



GENERAL

1.01 SCOPE

Design, supply and erection shall include all labor, equipment, materials and services necessary for or incidental to completion of molded glass-fiber reinforced polyester composites (G.R.P.) in accordance with the contract documents and specifications in compliance with local government codes.

1.02 QUALITY ASSURANCE

Manufacturer shall submit data, samples and certified testing reports showing compliance to all guidelines set forth in the G.R.P. technical specifications, BS 4549 and BS 3749.

1.03 SUBMITTALS by MANUFACTURER

- A. Product data including materials data, mechanical properties, fire rating properties, finishes, coatings, storage, installation and handling method and recommendations.
- B. Shop drawing showing layouts, elevations, dimensions, joints, details, subframe as well as the interfacing to the adjacent works; include field-measured dimensions of the spaces where items are to be installed.
- C. Samples for each custom finish specified; submit two samples, minimum size 200x200 mm, representing the actual product, theming, color, texture and patterns.
- D. Scaled prototype or mock up unit to be erected on site for inspection and approval upon requested and specified by the client.

PRODUCTS

2.01 MATERIALS

- A. The G.R.P. laminated panel shall consist of approximately 35% glass-fibre content. Raw materials and fabrication process shall comply with BS 3532 for unsaturated polyester resin and BS 3496 for E-glass-fibre reinforcement.
- B. G.R.P. shall be ultra-violet resistant in which high quality gelcoat pigment shall be adopted to avoid rapid discoloring (Light-fastness).

2.02 PHYSICAL PROPERTIES (G.R.P. Laminate)

1. Glass-fiber Content	= 35%	by weight
2. Dry Density	= 1500-1800	Kg/m ³
3. Nominal Shell Thickness	= 5	mm
4. Ultimate Flexural Strength	= 135	MPa
5. Ultimate Compressive Strength	= 175	MPa
6. Ultimate Tensile Strength	= 105	MPa
7. Ultimate In-Plan Shear Strength	= 60	MPa
8. Ultimate Inter-laminate Shear Strength	= 18	MPa
9. Modulus of Elasticity	= 9500	MPa
10. Average Barcol Hardness (BS 2782 Part 10)	= 30~35	
11. Flammability	= Up to BS 476 Part 7: Class 1/2	
12. Recommended Factor of Safety	= 3.0 (Materials) x 1.3~1.5 (Load Factors) = 3.9~4.5	

PS: The above strength values are presented from the testing of GRP control samples and the final strength values obtained on the actual products may vary due to geometry variations.

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2.03 Manufacturing and fabrication procedures shall refer to our technical specifications.

EXECUTION

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3.01 DELIVERY, STORAGE AND HANDLING

- A. Delivery: All G.R.P. features are well-packed and labeled with the following measures taken:
 - ▶ Pack and otherwise protect each unit during shipping and handling to avoid edge damage.
 - ▶ Non-staining resilient spacers shall be placed in between product(s)
 - ▶ Non-staining materials are placed to support products during shipment.
- B. Store and handle G.R.P. products off the ground, under cover, and in a dry and level surface location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, staining, and other causes. Avoid stacking and leaning of pieces as far as possible.
- C. Client shall provide sufficient space and access for unloading and logistic arrangement.

3.02 INSPECTION

- A. G.R.P. product with viewable part surfaces shall be free of noticeable defects (ripples, porosity, chips, scratches)
- B. Dimension Tolerance (for general):
 - ▶ Edge straightness: (+/- 2mm)
 - ▶ Plane surface straightness (+/- 2mm)
 - ▶ Overall length and width (+/- 3mm)
 - ▶ Chords, radii and diameter (+/- 2mm)

3.03 ERECTION

- A. Client shall be responsible for providing setting out reference lines, centers, levels, gradients and marks in sufficient detail for correct installation.
- B. Experienced technicians shall check all reference marks prior to installation. All discrepancies that will affect the G.R.P. installation shall be brought to the attention of the client and resolved before the installation commence.
- C. G.R.P. pieces shall be installed level and plump as shown in the approved shop drawings. It will be securely anchored, jointed and finished in accordance with the design drawings and method statements.
- D. The maximum deflection shall not exceed 2% of the span measured between centers of supports for any specified loadings.
- E. All fixing of G.R.P. pieces shall be in stainless steel, aluminum or passivated zinc-plated mild steel to BS 1706. All internal G.R.P. flanges shall be bolted through with compression joint seals to ensure weatherproofing.

3.04 PROTECTION

- A. Protect installed products until completion of works.
- B. Touch-up, repair or replace damaged products and clean before handover to client for substantial completion.

WARRANTY

- 4.01 UMAGINE warrants our G.R.P. products for one year from the date of acceptance to remain free from cracks, chips, crazing, delamination and marks due to defective material or workmanship.
- 4.02 This limited warranty does NOT cover any liability to the damages arising out of any causes other than in inherent workmanship defect, including but not limited to (1) any incidental, consequential or special damages resulting from the use, service or failure; (2) any damages due to misuse, negligence, mishandling, accident, mechanical abuse, fire, abnormal chemical attack or other casualties which are excluded from this warranty.