

Glassfibre Reinforced Concrete (GRC)

Glassfibre Reinforced Polyester (GRP)



الخليج للقوالب الخرسانية
GULF PRECAST



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INTRODUCTION TO GRC

Glass fiber reinforced concrete –GRC– is one of the most versatile and innovative building materials available today and is making a significant contribution to cost saving, technology and to the aesthetics of the construction industry worldwide.

GRC gives the architects a unique and unrivalled opportunity to express individual interpretation and creativity in a way not offered by any other material, in terms of shape, form, texture, weight, mould ability and long term technical properties.

Gulf Precast is proud of its success in the construction of a range of iconic projects in the UAE, such as the Dubai Mall, the Palazzo Versace and the Paris Sorbonne university, which represent a significant development in the architectural aspects in the UAE's built environment, and a close correlation between precast and design beauty. By performing these projects, we have demonstrated our skillful ability and expertise in using the innate properties of glass fiber to achieve client satisfaction and succeeded in integrating excellence and aesthetic within construction requirements.

Gulf Precast designs, manufactures and installs GRC solutions, working closely with architects, owners, and contractors to develop the most cost-effective approach without altering the design intent. GRC products from Gulf Precast conform with international standards, giving confidence to our customers and ensuring best in class developments in all their aspects.

GLASS REINFORCED POLYESTER

GLASS REINFORCED POLYESTER, known as GRP or Fiberglass, is one of the world's most adaptable materials with myriad of uses in building and industrial applications. It is Ideal for domes, vaults, minarets or car parks.





In addition to manufacturing according to pre-set international specifications, Gulf Precast offers a comprehensive consultancy, design, installation and commissioning service.

The many outstanding features which make Gulf Precast's GRC the product of choice for decorative cladding and curved long span include:

- Lightness
- Weather Resistance
- Impact Resistance
- Potential translucence
- Ease of transportation and installation
- Color Fastness
- Adaptability to long spans and curvatures

Typical Properties of GRC (at 28 days)

Property	Hand or Machine Spray		Vibration Cast
<i>Glassfire:</i> (weight %)			
<i>Bending:</i> Ultimate Strength (MOR)	MPa	20-30	10-14
Elastic Limit (LOR)	MPa	7-11	5-8
<i>Shear:</i> Interlaminar Strength	MPa	3-5	N.A.
In-Planar Strength	MPa	8-11	4-7
<i>Compressive Strength</i>	MPa	50-80	40-60
<i>Impact Strength</i>	Kj/m ²	10-25	10-15
<i>Elastic Modulus</i>	GPa	10-20	10-20
<i>Strain to Failure</i>	%	0.6-1.2	0.1-0.2
<i>Dry Density</i>	t/m ³	1.9-2.1	1.8-2.0



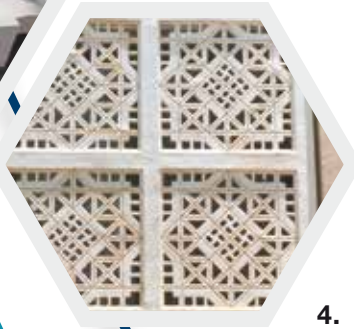
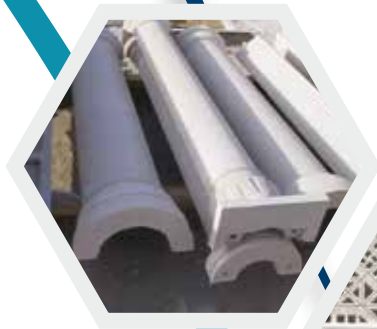


1. Lightweight Structure, Reduced Transport & Installation Costs:

Due to its reduced thickness, a GRC cladding panel can weight 7 times less than a similar precast concrete panel.

Average weight of a GRC element is 12 mm thick (with 100x100 mm stiffening ribs): 40-35 kg/M²

GRC lightweight panels can be transported in light pickups with no weight restriction, and can be erected easily without the need for heavy cranes or special erection tools.



2. Excellent Edge and Corner Strength:

Due to heavy fiber concentration in the GRC mix, GRC edges, chamfers, decorative reliefs, etc. have strong impact resistance and do not spall or break during transport and installation like concrete edges.

3. Improved Surface Details and Quality of Finish:

With GRC, the quality of finish is so outstanding that it allows much greater freedom and creativity in the design of intricate mouldings and patterns.

4. Easy to mould into complex shapes:

With its exceptional strength and impact resistance, GRC allows for all sorts of complex shapes and details, offering an infinite array of possibilities, from arabesques to moushrabias to sculptured columns to decorative open screens, etc...

