



Cem-FIL® Fibers

Glass fiber Reinforced Concrete (GRC)

PRODUCT DESCRIPTION

Cem-FIL® Alkali Resistant Glass fibers were first developed by the Building Research Establishment in the UK 40 years ago, and were later manufactured under license in Japan and the USA. They have the longest service history, and have been used in more than 100 countries worldwide to create some of the world's most stunning architecture.

Following the development of Cem-FIL® fibers we also partnered the development of:

- Equipment and processes used in the manufacture of GRC
- Advanced matrix development
- Design and performance guidelines
- Application development

As a part of OCV Reinforcements (the world leader in glass fibre reinforcements) we have developed a wide range of Cem-FIL® products to satisfy the needs of the developing markets and the diverse processes used.

We have amassed a wealth of experience both in the manufacture of Cem-FIL® fibers, and GRC products, which we use to jointly develop the industry with our customers.

PRODUCT APPLICATION

Cem-FIL® GRC products can be produced by one of many manufacturing processes. The most common are the spray and vibration-cast premix, but products may also be spun, filament-wound, laminated on a moving conveyor, pressed, vacuum-formed, extruded, etc.

As the manufacturing processes have evolved, so have the fibers. A large range of fibers has been developed to satisfy the needs of the markets, and to provide optimum processing efficiency and performance in the chosen manufacturing methods.

In addition to the manufacturing processes, guidelines and techniques for moulding, achieving different surface finishes, and enhanced mechanical properties have also been developed.

Our plan is always to enhance the usability, desirability and understanding of GRC, so that GRC products can satisfy the needs of an ever-expanding market.

IMPORTANT CHARACTERISTICS

CEM-FIL® FIBERS:

- 40 years in-service use worldwide
- Proven durability and performance
- Comprehensive product range
- Excellent processing characteristics
- High tensile strength and elastic modulus
- Manufactured under ISO 9001 approved Quality Management System

GRC:

- Lightweight and thin section
- Strong and durable
- Excellent mouldability
- Attractive and versatile

CEM-FIL® FIBERS: Typical Properties

Strand Tensile Strength	1.7	GPa
Elastic Modulus	72	GPa
Specific Gravity	2.68	
Strain to Failure	2.4	%
Softening Point	860	°C
Fire Performance	Incombustible	



CEM-FIL® PRODUCTS

The following represents only part of the Cem-FIL® standard product range: For enquiries about products not shown, please contact our representatives.

Assembled Roving

Product Code:	Roving Tex	Strand Tex	Filament Ø (µm)	No. of Strands
61	2500	82	14	30

Typical Applications:

61 – a dual-purpose roving most widely used roving for all spray-up applications, but can also be used as a chopping roving (chopped by the customer and used to produce vibration-cast premix GRC)

Chopped Strands

Type:	Product Code:	Strand Tex	Filament Ø (µm)	Lengths (mm)
High Integrity: - High Tex	60	135	18	6, 9, 12, 18
	60	82	14	6, 12, 18
	62	45	14	6, 12, 18
Water Dispersible - Low Humidity	70	n/a	14 or 20	3, 6, 9, 12
	W-70	n/a	14	6, 12, 18

Typical Applications:

- 60 – general vibration-cast or sprayed premix applications
- 62 – vibration cast or sprayed premix applications requiring greater reinforcing effect at low fibre addition rates
- 70 – reinforcement of architectural face-mixes of GRC products
- W-70 – reinforcement of calcium silicate products, and replacement of asbestos fibers



CHARACTERISTICS OF GRC

Thin and Light-Weight

- Rapid erection without heavy lifting equipment
- Reduced load gives savings to foundation and structure costs
- Economical transport

Durable

- GRC will not rot or corrode, and resists biological attack
- No embedded steel, so no spalling or staining
- Advanced matrices can be used to further enhance long-term ductility, reduce shrinkage, etc. Examples: GRC Cement, Asahi Super Suncrete, Cem-Star Metakaolin

High Quality Matrix

- Low permeability and a hard dense surface
- Carbonation 1/10th the rate of concrete
- High compressive and flexural strength
- Low maintenance

Attractive and Versatile

- Can be formed with complex shapes, colours and textures
- Can be used to accurately simulate natural materials (timber, rock, stone, etc)
- Making aesthetic solutions possible

Non-Combustible

Excellent Acoustic Performance

TYPICAL PROCESSES AND APPLICATIONS

Manual Spray	<ul style="list-style-type: none"> Architectural façade cladding Permanent formwork Acoustic barriers and parapets Artificial rock Field irrigation channels
Vibration-cast Premix	<ul style="list-style-type: none"> Architectural mouldings Drainage channels Telecom housings Simulated roof slates Promenade tiles Open Access Floors
Premix Spray	<ul style="list-style-type: none"> Renovation components Street / garden furniture Mouldings
Centrifugal casting	<ul style="list-style-type: none"> Pipes
Filament Winding	<ul style="list-style-type: none"> Telecommunication masts Foundry crucibles Sewer re-lining panels
Automated / Robotic Spray	<ul style="list-style-type: none"> Architectural façade cladding Sewer re-lining panels Permanent formwork
Continuous Lamination	<ul style="list-style-type: none"> Canal bank protection Corrugated sheet Low-cost housing



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FINISHES

GRC may be painted, stained, or may be produced with tiles, granite or other stone veneer finishes.

To achieve integral coloured finishes, Cem-FIL® GRC can use white cement and pigments. Textures can be achieved from the mould, or by acid etching or sand-blasting to expose the texture and colour of the aggregate.

When using white cement, with or without pigments, the best long term performance can be achieved through the use of Cem-Star Metakaolin in the mix. Cem-Star is a highly pozzolanic white additive, ideal for use with white cement and pigments, but also suitable for use with normal grey Portland cements. Cem-Star Metakaolin will enhance the long term ductility of GRC, reduces shrinkage, reduce efflorescence, and also acts as a pumping aid.

Further details of Cem-Star GRC and other techniques are available on request.

ADDITIONAL CHARACTERISTICS OF CEM-FIL® GRC

Typical Mechanical Properties of Cem-FIL® GRC at 28 days					
Property:		Unit	Simultaneous Spray	Premix Spray	Vibration-Cast Premix
Fibre Content		Weight %	5	2.5 – 4.2	3
Bending Strength	MOR	MPa	22 – 32	12 - 14	10 – 12
	LOP	MPa	7 – 13	7 – 10	6 – 9
Tensile Strength	UTS	MPa	8 – 12	5 – 9	4 – 7
	BOP	MPa	5 – 7	4 – 6	4 – 6
Compressive Strength		MPa	50 - 80	40 - 60	40 – 60
Shear Strength	Inter-laminar	MPa	3 - 5	N/A	N/A
	In-Plane	MPa	8 – 12	4 – 7	4 – 7
Impact Strength		kJ/m ²	10 – 25	10 – 15	10 – 15
Elastic Modulus		GPa	10 – 20	10 – 20	10 – 20
Strain to Failure		%	0.6 – 1.2	0.2 – 0.3	0.1 – 0.2
Dry Density		t/m ³	1.9 – 2.1	1.8 – 2.0	1.8 – 2.0

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