Performance Characteristics of Different Panels

Thickness	Maximum recommended span (20lb/ft² wind load)	Fire Resistance (BS476 Pt.8)	Thermal Insulation (U-Value)	Sound Reduction (approx.)	Weight (approx.)
	feet	hours	BTU/in h/ft²/°F	dBA	lb/ft²
Single skin – flat sheet					
GFRC ³/₄in thick.	2.3	N/A	37.0	30	3.3
GFRC ¹/₂in thick.	3.7	N/A	36.0	32	5.0
Single skin – flanged Depth 5¹/₂in GFRC ³/₄in thick. Insulation wool fill min. 3in	6.7	0-2 (depends on infill and lining)	4.0	30	5.5
Single skin – profiled Depth 3in GFRC ³/₄in thick. Insulation wool fill min. 3in	7.7	0-2 (depends on infill and lining)	4.0	30	5.5
Single skin – ribbed Depth 5in GFRC ¹/₂in thick Insulation wool fill min. 3in Ribs formed by spraying over preformed sections or over foam plastic formers.	10	0-2 (depends on infill and lining)	4.0	32	7.3
Single skin – studframe Plasterboard inner lining. GFRC ³/₄in thick. 2ft Stud centres. Insulation wool fill min. 3in	20 (depends on stud size)	0-2 (depends on infill and lining)	4.0	36	9
Double-skin – sandwich ³/₄in GFRC 4¹/₂in EPS ³/₄in GFRC For panels to behave mechanically as sandwich panels it is necessary for the infill to have sufficient shear properties and an adequate bond to be present between layers.	12	N/A	3.0	32	9

Typical Mechanical Properties of Cem-FIL GRC (At 28 Days)

Property	Unit	Spray	Premix
Addition of Cem-FIL fiber	Weight%	5	3
Bending:			
Ultimate Strength (FU)	psi	2900-4400	1450-2000
Elastic Limit (FY)	psi	1000-1600	700-1150
Tensile:			
Ultimate Strength (TU)	psi	1150-1600	580-1000
Elastic Limit (TY)	psi	700-1000	580-870
Shear:			
Interlaminar Strength	psi	430-700	N.A.
In-plane Strength	psi	1150-1600	580-1000
Compressive Strength	psi	7250-11600	5800-8700
Impact Strength	in.lb/in² x 10^6	55-140	45-80
Elastic Modulus	psi x 10^6	1.45-2.9	1.45-2.9
Strain to Failure	%	0.6-1.2	0.1-0.2
Dry Density	pcf	120-130	110-130

Note:
1. The long term toughness and durability of GFRC can be greatly improved by the addition of a specific type of metakaolin.
2. The properties of GFRC can also be improved by the addition of acrylic polymers.
3. The above data is relevant to GFRC formulations having sand : cement ratios of between 0.5 and 1.0.

Other Properties of Cem-FIL GFRC

Thermal: Coefficient of expansion 20 x 10⁻⁶/°F. Excellent freeze thaw resistance

Moisture: Low permeance to water vapour and impermeable to liquid water

Moisture Induced: Movement Reversible movement is 0.1-0.15% from oven dry to saturated (design figures depend on conditions)

Fire: Excellent fire properties. Actual performance is dependent on formulation.

Fatigue: Greater than 10 million cycles at the normal working stress levels.

Design Considerations
Determination of the flexural strength for design must be based on test data provided by the specific manufacturer. The procedure for the design of GFRC panels is based on the aged ultimate strength, measured by the 28-day yield strength, to ensure that in-service panel stresses are maintained below the composite cracking strength at all times. This is done by keeping factored strength greater than factored loads.

Distribution points throughout the U.S.A.
For details contact:
Tel: 716 830 9802
E-Fax/E-Voice: 208 723 4947
E-Mail: info@cem-fil.com

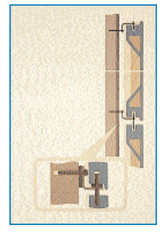
SAINT-GOBAIN VETROTEX

Vetrotex Cem-FIL® S.L.
Ctra. Madrid-Barcelona Km 34,500
Aptdo. Correos N° 60
28800 Alcalá de Henares (Madrid), Spain
Tel: +34 91 885 5803
Fax: +34 91 885 5810
www.cem-fil.com

SAINT-GOBAIN VETROTEX

Cem-FIL® Fibers

Cem-FIL GFRC Composites



Cem-FIL®

Glassfiber Reinforced Cement

Cem-FIL® fibers are high modulus fibers (10 times stiffer than polypropylene) with an associated high tensile strength (3-4 times stronger than steel). They are therefore ideal as reinforcing fibers for cement-based matrices.