5. Maintenance Free:

GRC is an inert material, unaffected by salt, freeze/thaw cycles, or corrosive atmosphere. Unlike concrete, as it has no steel components, it is not weakened or cracked by steel corrosion and can last without maintenance for long years.

6. Ideal for Restoration Works:

All the above characteristics point to GRC as the ideal material for restoration of old buildings, facades and decorative features, as GRC can replicate exactly or improve upon any original feature.

7. Environment friendly:

GRC neither uses nor emits any volatile material, and is a low energy product, therefore contributing to a safe and clean environment.

Material Content

Glass Fiber Reinforced Concrete uses the following raw materials:

- Akali Resistant glassfibre formed into continuous strands or rovings, or pre-chopped strands, either loose or bonded into a mat for hand lay-up.
- Ordinary Portland Cement, white or grey. (If rapid demoulding, 1 to 1 ½ hours is required, special cements can also be used).
- Clean, dry and graded sand.
- Acrylic polymer in emulsion form for curing (with option of many products).
- Superplasticiser to improve the workability of the mortar and to improve the composite's strength.
- Water





Typical Formulation

Material	Weight (Kg or lb)	Approx Percentage
Cement	100	42
Sand	100	42
Superplasticiser	1	0.4
Alkali Resistant fibres	7 - 13	3 - 5
Water	33 - 40	14 - 16
TOTAL	236 - 248	
Acrylic Polymer	7-13 if required	3.5%

Moulds or Forms

The appearance of the finished product is directly related to the form material and the quality of the mould itself. Moulds can be made from various materials such as:

- Steel
- Plywood
- Plastic
- Rubber Moulding Compounds
- GRP (Glassfibre reinforced polyester resin)
- GRC itself

A combination of materials is frequently necessary in order to give the desired stiffness, shape and surface finish.

For complicated details, moulds of plastic, rubber, foam or sculptured sand may be used.

Mould material and construction are chosen so as not to allow warping or buckling to occur and have to be non-absorbent.

All corners have fillets, chamfers or rounded corners. Mould release compounds are chosen to match the mould material being used.



There are four basic finishing techniques: Mist Coat, Deep Pigmented Finish, Face Mix and Coating.

Mist Coat

A smooth or light textured off-the-form finish, usually made from coloured sands, crushed natural aggregates or stones, with or without pigments, mixed with white cement unless a dark colour is specified.

A 3mm (1/8 in) thick mist is sprayed into the form before the GRC is applied. The mist coat and the GRC matrix are usually of the same formulation. Imitation of natural slates, stones and terra cotta can be accurately simulated by this technique. The appearance can be enhanced by acid etching or light abrasive blasting after demoulding.



Slate Finish



Slate Finish

Deep Pigmented Finishes

The pigment is added and mixed with the wet GRC mortar, then sprayed onto the moulds. The result is elements with in-depth pigmented colour, as opposed to surface finish or mist coat.



Imitation Wood



Tiling

Face Mix

Up to 12mm (1/2 in.) thick and laid into the mold before the GRC backing is applied.

The mix consists of sand, coarse aggregates from 1 to 10mm (3/16 to 3/8 in) and pigments to get the desired colour. The face mix characteristics match closely those of the GRC matrix to reduce differential movement.



The following is a list of typical applications for GRC as produced by Gulf Precast. Many more are possible whenever weight, fire resistance, mouldability or brittle behaviour is an issue.



Cladding



Architectural Moulding



Restoration



Permanent Formwork



Decorative Screens



Lightweight Buildings with steel structure frames



INTRODUCTION TO GRP

In its simplest form, GRP (Glassfibre Reinforced Polyester) is a material system consisting of a polyester resin matrix, Glassfibre reinforcement mats and suitable additives. GRP allows for greater design flexibility not achievable using traditional building materials due to their inherent limitations. GRP is non-corrosive, strong, lightweight, maintenance free, and can be erected efficiently and economically.

Per unit weight, GRP is among the strongest commercial materials available; for the same cross section, it is lighter and stronger than concrete, steel or aluminum.

Compared to GRC, GRP sections are thinner, stronger and lighter.

Glassfibre Reinforced Polyester (GRP) is used extensively in many fields:
Structural, Marine, Construction, etc.

The Chemical resistance of a GRP product depends on the type of resin used and the quality of the fabrication process. At Gulf Precast we incorporate premium resins and materials and perform quality assurance and control tests throughout the production process to produce superior corrosion and fire resistant components.

ADVANTAGES OF GRP

The advantages of GRP can be summarized as follows:

- Excellent corrosion resistance to a wide range of acids, caustics, chlorides, solvents and oxidizers.
- Considerable savings in weight, against equivalent metal or cementitious based systems.
- Requires no cathodic protection.
- Very high strength to weight ratio.
- Simple and effective jointing – lower installation costs.
- Non conductive, but can be made electrically conductive, as required.
- Wide range of temperature – cryogenic to 350° F.
- Fine internal finish providing excellent flow characteristics.
- Good thermal insulation.
- High fire resistance, as required.
- Minimal maintenance cost.
- Can be moulded into complex shapes with in-built colours and textures.

