Emirates Facade (EFCO) Prequalification
Emirates Façade Co. ZEPCO
COMPANY PROFILE

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1. INTRODUCTION

EFCO is a dynamic engineering firm specializing in façade systems. We participate in most presages tenders and jobs. The company has developed an impeccable reputation as a reliable organization, associating itself with a carefully selected international or local organization having proven records of top performance and quality products thus ensuring the ability of achieving the client's trust. Your esteemed organization can really depend on our reliable service for:

**Engineering and design**
Due to our wide local experience and our partner worldwide experience as well as multi divisions and activities, we are able to design the most sophisticated façade. We will give your building a truly engineering study and suggest the right solutions, to match the client's needs and architectural requirements.

**Estimation, cost evaluation, technical comparison**
Our professional estimation team can deal with all building types (palaces, villas, residential, commercial, hotels, malls, industrial). Through our engineering estimators, we can build accurate cost, suggest the missing details, and suggest the right materials.

**Installation, site activities**
Our highly trained workers are ready from day one to share with the contractor all site activities starting from surveying and monitoring the dimension till handing over the project. You will have real coordination matching your work program through our engineered planning program.
a. ORGANIZATION

Dynamic growth and expansion into new areas related to its former core activity have led to a solid reorganization of the Company, positioning it to manage most effectively its expansion both to date and in the future. EFCO now structured as following of autonomous divisions, one for every specialized area, headed by a Manager with a dedicated supporting team.

**EFCO MAIN DIVISIONS**

- **GRC & GRP**

- **Aluminium & Glazing.**

- **Façade Cladding**

- **Kitchen Cabinets, Wardrobes**

- **Wrought iron**

- **Rolling Shutter, Garage Doors**

- **K-Span Building System – EFCO SHADE®**

- **Precast building managements**

Each division is an independent cost centre, but with the facility to draw on the centralized support functions such as marketing and finance, and guided by the corporate strategy. The current organization chart is shown in the next section.
b. RESOURCES

For a bigger scope, a Company might have additional recourses from its principles such assistance which might include designs, submittals, and supervisions. Below is the list of our available manpower:

<table>
<thead>
<tr>
<th>S.No</th>
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<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Manager</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Area Manager</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Activity Manager</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Cad operators</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
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<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Site Engineers</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Secretaries</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Accountant</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Public Relation Officer</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Factory Manager</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Fabrication Foremen</td>
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<td>12</td>
<td>Installation Foremen</td>
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</tr>
<tr>
<td>13</td>
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<td>14</td>
<td>Instrument technical</td>
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<td>15</td>
<td>Electrician</td>
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<tr>
<td>16</td>
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<td>15</td>
</tr>
<tr>
<td>17</td>
<td>Helpers</td>
<td>45</td>
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<tr>
<td>18</td>
<td>Site installers</td>
<td>35</td>
</tr>
</tbody>
</table>
c. PRODUCTS AND SERVICES

Our products include:

1. Glass Reinforced Cement Products (GRC)
   - Wall Claddings
   - Cornice
   - Caloustra
   - Balustrades
   - Arches
   - Decorative Columns

2. Glass Reinforced Plastic (GRP)
   - Wall Claddings
   - Cornice
   - Caloustra
   - Balustrades
   - Arches
   - Decorative Columns
   - Red Roof Tiles
2. COPIES OF REGISTRATION CERTIFICATES

EFCO-GRC Trade License
Certificate of Registration

This is to certify that the
QUALITY MANAGEMENT SYSTEM
of
CRTD (CERNOBIA TRANCE)
located at

has been assessed against
ISO 9001:2015

The above-named organisation has achieved conformity to

This Certificate is valid for

The organisation must ensure that

Signatory:

[Signature]

[Name]

[Position]

[Date]

[Company]

[Address]

[Telephone]

[Email]

[Website]

[Logo]

[QR Code]

[Logo]

[QR Code]
Emirates Façade Construction Units Building Works consistently improving the quality of our product to add value for clients through innovation, foresight, and integrity.
"Our pledge is to deliver top quality products and remarkable performance"
"At Emirates Façade Construction Units Building Works, we strive to be the best manufacturing company that consistently delivers products beyond expectation of our valued clients promptly at a competitive price"
4. TECHNICAL METHOD STATEMENT

Glass Reinforced Concrete (GRC)

**INTRODUCTION:-**

This method of statement describes briefly how EFCO intends to proceed with the Production, delivery and erection of Glass Reinforced Concrete elements.

