



شركة ديكو مصر للإنشاءات الحديثة

# GRC

## Fixation procedure Submittal

with compliance to



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## **GFRC method of statement**

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## 1/ Scope.

- 1.1 Scope of this method of statement covers the manufacturing of GFRC units & erection t\_ also covers joint treatment & repairs for GFRC.
- 1.2 this method of statement could be extended to other area where GFRC Works is specified.

## 2 / Purpose.

The purpose of this method of statement is to describe all material used , work procedures , sequence of works and methods of inspection to GFRC units as total work .

## 3 / references.

- 3.1 GFRC - PCI/128.
- 3.2 Previous shop drawing by contractor side and contractor / manufacturer recommendation.
- 3.3 ASTM C 947-81  
ASTM C 948-81  
Standard test and methods for GFRC pre-casted section and comparison.
- 3.4 BS EN 1170-1 1998 to 1170-7 1998 , referring to the needed tests and test methods for glass-fiber reinforced cement.

## 4 / Materials.

- 4.1 White Portland Cement.
- 4.2 Pure graded sand .
- 4.3 Fiberglass (Alkali – Resistant ) Cem-fill/NEG production.
- 4.4 Latex base bonding agent .
- 4.5 Acrylic base Paint .
- 4.7 Joints In situ GFRC mix.

## 5 / Procedure.

### 5.1 Survey:

Survey and determination of areas that needed to be covered by GRC pieces or repaired , and final areas level and shapes , also the areas of external pieces and accurate DMs according to site conditions.

#### 5.1.2 Shop DWG.

Shop-Dwg will be furnished upon survey and due to site condition measurement which includes :

- 1 – Actual Dms. ( Architectural ) due site condition as built.
- 2 – Type of fixation required upon manufacturer recommendations.
- 3 – Samples of connectors that will be used and data sheet if required by consultant.

### 5.2 Molding:

- 5.2.1 According to actual areas and DMs Gypsum / wood master pieces will be furnished , upon casting design.
- 5.2.2 Cleaning the edges of Waxing master piece with appropriate wax material in order for molding start.
- 5.2.3 molds application on surface of master piece according to manufacturer recommendations .
- 5.2.4 De-molding and mold final adjustment .
- 5.2.5 GRC casting .

### 5.3 – Production:

All production tech. will be according To PCI -128 & Cem fill power spray recommendation & premix recommendations

### 5.4 Installation :

#### 5.3.1 installation of section & erection:

- 5.3.1.1 GFRC pieces instillation according to Shop Dwg to main supporting done by others.

- 5.3.1.2 Joint treatment , surface leveling & Repairs of the new pieces with extra latex GFRC manual mortar 3% fiber content by weight sand :cement ratio 1:1 by weight ( Repair layer ) max width of joint 25 mm.
- 5.3.1.3 Fine cement sand mortar 1:1 for face finishing of joint areas treated to mach wit the rock texture.
- 5.3.1.4. Joint insulation with concentrated Latex material emulsion If needed with area under movement. compose in-situ with 1:1:2 Cement :Resin :Water.
- 5.3.1.5 Repainting and matching colors with old colors used.

## 6 / Repair and joint treatment

### 6.1 Rigid non movable area due to fixation or handling :

- 6.1.1 sanding the repaired area 50mm+ on each sine and cleaning.
- 6.1.2 Latex paint for area that needed to be repaired .
- 6.1.3 Applying GRC mortar similar as casting mortar with higher water content and latex content to ensure bond between the two surfaces .
- 6.1.4 sanding the repaired area after treatment for leveling and smoothness a putty for paint can be applied or soft cement latex putty .
- 6.1.5 paint treatment or acid wash or cement color wash as per project specs .

### 6.2 Movable Joints between pieces

- 6.2.1 sanding the repaired area 50mm+ on each sine and cleaning and adjusting edges to be ready for rubber treatment material.
- 6.2.2 Latex paint for area for joints and flexible joint edge adjustment .
- 6.2.3 filing the joint gap( 20mm max width ) with the appropriated foam backing size rod .
- 6.2.4 Joint filling with polyurethane rubber material such as sika-flex .
- 6.2.5 surface smoothness of rubber joint with water and solvent .

**Note 1** : Joints are visible and modules of grc sections will be approved prior treatment in shop dwg .

**Note 2** : non visible solid joint may be applied but a non visual hair crack must occur between areas .

## 7 / Material Characteristics – GFRC

- 7.1. Shell thickness 12 mm (field area) 20 mm (attachment pts)
- 7.2. Weight (depending on reinforcement) 28-32 kg/m<sup>2</sup>.
- 7.3. Flexural strength 150 kg/cm<sup>2</sup> +/- 10% (ASTM C947)
- 7.4. Compressive strength 450-550 kg/cm<sup>2</sup> +/- 10% (ASTM C109)
- 7.5. Density 1850-2050 kg/m<sup>3</sup>.