Typical Properties of GRP

<i>Flexural strength</i>	110 - 22- MPa
<i>Flexural modulus</i>	5500 - 9700 MPa
<i>Tensile strength</i>	62 - 125 MPa
<i>Tensile modulus</i>	5500 - 9700 MPa
<i>Elongation</i>	1.0 to 2.5%
<i>Compressive strength</i>	100 - 175 MPa
<i>Impact strength</i>	0.7 - 2.1 M/mm
<i>Density kg./M³</i>	1250 - 1750 kg/M ³
<i>Continous heat resistance</i>	cyrogenic to 350° F



Domes / Cupolas

1. Domes/Cupolas:

Gulf Precast has been one of the leaders in GRP cupola and dome manufacturing since 1984. Gulf Precast can replicate existing or manufacture new cupolas and domes, which have an advantage over other materials because they are light and can be moulded into complex shapes. These shapes can be curved, corrugated, ribbed or contoured in a variety of ways, with varying thickness. GRP colours are not simply surface deep but spread homogeneously through the full thickness of the material itself and they can match any colour including metallic.



Al Murooj Rotana

2. Cornice:

Gulf Precast's GRP cornices can replicate most finishes including cast stone, marble, granite, copper, steel and wood. GRP has the advantage of being lightweight, cost effective, virtually maintenance free, less labor intensive to erect, moulded in many complex shapes, in-depth color never needs painting, as well as design flexibility.

3. Columns and Capitals:

Custom GRP Columns and Capitals are cost effective, non-corrosive, and virtually maintenance free. Gulf Precast can manufacture any shape, size and proportioned column and capital. Columns (with in-built steel structure) can be manufactured load-bearing to hold substantial weight.



Columns / Capitals

4. Mosques:

Gulf Precast has been one of the leaders in GRP minaret and dome manufacturing for the past thirty years. Our coloured GRP minarets and domes stand as beacon and beautifully enhance the appearance of any structure.

5. Custom and specialty:

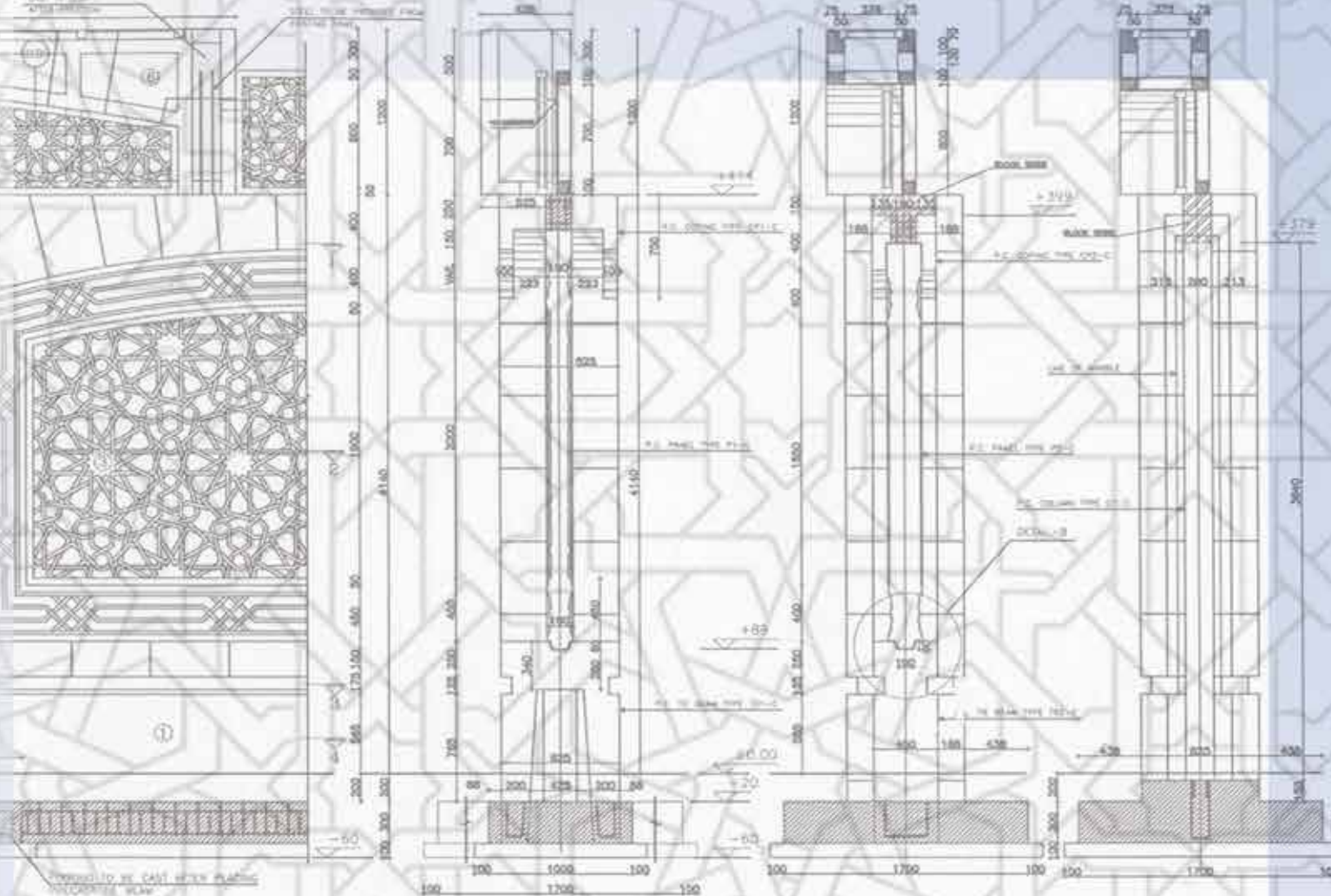
Gulf Precast custom designs and manufactures many different products for all industries. Common customs applications include canopies, louvers, balusters, translucent sculptured walls, fountains, etc.