**Glass Reinforced Concrete (GRC):-**

Is a mixture of cement, fine aggregate, water, chemical admixtures and alkali resistant glass fibre?

There are a number of different manufacturing processes; the most common are hand-spray and premix methods. Glass fibre Reinforced Concrete (GRC) is a material which today is making a significant contribution to the economics, to the technology and to the aesthetics of the construction industry worldwide.
**RAW MATERIALS:-**

1) Comfily alkali resistant glass fibre formed into strands, roving’s or mat.
2) Ordinary Portland cement, white.
3) Clean, dry and graded sand.
4) Acrylic polymer in emulsion for curing.
5) Super plasticizer to improve the workability of GRC to improve the composite strength.
6) Water.

The sand used should have a particle size not exceeding approximately 1mm and should be well graded. Material passing sieve No. (100) should not exceed 10%. The sand should preferably be dry.

The water/admixture/polymer contents will need to be adjusted according to materials.

**MIX DESIGN FOR SPRAY UP PANELS AND PREMIX:-**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Raw materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cement</td>
</tr>
<tr>
<td>2</td>
<td>Sand</td>
</tr>
<tr>
<td>3</td>
<td>Plasticizer</td>
</tr>
<tr>
<td>4</td>
<td>Polymer</td>
</tr>
<tr>
<td>5</td>
<td>AR Glass Fibre</td>
</tr>
<tr>
<td>6</td>
<td>Water</td>
</tr>
</tbody>
</table>
MOULDS OR FORMS:

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

1) Steel
2) Plywood
3) Plastic
4) Rubber moulding compounds
5) GRP
6) GRC itself.

A combination of materials is frequently necessary in order to achieve desired stiffness, shape and surface finish. For complicated details, moulds of plastic or rubber are used.
**MANUFACTURING**

Glass fibre reinforced concrete products are manufactured using various techniques, the most popular are:-

1) **Spray process**

   1) **Sprayed GRC** :-

   a) The water and admixture are placed in a high shear mixer and the sand/cement are slowly added until a smooth cream of slurry is achieved. The consistency of slurry can be checked using slump test. Mixing time will be about 1 – 2 minutes.

   b) When the mix is ready, it is transferred to a pump/spray unit. The pump conveys the slurry at a regular rate of flow to the spray gun. At the spray gun, fibre in the form of a roving is chopped to a length of approximately 32mm and added to the slurry. The two materials are projected onto the mould surface using an air supply from a compressor.

   c) The GRC material is sprayed and built up in this layers until the required thickness is achieved – normally 10 – 15 min. Simple hand-rollers are used to compact the material between layers.

   d) The product is left in the mould and covered with polythene to prevent moisture loss until the next day. The product is then remoulded.

   e) After remoulding, the units are covered with polythene and allowed to cure for approximately 7 days.
If a polymer curing compound is used in the mix, the units can be exposed to the atmosphere for two or three days as per the supplier’s instructions.

2) Premix GRC
   a) The sand and cement are mixed dry and then the water/admixture and polymer are added. Generally a two speed slurry/fibre blender mixer is used. With this type of mixer, the fast speed is designed to create a smooth creamy slurry. This takes about 1–2 minutes. The mixer is then switched to slow speed and fibre in the form of chopped strand (length approximately 13mm) is added slowly. The fibre is blended into the mix for approximately 1 minute.
   b) Once the mix is ready, it is poured into the moulds which are vibrated using a vibrating table.
   c) The product is left in the mould to set and is covered with polythene sheet to prevent moisture loss. The product is remoulded the next day.
   d) After remoulding, the products are cured under polythene sheet to maintain moist conditions for approximately 7 days. Alternatively, a polymer curing compound can be used as described for the sprayed process.

