Introduction

Fibre-Rod is the brand name for standard shapes, sheet and other structures supplied and distributed by Fibreglass World Africa.

What is the Pultrusion Process?

Pultrusion is a continuous molding process, whereby reinforced fibreglass matt roving’s, fillers and resins are saturated with liquid resin and then carefully pulled through a curing and heated die to form a completed composite structural shape where cross sections are constant.

Glass placement, resin formulation, catalyst level, die temperature and pull speed are critical process variables. They must be set up correctly and monitored during the manufacturing process to ensure proper appearance and the specified chemical and physical properties.

The resin provides environmental resistance and the glass provides strength, in addition to safety from fire.

Fibre-Rod Properties

- **Corrosion-Resistant**: Fibre-Rod is impervious to a wide range of corrosive environments and will not rust or rot.
- **Non-Conductive**: Fibre-Rod is thermally and electronically non-conductive, making it an excellent insulator.
- **Non-Magnetic**: Fibre-Rod provides stability and strength in applications where magnetism is an issue.
- **High Strength**: Fibre-Rod combines high strength with light weight. The material is 75% less dense than steel, and 33% less dense than aluminium.
- **Low Maintenance**: Fibre-Rod products have a permanent colour and is virtually maintenance free.
Applications of Fibre-Rod

Fibre-Rod provides numerous benefits in commercial and industrial construction. The products are used extensively as components of equipment in mining and allied fields. In many cases conventional materials are replaced because they are costly and ineffective in corrosive environments.

Weather Resistant

Fibre-Rod pultruded products are coated with a polyester film for maximum corrosion and weather resistance. Standard Fibre-Rod is made using an isophthalic polyester. UV stabilisers and fire retardant additives can be incorporated for special applications, vinyl-ester epoxies are available on request.

Fibreglass Signposts

Fibre-Rod pultruded profiles have proven to be highly and widely used as posts in the signpost industry.

This popularity is due to the following features:

- Fibre-Rod is lightweight, with a high strength to weight ratio.
- Fibre-Rod profiles are easy to install.
- Produced with colour moulded into the product, no maintenance is required.
- Minimal damage to vehicles on impact due to the inherent nature of the product

Fibre-Rod signposts are available in 50mm and 75mm diameters, either round or square. These signs are standard for road and municipal signs.
Fabrication

Cutting

Use a 24-32 tooth hacksaw, a masonry blade (Preferably carbide tipped) or a 60-80 grit diamond-tipped saw to cut Fibre-Rod.

Drilling

A standard twist drill is used to drill through Fibre-Rod products, at thicknesses between 3-10mm.

Punching

Drilling is preferred, refer to drilling above.

Routing

Excellent results have been achieved with carbide tipped bits.

Threading and Tapping

Threading is not recommended. Do not bend, roll or press Fibre-Rod profiles.

Fastening

Mechanical fastening with screws, bolts or rivets can be used on Fibre-Rod, similar to the fastenings used with steel. Adhesives or a combination of mechanical fasteners and adhesives can be used as well. Before bonding, ensure that surfaces are clean and sanded.

We recommend the use of epoxies and modified acrylic adhesives.
Technical Data

The value of the modulus of elasticity with change in temperature is as follows:

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Modulus of Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>24°C</td>
<td>15858 MN/m²</td>
</tr>
<tr>
<td>50°C</td>
<td>12416 MN/m²</td>
</tr>
<tr>
<td>80°C</td>
<td>9652 MN/m²</td>
</tr>
<tr>
<td>94°C</td>
<td>8274 MN/m²</td>
</tr>
</tbody>
</table>

Resin Systems Available
1. Polyester Resin
2. Vinylester Resin
3. Epoxy Resin

<table>
<thead>
<tr>
<th>Mechanical Properties</th>
<th>Rod &amp; Flat Bar</th>
<th>Standard Shapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultimate Tensile</td>
<td>689</td>
<td>206</td>
</tr>
<tr>
<td>Ultimate Compression</td>
<td>413</td>
<td>190</td>
</tr>
<tr>
<td>Ultimate Flexural</td>
<td>689</td>
<td>206</td>
</tr>
<tr>
<td>Tensile Modulus</td>
<td>41368</td>
<td>17236</td>
</tr>
<tr>
<td>Compressive Modulus</td>
<td>N/T</td>
<td>17236</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>41368</td>
<td>11031</td>
</tr>
<tr>
<td>Ultimate Shear</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Ultimate Bearing</td>
<td>N/T</td>
<td>206</td>
</tr>
</tbody>
</table>

Full Section in Bending:
- Modulus of Elasticity MN/m²: 41368
- Tensile Strength MN/m²: 689
- Compressive Strength MN/m²: N/A

Electrical:
- Electrical Strength, short term in oil (ASTM-D149) vpm: N/T 200
- Dielectric Constant, 60 Hz (ASTM-D150): 6.0 5.6
- Dissipation Factor, 60 Hz (ASTM-D150): 0.01 0.03
- Arc Resistance, (ASTM-D495) Seconds: 150 120

Thermal:
- Thermal Coefficient of Expansion Deg, °C X 10⁻⁶: 5-14
- Thermal Conductivity, W/m Deg. °C: 0.3

Other:
- Density Mg/m³: 2.0 1.8
- Water Absorption (24 Hour immersion) Max % by weight: 0.25 0.60

Fire Retardant Properties:
- Flame Resistance ing/burn seconds: 75/75
- Intermittent Flame Test Rating: 100
- Flammability Test (ASTM-D635) Average Time Burning < 5 Seconds
  - Average extent of burning = 15 mm

*Properties specified above in longitudinal direction. Traverse direction properties differ from above stated.

Comparative Table

<table>
<thead>
<tr>
<th></th>
<th>Pultruded Section</th>
<th>Mild Steel</th>
<th>Aluminium</th>
<th>Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density Mg/m³</td>
<td>1.8 - 1.9</td>
<td>7.8</td>
<td>2.7</td>
<td>7.92</td>
</tr>
<tr>
<td>Tensile Strength MN/m²</td>
<td>200 - 400</td>
<td>410 - 480</td>
<td>80 - 430</td>
<td>480 – 1580</td>
</tr>
<tr>
<td>Compressive Strength MN/m²</td>
<td>200 - 280</td>
<td>410 - 480</td>
<td>84</td>
<td>N/A</td>
</tr>
<tr>
<td>Flexural Strength MN/m²</td>
<td>200 - 450</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Coeff. thermal expansion Deg, °C X 10⁻⁶</td>
<td>9 - 11</td>
<td>11 - 14</td>
<td>22 - 23</td>
<td>16 - 18</td>
</tr>
<tr>
<td>Coeff. Thermal conductivity W/m Deg. °C</td>
<td>0.3 – 0.35</td>
<td>46</td>
<td>140 - 190</td>
<td>110</td>
</tr>
</tbody>
</table>

Impact Resistance
- (All material being same thickness) 20 joules
  - Surface Crazing
  - Bent
  - Badly Bent
  - Bent

- Laminate break down in oil at 90°C kv
  - 50 Conducting
  - Conducting
  - Conducting