6. Restorations:

Gulf Precast has completed numerous restoration projects for old existing buildings. Gulf Precast's ability to reproduce the shapes and sizes of complex configurations allows builders the freedom to recreate historical shapes and finishes, without sacrificing the authentic look.



Mosques



SECTION A-A
SCALE 1:25

SECTION B-B
SCALE 1:25

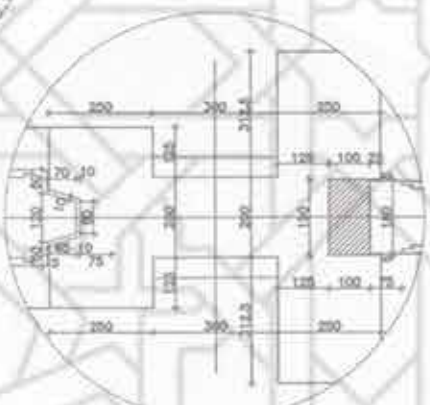
SECTION C-C
SCALE 1:25



SECTION D-D
SCALE 1:25

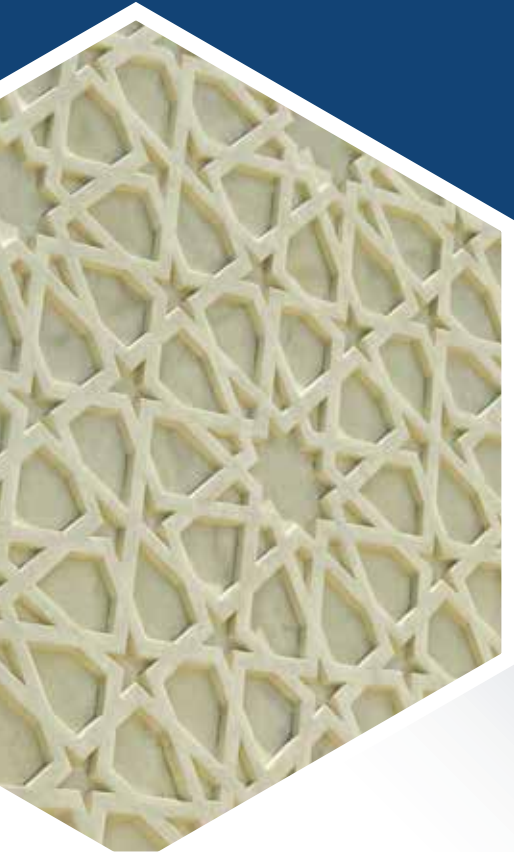


DETAIL-D
SCALE 1:25



DETAIL-D
SCALE 1:25

- FINISHES**
- (1) FAIRFACE CONCRETE (PIGMENTED)
 - (2) FAIRFACE PRECAST CONCRETE PANEL & COLUMN
 - (3) DECORATIVE FAIRFACED PRECAST CONCRETE PANEL
 - (4) FAIRFACE PRECAST CONCRETE PANEL WITH GROOVES
 - (5) G.R.C. DECORATIVE SCREEN
 - (6) G.R.C. PANEL WITH GROOVES



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