**TYPICAL PROPERTIES OF G.R.C. (AT 28 DAYS)**

<table>
<thead>
<tr>
<th>PROPERTIES</th>
<th>HAND/MACHINE SPRAY</th>
<th>PREMIX PROCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass fibre contents</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Ultimate strength</td>
<td>20 – 30 N/mm²</td>
<td>10 – 14 N/m²</td>
</tr>
<tr>
<td>Elastic limit</td>
<td>7 – 11 N/mm²</td>
<td>5 – 8 N/m²</td>
</tr>
<tr>
<td>Compressive strength</td>
<td>50 – 80 N/mm²</td>
<td>40 – 60 N/mm²</td>
</tr>
<tr>
<td>Dry density</td>
<td>1.9 – 2.1 t/m³</td>
<td>1.8 – 2 t/m³</td>
</tr>
</tbody>
</table>
GLASS REINFORCED PLASTIC (GRP)

**INTRODUCTION:-**

This method of statement describes briefly how EFCO intends to proceed with the Production, delivery and erection of glass reinforced plastic (GRP) elements.

**Glass Reinforced Plastic (GRP):-**

Is a chemical materials applied on the moulds and Using the Fibre glass materials.

There are a number of different manufacturing processes; the most common are hand Layup.
**RAW MATERIALS:-**

1) White or coloured Gel coat.
2) Fibre glass.
3) Resin

**MOULDS OR FORMS:-**

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

1) Steel
2) Plywood
3) Plastic
4) Rubber moulding compounds
5) GRP

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

For complicated details, moulds of plastic or rubber are used.
**MANUFACTURING**

The manufacturing process and raw material used in the G.R.P. ROOF is specified as follows:

A) The GRP Sheet roof panel made of reinforced FIBRE GLASS Brick red colour.

B) The actual site measurement is taken in order to prepare moulds accordingly.

Then the prepared GRP mould is prepared by using release wax mirror glaze MGH 8 to give a high gloss surface and good release properties for the mould. As a second stage a release film CRA No.5 of a POLYVINYL alcohol is applied.

Using the hand lay-up process by the mean of a lamb skin roller, white GELCOAT of “SCOTT BADER” of ENGLAND is applied in two layers having a total thickness of about 0.8mm.

The reinforcement layers are then applied using 450g/M2 FIBRE GLASS mat of "BINANI" with ORTHOPHTALIC RESIN of “SCOTT BADER’ of ENGLAND. The laminate will have RESIN to gloss ration 2.5 -1.

The cured GRP Roofing sheets are then de-moulded, cutting the extra edges, checked by the QC in-charge for the quality and the thickness of the GRP sheets. The GRP sheets then cleaning and polishing and final inspection before transportation to site for Installation.
**SITE ARRANGEMENT**

The main contractor should provide man lifts, scaffolding and surveyor for levels around the building. GRP sub contractor should start the production immediately in order to cover these areas within a short time as much as possible.

**ERECTION REQUIREMENT**

01 Site accessibility, power supply and platforms:

Clear space for storing GRP material and access road has to be provided by the main contractor to proceed the works at the areas specified and agreed mutually. Scaffolding are to be erected around the wings as platform up to 1 meter width to allow the workers to fix the GRP sheets at the side curve areas. The GRP panels should be lift by tower crane, mobile crane or boom loader was applicable. Power supply of 220 V is to be arranged by the main contractor at the nearest point of activity.
### 5. REFERENCE LIST

**EFCO- GRC Division Projects**

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>CONTRACTOR</th>
<th>CONSULTANT</th>
<th>AMOUNT</th>
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<td>Al Salaam</td>
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<td>Hand Rail at Sea Palace</td>
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<td>Calustra for Al Sader</td>
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6. PHOTOS OF EFCO PROJECTS

GRC Projects

Mosque (GRC)
*Decorative GRC*
**GRC Dome**
GRC Balustrades and Caloustra
GRC Cladding
GRC Cornice
GRC Ceiling
GRC Boundary Wall
GRC Columns
GRC Finials
GRP Projects

GRP Ceiling
GRP Red Tiles
7. COMPANY QUALITY POLICY

1-RAW MATERIAL SPECIFICATION.
The basic raw materials for GRC production are; Cement, sand, water and alkali resistant glass fibre. To these basic materials, admixtures, pigments and other additives may be used to achieve particular properties. All materials should be identified and stored properly.

CEMENT
Cement suitable for precast concrete production is generally suitable for GRC. The Portland White Cement is dictated by the end product.

SAND/AGGREGATE
The silica sand is very important for the production of good quality GRC. The sand must be hard, durable and clean and should be suitably graded (0.5-1mm).

GLASS FIBRE
Glass fibre must be of an alkali resistant type specifically formulated for use in GRC. The best Alkali Resistant Glassfibre.