## 8 / Inspection:

Inspection of section is visual inspection and according to Architectural Precast Association specifications , any deflections that exceeds the tolerance mentioned in Architectural Precast Association specifications that may be visual according to lightning conditions , to be repaired or equilibrated upon recommendation of consultant based on extra prices.

For non- Visual Joints , customer must agree on acceptance of hair-cracks that may occur in some joints , These hair-cracks will be visual from 6 m and closer .

## 8 / Attachments:

- 8.1 GFRC mixing ratios – Matrix .
- 8.2 Cem-fill tech data For Fibers Used In GRC .
- 8.3 GRC complete Method of Statements.
- 8.4 Architectural Precast Association specifications.
- 8.5 Fiber Glass NEG-Cemfill samples .

- **GFRC FABRICATION, ERECTION ACCEPTED TOLERANCES AS PCI MNL 130**

- **GFRC FABRICATION**

- A. Proportioning and Mixing: For backing mix, meter sand/cement slurry and glass fibers to spray head at rates to achieve design mix proportions and glass-fiber content according to PCI MNL 130 procedures.
- B. Spray Application: Comply with general procedures as follows:
  - 1. Spray mist coat over molds to a nominal thickness of 1/8 inch (3 mm) on planar surfaces.

Retain subparagraph above or first subparagraph below, unless neither is required.

- 2. Spray or place face mix in thickness indicated on Shop Drawings.
  - 3. Proceed with spraying backing mix before [mist coat] [face mix] has set, using procedures that produce a uniform thickness and even distribution of glass fibers and matrix.
  - 4. Consolidate backing mix by rolling or other technique to achieve complete encapsulation of glass fibers and compaction.
  - 5. Measure thickness with a pin gage or other acceptable method at least once for each 5 sq. ft. (0.5 sq. m) of panel surface. Take not less than six measurements per panel.
- C. Hand form and consolidate intricate details, incorporate formers or infill materials, and over spray before material reaches initial set to ensure complete bonding.
- D. Attach panel frame to GFRC before initial set of GFRC backing, maintaining a minimum clearance of 1/2 inch (13 mm) from GFRC backing, and without anchors protruding into GFRC backing.
- E. Build up homogeneous GFRC bonding pads over anchor feet, maintaining a minimum thickness of 1/2 inch (13 mm) over top of anchor foot, before initial set of GFRC backing. Measure pad thickness at 25 percent of anchor locations.
- F. Inserts and Embedments: Build up homogeneous GFRC bosses or bonding pads over inserts and embedments to provide sufficient anchorage and embedment to comply with design requirements.
- G. Curing: Employ initial curing method that will ensure sufficient strength for removing units from mold. Comply with PCI MNL 130 procedures.
  - 1. Keep moisture off of the surface of mixes with polymer curing admixtures during first 3 hours of curing. Maintain temperature between 60 and 120 deg F (16 and 49 deg C) during the first 12 to 16 hours
  - 2. Prevent drying of moist cured mixes during first 24 hours. Maintain units in surface-damp condition at a temperature above 60 deg F (16 deg C) in a minimum of 95 percent relative humidity for a period of 7 days.

Coordinate below with Shop Drawings.

- H. Panel Identification: Mark each GFRC panel to correspond with identification mark on Shop Drawings. Mark each panel with its casting date.

• **FABRICATION TOLERANCES**

- A. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with PCI MNL 130 for dimension, position, and tolerances.

Retain paragraph above if incorporating tolerances by reference; retain first paragraph and subparagraphs below if detailed listing is required in this Section.

- B. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with the following dimensional tolerances. For dimensional tolerances not listed below, comply with PCI MNL 130.

Tolerances below are PCI recommendations. Manufacturers may be able to comply with closer tolerances if required. Closer tolerances normally increase costs.

1. Overall Height and Width of Units, Measured at the Face Adjacent to Mold: As follows:
  - a. 10 feet (3 m) or under, plus or minus 1/8 inch (3 mm).
  - b. More than 10 feet (3 m), plus or minus 1/8 inch per 10 feet (3 mm per 3 m); 1/4 inch (6 mm) maximum.
2. Edge Return Thickness: Plus 1/2 inch (13 mm), minus 0 inch (0 mm).
3. Architectural Facing Thickness: Plus 1/8 inch (3 mm), minus 0 inch (0 mm).
4. Backing Thickness: Plus 1/4 inch (6 mm), minus 0 inch (0 mm).
5. Panel Depth from Face of Skin to Back of Panel Frame or Integral Rib: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
6. Angular Variation of Plane of Side Mold: Plus or minus 1/32 inch per 3 inches (0.8 mm per 75 mm) of depth or plus or minus 1/16 inch (1.5 mm) total, whichever is greater.
7. Variation from Square or Designated Skew (Difference in Length of Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches (3 mm per 1800 mm) or plus or minus 1/4 inch (6 mm) total, whichever is greater.
8. Local Smoothness: 1/4 inch per 10 feet (6 mm per 3 m).
9. Bowing: Not to exceed L/240 unless unit meets erection tolerances using connection adjustments.
10. Length and Width of Blockouts and Openings within One Unit: Plus or minus 1/4 inch (6 mm).
11. Location of Window Opening within Panel: Plus or minus 1/4 inch (6 mm).
12. Maximum Permissible Warpage of One Corner out of the Plane of the Other Three: 1/16 inch per 12 inches (1.5 mm per 300 mm) of distance from nearest adjacent corner.