" When blended with a cement/sand mortar, Cem-FIL fibers create a thin concrete-like material: Cem-FIL GFRC "

Transport efficiency

Abu Dhabi

Cem-FIL GFRC is a material with the following interesting range of properties

Thin
Typically $^{3}/_{8}$ - $^{5}/_{8}$ in in thickness depending on application.

Lightweight
Typically $^{1}/_{4}$ of the weight of concrete, thus reducing transport and erection costs, and allowing savings in building structural and foundation costs.

Strong
Excellent impact and flexural strength, and resistance to crack development.

Mouldable
Able to be formed into complex shapes, Cem-FIL GFRC is ideal for building renovation and restoration.

Attractive and Versatile
Can reproduce fine surface details and finishes.

Durability with Low Maintenance
Cement-based material which does not corrode or rot.

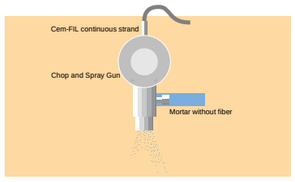
Typical formulations
Cem-FIL GFRC is an ideal material for the production of factory finished prefabricated products.There are two main methods of incorporating Cem-FIL fibers in GFRC:

- the simultaneous spraying of Cem-FIL fibers and mortar into a mould (3.5% to 5% of fiber)
- the preparation of a Cem-FIL premix, which will then be vibration cast, injected, extruded or pressed into the mould (2% to 3.5% of fiber)

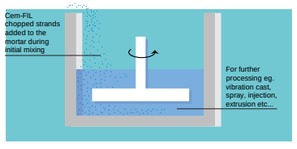
	SPRAY (lb)	PREMIX (lb)
Cement	50	50
Fine aggregate	50	50
Superplasticiser	0.5	0.5
Water	17	18
Cem-FIL	5.9 (5%)	3.6 (3%)

These formulations can be adapted to specific needs using extra additives such as Cem-Star®, which will improve the long term strength and toughness of GFRC components requiring a high level of performance, and acrylic polymers which will allow dry curing.

SIMULTANEOUS SPRAYING



PREMIX



Manufacturing Processes

CUSTOM MADE PRODUCTION

The basic Spray and Premix GFRC technologies offer simple and flexible low investment production, which matches perfectly the requirement of intricate, "one-off" architectural projects.

Simultaneous Hand Spray

Ideal for the production of larger architectural cladding panels or other elements which benefit from high strength.

Vibration Cast Premix

Suitable for small mouldings with complex shapes such as sunscreens or drainage components.

Sprayed Premix

An "open mould" technique, used for small facade elements such as cornices.

MASS PRODUCTION

Automated or developed versions of the Spray and Premix methods are appropriate for high volume, capital intensive manufacture of standard products.

Automated Spray

The spray gun reciprocates across moulds moving below. The method is used where products are essentially flat in overall form such as bridge deck formwork, or for components such as ducts which can be post-formed by a folding mold technique.

High Volume Premix Processes

Premix can be vibration cast, pressed, extruded or injected into small, detailed, lightweight and strong elements like slates, utility housings, window frames, ... the degree of mechanisation and investment depending on the output level required.

Continuous Lamination Processes

Processes have been developed which use proprietary methods of adding glassfiber into the mortar mix. Additional or positioned reinforcement in the form of continuous Cem-FIL Rovings, Chopped Strand Mat or Woven Net can be used. The products are generally flat or can be post-formed into corrugated or other simple shapes.

Applications

Building

Roofing
- Imitation Slates, Shingles, Tiles
- Corrugated Sheets
- Promenade tiles

Facade Cladding
- Architectural panels and elements
- System building
- Overcladding systems

Foundations
- Insulation blocks
- Permanent formwork

Interior
- Fire production boards
- Floor systems
- Ceiling – Permanent formwork
- Decorative

Decorative Cladding - Far East

Housing - South Africa

Building Board - Europe

Civil Engineering

Roads, Railways and Bridges
- Parapets
- Noise barriers
- Bridge deck formwork
- Cable ducts
- Duct covers and lids
- Drainage channels
- Tunnel linings

Irrigation and Drainage
- Drainage systems
- Canal bank protection
- Sewer liners
- Irrigation systems
- Septic tanks

Mining, Tunneling and Other
- Linings
- Meter housings

Sound Barriers - Spain

Bridgedeck Formwork - Europe

Telecommunications Building - Spain