Spray Process: Supplied as Roving
The most widely used AR Fibre. It is particularly suitable for architectural products.
This is a stiffer fibre used for Hand and Auto-Spray

WATER
Water suitable for concrete is suitable for GRC. In extreme climatic conditions cooling of the water may be necessary.

ADMXIUTURES
These are widely used in the manufacture of GRC to assist in the manufacturing process and to enhance the final properties. A plasticiser should be used to maintain workability whilst allowing reduction in the water cement ratio. Admixtures can also accelerate, retard, reduce bleeding, waterproof and reduce segregation. The selection of the most appropriate will depend on local factors, particularly the cement and sand used and the climatic conditions.

PIGMENTS
Pigments can be used to colour either white or grey cement. To achieve consistency their use is often associated with a "facing mix" which subsequently receives post treatment normally acid washing, sand blasting or polishing.

MOULD RELEASE AGENTS
All moulds require a thin coat of release agent daily prior to use.
2-MOULDS
Moulds can be manufactured from a variety of materials. Whichever material is chosen the mould must, for the number of casts required, maintain dimensional accuracy and the required surface finish. Common mould materials are:

STEEL
Used for standard and other products where large numbers of casts are involved.

TIMBER
Probably the most widely used and versatile material.

GRP
Used when more than one mould of a particular shape is required.

RUBBER
Many intricate shapes cannot be satisfactorily manufactured from a rigid mould and in these cases flexible moulds must be used.

3-MIX DESIGN
Selecting the correct mix design is essential in making quality GRC products. The GRC mix chosen must achieve the required mechanical properties at 7 & 28 days. It must have achieved sufficient strength for demoulding and must have the required workability and maintain this workability during the production process.
A basic GRC mix consists of Portland cement, fine sand, water, plasticizer and/or polymer.
It is now normal practice to use equal quantities of sand and cement – ie a 1:1 Sand/Cement ratio. The sand is essential to reduce shrinkage in the GRC.
The Water/Cement ratio should be as low as possible - normally in the range 0.30 – 0.38. To achieve this it is necessary to add plasticizers or super plasticizers to the mix. Depending on the climatic conditions retarding or accelerating plasticizers should be used.
The dosage rates of plasticizers vary enormously and the manufacturers recommendations should be used. Dosage rates are normally quoted as % addition by weight of cement.
The Water/Cement ratio refers to the total weight of water in the mix not just the added water. Water can also be present in the sand. If 50 kgs of sand are added and the sand had a 6% moisture content then 3 kgs of water is contained in the sand and this must be removed from the added water.
GLASS CONTENT
The glass content is the percentage of glassfibre measured as a percentage of the total weight.
ie: Glassfibre % = Weight of Glass
Weight of Glass + Weight of Cementitious Slurry
For the Spray Process the glassfibre percentage would be in the range 4 – 5% and for Premix 1.5 – 3.5%.
In Premix, the glass is added to the mix and so the weight of glass is shown as a component of the mix.
In the Spray Process were the fibre and cementitious slurry are fed independently to the Spray Gun, then a fibre percentage is normally stated.
With Premix the fibre length typically 13 mm would be stated, with Hand-Spray glassfibre roving is used and the fibre length is dictated by the number of cutting blades in the spray gun.

TYPICAL MIX DESIGN

<table>
<thead>
<tr>
<th>RATIOS</th>
<th>Hand-Spray (Non Polymer) QUANTITIES (kgs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement/Sand ratio 1:1</td>
<td>Cement (OPC) 50.0</td>
</tr>
<tr>
<td>Water/Cement ratio 0.32 – 0.34</td>
<td>Sand 50.0</td>
</tr>
<tr>
<td>Plasticizer 0.5% on cement</td>
<td>Water 16-17</td>
</tr>
<tr>
<td>Sprayed with 5% Glassfibre</td>
<td>Superplasticizer 250 ml</td>
</tr>
</tbody>
</table>

4-QC/QA EQUIPMENT
For the manufacture of Quality Assured GRC products it is necessary to have or have access to the following equipment.

BALANCE
Capable of weighing 1000 gms in increments of 0.1 gm.

MUFFLE FURNACE
Temperature 500 degrees C. and/or an oven with forced air circulation capable of maintaining a temperature of 105 degrees C plus or minus 5%, together with sample baskets.