- C. Position Tolerances: Measured from datum line locations, as indicated on Shop Drawings.
  - 1. Panel Frame and Track: Plus or minus 1/4 inch (6 mm).
  - 2. Flashing Reglets at Edge of Panel: Plus or minus 1/4 inch (6 mm).
  - 3. Inserts: Plus or minus 1/2 inch (13 mm).
  - 4. Special Handling Devices: Plus or minus 3 inches (75 mm).
  - 5. Location of Bearing Devices: Plus or minus 1/4 inch (6 mm).
  - 6. Blockouts: Plus or minus 3/8 inch (10 mm).
- D. Panel Frame Tolerances: As follows:
  - 1. Vertical and Horizontal Alignment: 1/4 inch per 10 feet (6 mm per 3 m).
  - 2. Spacing of Framing Member: Plus or minus 3/8 inch (10 mm).
  - 3. Squareness of Frame: Difference in length of diagonals of 3/8 inch (10 mm).
  - 4. Overall Size of Frame: Plus or minus 3/8 inch (10 mm).

- **FINISHES**

This Article presumes Architect has preapproved one or more design reference samples. Include complete description of design reference sample here. If preapproving manufacturers, coordinate with "Manufacturers" Article. Revise paragraph below to add requirements if GFRC finish is to match another product such as architectural precast concrete.

- A. Finish exposed-face surfaces of GFRC as follows to match approved [**design reference sample**] [**and**] [**mockups**]. Panel faces shall be free of joint marks, grain, or other obvious defects.

Retain subparagraph below if Architect's design reference sample is used. Revise if multiple samples are approved.

- 1. Design Reference Sample: **<Insert description and identify manufacturer and code number of sample.>**

Retain type of finish from subparagraphs below. If more than one finish is required, add locations to finish descriptions or indicate on Drawings. Add more detailed descriptions of finishes outlined below when greater definition is required.

- 2. As-Cast-Surface Finish: Provide surfaces to match accepted sample or mockup units for acceptable surface air voids, sand streaks and honeycombs.
- 3. Textured-Surface Finish: Impart texture by form liners to match accepted sample or mockup units for acceptable surface air voids, sand streaks, and honeycombs with uniform color and texture.
- 4. Retarded Finish: Use chemical-retarding agents applied to GFRC forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal to match accepted sample or mockup units

5. Sand- or Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces to match accepted sample or mockup units.
6. Acid-Etched Finish: Use acid and hot-water solution equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces to match accepted sample or mockup units.

• ***ERECTION TOLERANCES***

Tolerances below are PCI MNL 130 recommendations.

- A. Erect GFRC panels to comply with the following noncumulative tolerances:
  1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch (13 mm).
  2. Top Elevation from Nominal Top Elevation: As follows:
    - a. Exposed Individual Panel: Plus or minus 1/4 inch (6 mm).
    - b. Nonexposed Individual Panel: Plus or minus 1/2 inch (13 mm).
    - c. Exposed Panel relative to Adjacent Panel: 1/4 inch (6 mm).
    - d. Nonexposed Panel relative to Adjacent Panel: 1/2 inch (13 mm).
  3. Support Elevation from Nominal Elevation: As follows:
    - a. Maximum Low: 1/2 inch (13 mm).
    - b. Maximum High: 1/4 inch (6 mm).
  4. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet (30 m): 1 inch (25 mm).
  5. Plumb in Any 10 Feet (3 m) of Element Height: 1/4 inch (6 mm).
  6. Maximum Jog in Alignment of Matching Edges: 1/4 inch (6 mm).
  7. Maximum Jog in Alignment of Matching Faces: 1/4 inch (6 mm).
  8. Face Width of Joint: As follows (governs over joint taper):
    - a. Panel Dimension 20 Feet (6 m) or Less: Plus or minus 1/4 inch (6 mm).
    - b. Panel Dimension More Than 20 Feet (6 m): Plus or minus 3/8 inch (10 mm).
  9. Maximum Joint Taper: 3/8 inch (10 mm).
  10. Joint Taper in 10 Feet (3 m): 1/4 inch (6 mm).
  11. Differential Bowing, as Erected, between Adjacent Members of Same Design: 1/4 inch (6 mm).