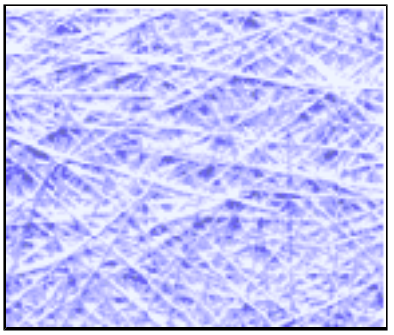
What is GRP?

GRP stands for Glass Reinforced Polymer, outside the industry it is commonly referred to as fibreglass.

Sheets of glass fibre matting are layered over a mould which is then coated with a special resin.

The mixture is then left to set naturally or for quicker results is placed in an oven.

The hardend polymer is then decorated and polished according to the customers specified finish.



Close up of fibreglass matting.

The advantages of fibreglass over other common materials

- The mould side of the product is left with a smooth aesthetically pleasing gelcoat finish, which never needs painting.
- GRP is cost effective in the long term, because it is corrosive resistant and maintainance free.
- Tooling costs are very low, in comparison with injection moulding and deep-draw steel tooling.
- We can apply a range of textures to the finished surface, including render, brick and stone.
- Damaged products are repairable.
- GRP products have good chemical resistance.
- GRP has good dielectric properties which makes it excellent as an electrical insulator.
- GRP products have good heat insulation.
- Mass production press tooling costs, are very competitive compared to other options.
- GRP is versatile.

The GRP advantages in comparison to galvanised steel:

- - corrosion resistance is not related to the zinc coating quality as on the steel,
- - no risk of injury,
- - resistant to salt water, to sulfur, chlorine or basic environments.

The GRP advantages in comparison to aluminium:

- - no electrolytic corrosion due to contact of two metals in humid environment,
- - much higher life span in basic, chlorine or halogen atmosphere.

The GRP advantages in comparison to stainless steel:

- - absence of corrosion under tension (mechanical),
- - absence of hollow corrosion,
- - recommended in chlorine environments

Mechanical Strength

A specific resistance, 2 to 4 times higher traditional materials, allows significant save of weight.

According to applications, a GRP solution (i.e.: 70% fibres, 30 % resin) allows a weight save, for equal resistance, up to:

- - 60 % in comparison to stainless steel,
- - 65 % in comparison to aluminium, -
- - 75 % in comparison to hot dip galvanised steel.

Installation - Assembling

A quick and reliable assembling reduces your installation times up to 50%.

The GRP advantages in comparison to metals:

- - no earthing required
- - no requirement for electric continuity test,
- - easy to work (cut, drill) on site,
- - no burring, no finishing and no risk of injury.

Thermal / Electrical Insulation

Interesting properties for security ....

- - excellent thermal insulation (1000 times less heat conductor than aluminium) ,
- - no spark risks due to contact with other materials,
- - excellent electrical insulation (~ 6 KV / mm).

New Opportunities

The utilisation of composite materials, in particular glass reinforced polymer (GRP), offers new applications and new markets every day. Thanks to the development of new products and constant improvement of the fabrication process, Arbory Group Ltd continuously offers new opportunities to our partners.

GRP Specifications

Glass Reinforced Plastic (GRP) is a light, durable and astonishingly tough constructional material which can be fabricated into all manner of products. It may be translucent, opaque or coloured, flat or shaped, thin or thick. GRP is a composite of a resilient durable resin with an immensely strong fibrous glass. The resin is the main component and is normally a polyester resin. Just as concrete may be reinforced with steel rods, so polyester resins may be reinforced with glass fibres to form GRP. This is the fabrication process, a single surface mould on which is impregnated layers of glass mat with liquid resin until the required thickness has been built up and the laminate is then extracted from the mould. Glass fibre is one of the strongest of all materials (Table 1). The ultimate tensile strength of a freshly drawn single glass filament (diameter 9-15 microns) is about 3.5 GPa. It is made from readily available materials, it is non-combustible and chemically resistant.

Material	Glass Content		Specific Gravity	Tensile Strength MPa	Tensile Modulus GPa	Specific Strength MPa
Polyester / glass moving	54	70	1.9	800*	80*	400*
Polyester / glass cloth	50	55	1.7	500	15	200
Polyester / glass mat	18	30	1.4	100	7	70
Mild steel (structural)			7.8	510	200	40
Duralumin			2.8	450	70	150
Douglas Fir			0.5	75	13	150
Hickory			0.8	150	35	200
Portland cement			2	10	17	5

* In fibre direction.

TABLE 1 - Source: Scot Bader

GRP AS A STRUCTURAL MATERIAL

The greatest advantage of GRP over conventional materials is the ability to design and build large structures conceived as a whole and not as an assembly of parts which have to be jointed together. Another advantage of GRP is the possibility of varying the thickness of the material locally and of increasing the strength characteristics at any point in any direction simply by making intelligent use of the glass fibre reinforcement.

GENERAL CONCEPTS

The properties of GRP compared with those of the metals it replaces are shown in tables 2 and 3. Both steel and light alloy have been selected because they are widely used. The two principal differences between GRP and metals are in modulus and density. Lack of stiffness is the most distinctive feature of GRP from an engineering design standpoint. Elongation at break is usually between 1 and 2% compared with about 40% for steel. On the other hand the deformation of unidirectional GRP is almost elastic to the point of failure, whereas the elastic point for steel is about 0.2%metals.

Material	Grade	Specific Gravity	Elastic Modulus	Proof Strength Tensile	Proof Strength Compressive	Impact Strength KJ/m2	Specific Strength MPa	Specific Modulus GPA
Mild Steel	B.S.15	7.8	207	240	240	50	31	27
Aluminium Alloy	HE15WP	2.7	69	417	417	25	154	26
Stainless Steel	316	7.92	193	241	241	1356	30	24
Random GRP	33*	1.47	8	120	75	75	54	5
Unidirectional GRP	62*	2.16	53	450	250	250	417	25

*Glass content by weight

TABLE 2 - Source: Scot Bader

Material	Comparative Thermal Properties		
	Thermal Conductivity	Thermal Expansion Coefficient	Maximum Working Temperature
	W/m K	x10 -6/°c	°c
Mild Steel	0.2	30	175^
Aluminium Alloy	0.3	10^1	250^
Stainless Steel	50	12	400
Random GRP	200	28	200

^ Depending on the type of polyester resin used and the application.

^^ Measured longitudinally

TABLE 3 - Source: Scot Bader

GRP PERFORMANCE

One of the design considerations is the expected performance of the product in the environmer in which it is to operate in practice. Several tests have been conducted in order to predict the likely performance of our products in most applications. The weather and water resistance of G laminates is largely a function of the gel coat since in most applications it is the gel coat surfac which is exposed to attack. The recommended gel coat is used where resistance to water and mild chemicals is required. For optimum chemical resistance combined with high structural performance a resin rich surface is obtained on the face of the moulding, which is exposed to t hostile environment.

Arbory Group Ltd is committed to producing this productsusing this excellent material at a competitive price.

For more information and/or a competitive quote, ring the number below and a representative will be in contact.

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