SLUMP TEST KIT
5-MIXING

WEIGHING / BATCHING
Once a mix design has been established it should be adhered to. The only way to ensure uniformity is to accurately weigh the raw materials and to be consistent in the method of operation of the mixer. All raw materials in the factory should be clearly marked so that they can be really identified and compared to the specified material.

The dry materials – cement and sand – should be weighed. When they are supplied in bags of known weight, then one bag could be added provided the bags are of consistent weight.

Liquids should be added by volume and consistency is critical. The most common fault in GRC production is adding the wrong quantity of water. A volumetric measuring and dispensing system can be used for water and plasticizer.

MIXING PROCEDURES
Mixing For Spray Production A typical method of mixing using the GRC High Shear Mixer is:
1. With mixing tub in position lower mixer and press “start”;
2. Add water and other liquids;
3. Add sand;
4. Keep the mixer running and add cement;
5. After all the cement has been added, mix for a further 15 seconds;
6. Stop and raise mixer, clean blade and scrape any unmixed material from the side of mixing tub;
7. Lower mixer and mix for a further 10 seconds;
8. The mix is now ready for use and should be poured into the pump hopper.

6-QUALITY CONTROL TEST

A-SLUMP TEST
After mixing the consistency of the mix can be checked by a simple slump test:
1. Tube
2. Plexiglas Target Plate
3. Spatula
Procedure
1. Place tube centrally on the target plate
2. Fill with slurry*, if necessary air bubbles are expelled by gently rodding the mix.
3. Screed the slurry top and level with the edge of the spatula. Clean any excess slurry from the plate with a damp cloth.
4. Lift the tube vertically off the plate with a slow continuous motion allowing the slurry to flow over the target area of concentric circle.
5. Measure the slump by the number of rings covered by the slurry. Given standard formulations 2 to 3 rings is the normal range to be aimed for depending on the relevant ambient temperatures.

B-BAG AND BUCKET CALIBRATION TABLE

<table>
<thead>
<tr>
<th>Slurry Output</th>
<th>For 5% Glass Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg/min</td>
<td>kg/30 sec</td>
</tr>
<tr>
<td>10.00</td>
<td>5.00</td>
</tr>
<tr>
<td>11.00</td>
<td>5.50</td>
</tr>
<tr>
<td>12.00</td>
<td>6.00</td>
</tr>
<tr>
<td>13.00</td>
<td>6.50</td>
</tr>
<tr>
<td>14.00</td>
<td>7.00</td>
</tr>
<tr>
<td>15.00</td>
<td>7.50</td>
</tr>
</tbody>
</table>
Procedure Bag Test
a) Weigh bag empty - (M) g.
b) Chop glass into bag for 15 seconds.
c) Weigh bag with fibre - (T) g.
d) Calculate output of glass from \((T - M) \times 4\) g/min.
e) Adjust air to chopper motor to achieve required output

Procedure Bucket Test
The object of this test is to measure the output from the slurry spray.
a) Weigh the bucket empty (M) Kg
b) Spray the slurry into the bucket for 30 seconds
c) Weigh the bucket with the slurry (D) Kg
d) Calculate the output of the slurry pump from \((D-M) \times 2\) Kg/min
e) Adjust the pump output until required rate is achieve.

QUALITY CONTROL TEST RECORD

GLASS CONTENT

<table>
<thead>
<tr>
<th>DATE</th>
<th>BAG AND BUCKET TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shift No.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7- PREPARATION AND CASTING

MOULDS
Prior to starting manufacture, a sufficient number of moulds should be „ready” so as to ensure continuous production. Start/Stop production should be avoided at all costs particularly in the spray process were prolonged stops will mean additional pump washouts.
A daily mould preparation sequence would involve:

Assembly
Reassemble the moulds ensuring all sides, ends, block outs, etc are in the right position. Check that there are no gaps and 90°degree corners are square. Visually check that there has been no deterioration which would affect the final product and check key dimensions with a tape.

Cleaning
Thoroughly clean the mould and remove any loose debris.
Release agent
Apply a thin coat of release agent to all mould surfaces by cloth, brush or spray. Remove any excess with a cloth.
(Suitable release agents are widely available)

Inspection
After a final inspection the mould is ready for production.

SPRAYING
Spraying is carried out by teams normally consisting of 3 - 6 people. They should be familiar with the procedure of operation, cleaning and maintenance of the equipment provided by the manufacturer.

