

SPEC NO: ADD-200000-225030
SPECIFICATION FOR GLASSFIBRE REINFORCED PLASTIC
PRODUCTS AND FABRICATION

1. GENERAL

1.1 CONTENTS

This specification covers the following GRP Products:

- GRP Cat ladders and Cages

1.2 RELATED DOCUMENTS

- Fibretek Specifications for profiles
- Contract Drawings
- Contract Specifications

1.3 SCOPE OF WORK

To supply all material necessary to install the glass reinforced plastic (GRP) cat ladders as shown on the drawings and as specified herein.

1.4 QUALITY ASSURANCE

- 1.4.1 A reputable and qualified manufacturer of proven ability who has regularly engaged in the manufacture and installation of GRP systems shall furnish the material covered by these specifications.
- 1.4.2 Substitution of any component or modification of system shall be made only when approved by the Consulting 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 In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

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 cat ladders shall be submitted to the Engineer for approval.

1.6.2 Manufacturer's catalogue data showing:

1. Dimensions, spacing and construction of cat ladder
2. Materials of construction

1.6.3 Detail shop drawings shown:

1. Dimensions of cat ladder
2. Sectional assembly
3. Location and identification mark

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 necessary for the fabrication and installation of the cat ladders 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 available with flame-retardant additives, which will achieve a flame spread of 25 or less in accordance with ASTM E 84.

- 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. Fibretex Pultrusion Technology
 2. Or approved equal

2.2 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.
- C. The following minimum mechanical properties shall apply:

**Table 1 - Fibreglass Pultruded Material Properties
 Minimum ultimate coupon properties (UN)**

<u>Material 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	1.661 – 1.938 glcc ³
24 hr. Water Absorption	ASTM D570	0.6% max
Coef. of Thermal Expansion	ASTM D696	4.4 x 10 ⁻⁶
Flexural Stress	Full Section	2482.1 MPa
Flexural Modules	Full Section	25510.6 MPa

3. GLASS FIBRE REINFORCED (GRP) LADDERS AND CAGES

3.1 SCOPE

This specification covers glass fibre reinforced plastic (GRP) ladders constructed of side rails, rungs and cage straps produced by the pultrusion process and cage hoops produced by the open moulded hand lay-up method.

3.2 PERFORMANCE REQUIREMENTS

Ladder and cage systems shall meet the requirements set forth in BS 5395:Part 3:1985. The ladder shall also be capable of supporting a concentrated vertical load of 1.5 kN applied at the middle of the rung.

3.3 DESIGN CRITERIA

The maximum length of a ladder supplied as a single section is 6.0m, however splice sets are available for joining sections to form longer ladders. Whenever a ladder is more than 2.3m above the ground, a safety cage should be fitted.

3.4 MATERIALS

3.4.1 The side rails and cage straps shall be fibreglass-reinforced pultruded (isophthalic polyester or Vinyl ester) with golden yellow pigment. An industrial grade polyurethane coating may be applied to the finished ladder and cage for outdoor application.

3.4.2 The side rails shall be channel 84 x 30 x 5mm. The rungs shall be a D-Shaped pultruded profile with a grey pigment and a non-skid surface. The rung connection is made with the use of a tapered DMC moulded G.R.P. plug secured with high strength epoxy adhesive.

3.4.3 The open mould hand lay-up process manufactures the cage hoops. A minimum width of 75mm and thickness of 8mm for the hoops is required. The cage shall be interconnected with 48mm pultruded channel spaced 90° on centre around the hoop.

3.4.4 Fibreglass pultruded rails, cage straps, solid rod and cage hoops to be manufactured by Fibretek Pultrusion Technology.

3.5 FABRICATION REQUIREMENTS

3.5.1 All joints and rungs shall be epoxied and riveted. The hoops shall be attached to the rails in a manner, which provides hand clearance throughout the length of the ladder.