



Stone Specifications

Glass-Fiber Reinforced Lightweight Concrete (GFRC or GRC)

Part 1. General

1.1 Scope:

Zoho Stone Architectural Products LLC (aka Zoho Stone) will provide molded composites including embedded hardware, loose connection hardware, integrated steel support, framing, metal lath, and related hardware for erection and installation in accordance with the contract documents and all applicable building codes.

1.2 Related supplementary work specified else where:

- A. Metal Fabrications.
- B. Rough Carpentry: Framing of Openings and Blocking.
- C. Joint Sealants and treatments.

1.3 Reference Standards:

- A. **ASTM C39:** Standard Test Method for Compressive Strength of Cylindrical Concrete Specimen.
- B. **ASTM C947:** Standard Test Method for Flexural Properties of Thin-Section GFRC
- C. **ASTM C948:** Standard Test Method for Dry and Wet Bulk Density Water Absorption, and Apparent Porosity of Thin Sections GFRC.
- D. **ASTM C1230:** Standard Test Method for Performing Tension Tests on GFRC Bonding Pads.
- E. **ASTM E84:** Standard Test Method for Surface Burning characteristics of Building Materials.
- F. **PCI-MNL 130:** Manual for Quality Control for Plants and Production of GFRC.

1.4 Substitutions:

- A. **Not Permitted**



1.5 Submittals and Samples:

- A. Product Sample:** Submit minimum two (2) samples of 6 inch X 6 inch plates representing actual specified color, texture and finish.
- B. Shop Drawings:** Zoho Stone shall provide drawings showing dimensions, joint details, layouts, materials, thickness, fabrication details, methods of support, integration with adjacent work and anchorages, and all drawings to support installation of all products.
- C. Product Data:** Zoho Stone shall provide manufacturers product data and step by step installation data and maintenance instructions.
- D. Manufactures Instructions:** Zoho Stone shall provide manufacturer's instructions and recommendations for product delivery, handling and storage requirements.
- E. Submit Manufacturers Warranty.**

1.6 Quality Assurance:

- A.** Manufacturer shall inspect each molded piece by its quality control engineers and designers to ensure that products comply with specified requirements prior to shipment.
- B.** All Complicated large products such as Domes, Fountains and etc, will be assembled and de-assembled at the manufacturer's site prior to shipment to ensure precision of fittings of all components.

1.7 Qualifications:

- A. Manufacturer's Qualifications:** Manufacturer has demonstrated capabilities to produce products of high quality and scope required for any size project. The manufacturer has over 15 years of successful experience in manufacturing of GFRC panels and shapes.
- B. Installer Qualifications:** Firms which have Five years or more experience specializing in the installation of conventional pre cast concrete elements. Third party installers must be approved by Zoho Stone.

1.8 Delivery, Storage and handling:

- A. Delivery:** All products will be safely wrapped, packed, labeled, palletized and delivered to the job site by Zoho Stone.
- B. Storage:** Store pallets in a flat and dry location off the ground (flat, smooth and level surface), and in such a manner to prevent damage or intrusion of foreign matters. Although all our products are proven to withstand all weather conditions, it is the



packaging that requires protections from the elements. Therefore all unopened packaging must be stored under a roof from time of delivery to site until time of installation. Store units upright and not stacked unless permitted by the manufacturer.

- C. Handling:** Haul, handle and lift all packages with care and according to manufacturer's recommendation in a manner that prevents damage. Avoid excessive stress and use appropriate equipment.
- D. Damage responsibility:** All Shipments will be carefully inspected and packed before leaving the warehouse. Except for damage caused by others, the installers are responsible for cracking, chipping or other damages to the products, after delivery, and until the installation is completed, inspected and approved by a contractor on the job site.

Part 2. Product

2.1 Materials:

- A. GFRC** is a composite material consisting of Portland Cement, alkali resistant Cem-FIL AR glass fibers, water, fine aggregates and additives. When mixed in certain proportions and manufactured under controlled conditions with appropriate equipments, it achieves physical properties that allow it to be used for precise designs, natural stone finishes and especially those applications where weight is a significant factor in the design. This mixture produces a composite which has significant flexural, tensile and high impact strength; asbestos free.
- B. Typical properties of raw materials:**
- a. Cement:** Portland Cement ASTM C 150, Type I.
Portland Cement ASTM C 150, Type II.
White Portland Cement (Low Iron).
- b. Glass Fiber:** Cem-FIL AR Glass Fiber is a continuous, alkali resistant glass fiber filament with high durability in cement. The fiber composition lies within a critical region of the Na₂O CaO ZrO₂ SiO₂ System.