8-PRODUCTION OF SINGLE SKIN CLADDING WITH PERIMETER BOX RIBS.
Depending on the quantity of casts required the mould can be manufactured from steel, GRP or timber.
The moulds are assembled, checked dimensionally and to ensure squareness and that it is on a level base. It can then be treated with release agent prior to spraying.
Assuming mixing and calibration checks are complete spraying can commence. A mist coat maximum 0.5 mm thick is sprayed onto all faces of the mould. This is immediately followed by the first layer of GRC. This is compacted by roller paying particular attention to edges and corners.
These are particularly important and minutes spent at this stage will save hours making good at a later date.
The 2nd layer of GRC is sprayed and compacted and the thickness is checked with a depth gauge. For panel thickness 12-15 mm a third spray may be necessary
The pre-cut rib formers are now placed. Note how the corners of the polystyrene have been chamfered to accommodate the build up of GRC at the mould edges.
The polystyrene formers do not extend to the mould corners as here fixing sockets are encapsulated in solid GRC.
Once these sockets have been correctly located and all the rib formers placed two layers of GRC with compaction between are sprayed over the rib formers. Stages 3-4 on the diagram show how this is achieved.
The GRC encapsulating the sockets can either be sprayed directly around the socket or first sprayed into a bucket, mixed and placed around the sockets by hand. Experience has shown that this second method gives the best results although it is necessary to reduce the glass % to 2.5 to 3 aid compaction. This can be done by switching off the chopper motor for half the time while spraying into the bucket.
The edges and sides of the mould are now cleaned and the mould is polythene covered. If the mould has been moved during the production process it is essential that it is checked to ensure that it is level and not twisted. Note a panel made from a twisted mould will always be a reject.
After 8-12 hours depending on temperature the panel can normally be demoulded. An assessment must be made that the GRC has hardened sufficiently for the demoulding to take place.
A panel of this size 3m x 1m would normally be demoulded using a lifting beam or frame probably attached to the corner fixing sockets.
Once demoulded the panel would be marked with an identification number and transferred to the curing bay. It would be handled and stored on edge. After curing for 7 days it would be transferred to the stock yard prior to delivery to site.
Any remedial work to the panel could be done immediately on demoulding or at the end of the curing period.

9-CURING
It is important to understand the reason for curing products and how cure is achieved.
GRC starts to hydrate after the initial set has been achieved and this hydration then continues for the life of the product. In practical terms 95% of hydration will be complete by 28 days for concrete products and because of its higher cement content, GRC hydrates at a faster rate and after 7 days approximately 95% of hydration would be complete.
To enable hydration to proceed water must be present within the product. There is sufficient water in the mix and the aim of curing is to keep this water in the product. Provided this is done, additional water for curing is not necessary. Water can be kept in the product either chemically using polymers or by maintaining the product in a humidity of 95% such that water will not evaporate from the product.

Dry Cure
Dry cure using a Polymer modified mix.
1. If this method is to be adopted the polymer addition will be catered for in the mix design.
2. After completion of spraying the product is to be polythene covered and maintained at a temperature between the minimum film formation temperature of the polymer and 40 degrees centigrade prior to demoulding.
3. After demoulding the product can then be air cured either inside the factory or in the stockyard. During winter months or when frost is expected the products should be stored inside for a further two days after demoulding.
Moist cure
1. After completion of the spraying process the mould is covered with polythene within one hour.
2. After demoulding the product is either;
   a. Stacked on a pallet and shrink wrapped
   b. Stacked in curing area and covered in polythene
   c. Stacked in purpose built humidity and temperature controlled curing chamber

When b. is adopted the product is to be wet down daily. In certain conditions this may be more frequent dependent upon humidity readings. Moist cured products are normally to be kept inside for a period of seven days.

10-PRODUCT HANDLING
Although considerably lighter than equivalent concrete components many large GRC items are too heavy to lift by hand and it is therefore necessary to consider some form of mechanical handling.

OVERHEAD CRANES
These are ideal for the movement of products within the factory. They maximise the use of factory space by allowing moulds to be closely spaced.

FORKLIFT TRUCKS
Ideal for use in the stockyard and for loading and unloading. They can be used internally for demoulding and product handling, but the necessary driveways reduce the effective area of the factory.

