. Any material that, in the opinion of the Engineer, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.
- 1.7.3 Identify and match-mark all materials, items and fabrications for installation and field assembly.

## **2. PRODUCTS**

### **2.1 GENERAL**

- 2.1.1 Materials used in the manufacture of the GRP products shall be new stock of the best quality and shall be free from all defects and imperfections that might affect the performance of the finished product.
- 2.1.2 All materials shall be of the kind and quality specified, and where the quality is not specified, it shall be the best of the respective kinds and suitable for the purpose intended.
- 2.1.3 All GRP products noted in 1.1 shall be manufactured using a pultruded process utilizing either isophthalic polyester or a vinyl ester resin with ultra-violet (UV) inhibitor additives. A synthetic surface veil shall be the outermost layer covering the exterior surface. Isophthalic polyester resin is also available with flame-retardant additives, which will achieve a flame spread of 25 or less in accordance with ASTM test method E84.
- 2.1.4 After fabrication, all cut ends; holes and abrasions of GRP shapes shall be sealed with a compatible resin coating to prevent intrusion or moisture.

2.1.5 GRP products exposed to weather shall contain an ultraviolet inhibitor and shall additionally receive one mil thick UV coating to shield from ultra-violet light if specified or requested.

2.1.6 All exposed surfaces shall be smooth and true to form.

2.1.7 Manufacturers:

1. Fibretek Pultrusion Technology
2. Or approved equal

### **2.3 STRUCTURAL SHAPES**

- A. Structural shapes shall be made from a premium grade iso-polyester or vinyl ester resin. All structural shapes shall contain a UV inhibitor.
- B. Manufactured by the pultrusion process

Structural GRP members composition shall consist of a glass fibre reinforced polyester or vinyl ester resin matrix, approximately 50% resin to glass ratio. A synthetic surface veil shall be the outermost layer covering the exterior surfaces. Continuous glass strand rovings shall be used internally for longitudinal strength. Continuous strand glass mats shall be used internally for transverse strength.

## **3. HANDRAILS FOR WALKWAYS**

### **3.1 SCOPE**

- A. This specification covers the design, material requirements, fabrication and installation of fibreglass reinforced plastic (GRP) handrail.

### **3.2 DESIGN CRITERIA**

- A. The GRP handrail is designed to meet the requirements of the U.S. Department of labour **Occupational safety & Health Administration (OSHA) Section 1910.23.**
- B. The normal height of Fibretek pultruded handrail (FPH) measured to the centre of the top rail is 1100mm above floor level when horizontal and 900mm above pitch line on staircases. The intermediate rail is located at mid-height. Spacing of posts should not exceed 1.75m. Rail cannot be terminated at a post, it must be continued for 75mm or a maximum of 300mm. Rail joints between adjacent frames should where possible be situated 150mm from the centre line of a post.

### **3.3 MATERIAL**

- A. The rails shall be 51 x 51 x 3mm square tube and the posts shall be 51 x 51 x 3mm box with a 44 x 44 x 6 square tube inserts manufactured by the pultrusion process. The parts must be coated with an industrial grade polyurethane paint for additional UV protection and wear resistance. The resin matrix shall be iso-polyester and shall contain an UV inhibitor.
- B. The pultruded parts shall meet the following minimum mechanical properties:

<u>Properties</u>	<u>Test Method</u>	<u>Values</u>
Tensile Stress	ASTM D638	206.8 MPa
Tensile Modules	ASTM D638	17.2 GPa
Compressive Stress	ASTM D695	206.8 MPa
Compressive Modules	ASTM D695	17.2 GPa
Flexural Stress	ASTM D790	206.8MPa
Flexural Modules	ASTM D790	11 031.6MPa
Shear Stress	ASTM D2344	31.0 MPa
Density	ASTM D792	1.66 – 1.99 g/cm <sup>3</sup>
24 hr. Water Absorption	ASTM D570	0.6% max
Coef. of Thermal Expansion	ASTM D696	4.4 x 10 <sup>-6</sup>
Flexural Stress	Full Section	2482.1 MPa
Flexural Modules	Full Section	25510.6 MPa

### **3.4 FABRICATION OF HANDRAIL SYSTEM**

- A. The fibreglass handrail system shall be fabricated into finished sections by fabricating and joining together the pultruded square tube sections using epoxy adhesive and connected as shown in the fabrication details. Handrail sections shall be fabricated to the size shown on the approved fabrication drawings and shall be piece marked with a waterproof tag.

### **3.5 INSTALLATION OF HANDRAIL SECTIONS**

- 3.5.1 The GRP manufacturer shall supply the fabricated handrail sections complete with fittings. The components used to join the fabricated sections together may be shipped loose, to be expoxied and riveted together in the field by the contractor, per the manufacturer's recommendations.
- 3.5.2 The fabricated handrail sections shall be installed as shown on the approved shop drawings. The handrail sections shall be accurately located, erected plumb and level. The sections shall be fastened to the structure as shown on the approved shop drawing.

### **3.6 APPROVED FABRICATORS**

1. Fibretek Pultrusion Technology
2. Or Approved Equal