Some typical properties of Cem-FIL AR Fiber are as follows:

• Single filament tensile strength	3.5 GN/m ²
• Strand Tensile strength	1.7 GN/m ²
• Young's Modulus of Elasticity	72 GN/m ²
• Specific Gravity	2.68
• Strain and breaking point (strand)	2.4%
• Filament Diameter	14 and 20 μ



These high Modulus glass fibers have been specially developed to reinforce cement based products. They offer:

- High Tensile Strength (1700 N/mm²), 3-4 times higher than that of steel.
- High Modulus (10 times that of polypropylene) which makes it an efficient reinforcement.
- Does not rust. Therefore it requires no minimum cover.
- Inorganic, non-flammable and no health risk.

c: Sand: Silica Sand of the following composition:

- Silica >96%
- Moisture <2%
- Soluble Salts (i.e. alkalis) <1%
- Loss on Ignition <0.5%
- Organic Matter no effect
- SO₃ 0.4 (4000 ppm) max
- Cl 0.6 (600 ppm) max

d: Crushed aggregates: Many varieties of aggregates such as marbles, granite and limestone are crushed to a suitable grading for use in Light Weight Concrete, to prevent undue internal stresses and cracking.

2.2 Physical Properties :

1. Glass Fiber	3-5% by weight
2. Shell Thickness	3/8 -5/8 inch (6mm-15mm)
3. Weight	4-6 Lbs/Ft ²
4. Density (ASTM C 948)	105.3 Lbs/Ft ³ (1686 Kg/m ³)
5. Finish	Based on manufacturer's selections
6. Color	Based on manufacturer's selections
7. Texture	Based on manufacturer's selections
8. Flexural Strength (ASTM C947)	1,035 psi (7,136Kpa)
9. Tensile Strength Yield (ASTM C 947)	755 psi (5206Kpa)
10. Compressive Strength (ASTM C 138)	4,000 psi (27.6Mpa)
11. Impact	TBD
12. Surface Burning (ASTM E 84)	
➤ Flame Spread Index:	0
➤ Smoke Index:	0
➤ Fuel Contribution:	0
13. Permeability	1,200 Coulombs
14. Weather Resistance	200 Hours = No Loss



15. Shear	TBD
16. Modulus of Elasticity (PCI MNL-130)	1.07E+06 psi
17. Absorption (ASTM C 948)	19.6%
18. Anchor Pull-Out Test (PCI-MNL 130 T9.2.2)	432 lb/ft

2.3 Dimensional Tolerances of finished products:

A. Overall Heights and Width of units measured at the face adjacent to the form:

10 Feet or under	+1/8"
10 to 20 Feet	+1/8", -3/16"
20 to 30 Feet	+1/8", -1/4"
Each additional 10 Feet	+1/16" per 10 ft or +1/4" whichever is greater.

B. Thickness:

Skin thickness:	+1/4", -0"
Side return thickness:	+3/8", 0"
Panel depth:	+3/8", -1/8"
C. Angular deviation of plane side mold:	1/32" per 3" depth or 1/16" total whichever is greater
D: Variation from Square or designated curvature:	1/8" per 6' or 1/4 in total whichever is greater

Part 3: Executions

3.1 Pre Installation Examinations:

- A.** Clean surfaces thoroughly before installation.
- B:** Inspect job conditions and field dimensions and provide markings in sufficient details for correct installation.
- C:** Installation pieces are manufactured to the exact and precise dimensions ordered.
- D:** Contractors shall install these pieces in a true and plumb fashion.
- E:** Report any discrepancies in design dimensions and field dimensions which could adversely affect the installation, to the distributor as soon as discovered.

3.2 Erection:

- A:** Installers primary responsibility is to follow manufacturer's installation guides FULLY.
- B:** Locate prewelded and premounted hardware and miscellaneous steel support.



C: Make sure these conform to the erection drawings and plan layouts.

D: Units must be temporarily secured into position until final bolting, welding or grouting is executed.

E: Following installation, alignment of pieces must be performed to ensure that the entire installation conforms to the plans and tolerances are kept in balance.

3.3 Repairs, patching and cleaning:

A: Imbedded countersunk fasteners and damages must be patched using the same bedding compound used to fill joints.

B: Patch blemishes occurring during transportation and handling or erection using a patching mixture matching the color and texture of surrounding surface.

C: Clean panels using methods and materials which are in accordance with the manufacturer's instructions and guidelines.