11-DELIVERY, STORAGE AND HANDLING
A. All G.R.C. materials shipped to be placed in custom built crates or pallets, and shipped in a manner that will protect the pieces from damage, dirt, moisture and wrapping
B. Support pieces during shipment on non-staining shock absorbing materials
C. Lift and support pieces only at points indicated for attachment on drawings
D. Storage: Once uncrated, material to be stored in an upright position on a flat, smooth and level surface. Avoid stacking and leaning of pieces as much as possible
E. Cover and protect pieces from excessive dirt, moisture, surface damage or other jobsite hazards.
12-ERECTION
A. Safety: installer is responsible for handling and installing the G.R.C. material in a safe manner
B. Experienced workmen to install the G.R.C. pieces. Materials will be installed level and plump and as per approved drawings. All pieces will be securely anchored and joints finished as shown in the approved shop drawings.

13-GRC Finishing
Horizontally Joints between GRC panels are sealed using foam backing rod and Sikaflex construction -D (polyurethane based sealant). Panel-to-panel *vertical* joints of GRC are then filled with repair mortar BASF Concresive 2200 and trowels to smooth finish.
The GRC will be in white smooth finish without any painting or coating. Sealant between the GRC and Aluminum is not in our scope of work. Sealant life and performance are greatly influenced by joint width. The joints between the GRC panels must be wide (10-16mm) to accommodate anticipated wall movements. When joints are too narrow, bond or tensile, failure of the joint sealant will occur.

14-Final Handover for the area
Request For Inspection (RFI) is to be raised and any comments on the workmanship shall be addressed until final approval is granted.
1. COMPANY QUALITY POLICY

It is the policy of EFCO, Inc. (EFCO) to ensure that the end customers are satisfied by providing goods, quality, and services which represent value within the scope of the sales contract.

Management recognizes that EFCO must be committed to providing the highest quality products and services, and that customer satisfaction is vital to the success of the organization. Therefore, all the office staff is educated in monitoring and improving quality management system procedures, processes that monitor customer, supplier, and vendor performance.

The management objectives of EFCO are:

- To achieve marketability and competitiveness
- To improve the quality of products
- To enhance the company's image
- To improve employee well-being

Corporate policy is that EFCO's management is committed to maintaining an environment that is conducive to achieving quality and enhancing productivity. It is also committed to comply with national and international quality management standards.
6. COMPANY SAFETY POLICY

1. Safety Guidelines
   a. All employees must attend the safety training course.
   b. Employees must wear personal protective equipment (PPE).
   c. Employees must follow the safety rules and procedures.
   d. Employees must report any accidents or incidents immediately.

2. Safety in the Work Area
   a. All equipment must be in good working condition.
   b. Employees must maintain a clean and organized work area.
   c. Employees must follow the correct procedures for handling equipment.
   d. Employees must avoid distractions and maintain a focused work environment.

3. Safety at the Worksite
   a. Employees must wear appropriate PPE when entering the work area.
   b. Employees must follow the safety rules and procedures at the worksite.
   c. Employees must report any accidents or incidents immediately.
   d. Employees must avoid distractions and maintain a focused work environment.

4. Safety of the Equipment
   a. All equipment must be in good working condition.
   b. Employees must maintain a clean and organized work area.
   c. Employees must follow the correct procedures for handling equipment.
   d. Employees must avoid distractions and maintain a focused work environment.

5. General
   a. Employees must be knowledgeable about the work area and the equipment.
   b. Employees must follow the safety rules and procedures.
   c. Employees must report any accidents or incidents immediately.
   d. Employees must avoid distractions and maintain a focused work environment.
COMPANY POLICY

It is the policy of EFCO Limited to deliver to the best of our ability and abilities for providing quality products which maximise value within the scope of the work undertaken.

Quality Promise: EFCO Limited is committed to providing the highest quality solution and related service and support to its customers, including the sales, design and the after-sales for a range of monitoring and reporting quality management systems, products and services, and data trending, and related products.

The management objectives are as follows:

- To improve operational and company values
- To improve the efficiency of the systems
- To satisfy the customers’ desires with solutions
- To ensure high-level QMS training

EFCO Limited’s Quality Management System is certified to meet the ISO 9001:2015 and the Quality Management Systems with a commitment to continuing improvement and the charter to continuously improve to meet the needs of the customer, and regulatory requirements and market conditions, and the development of the quality management system.