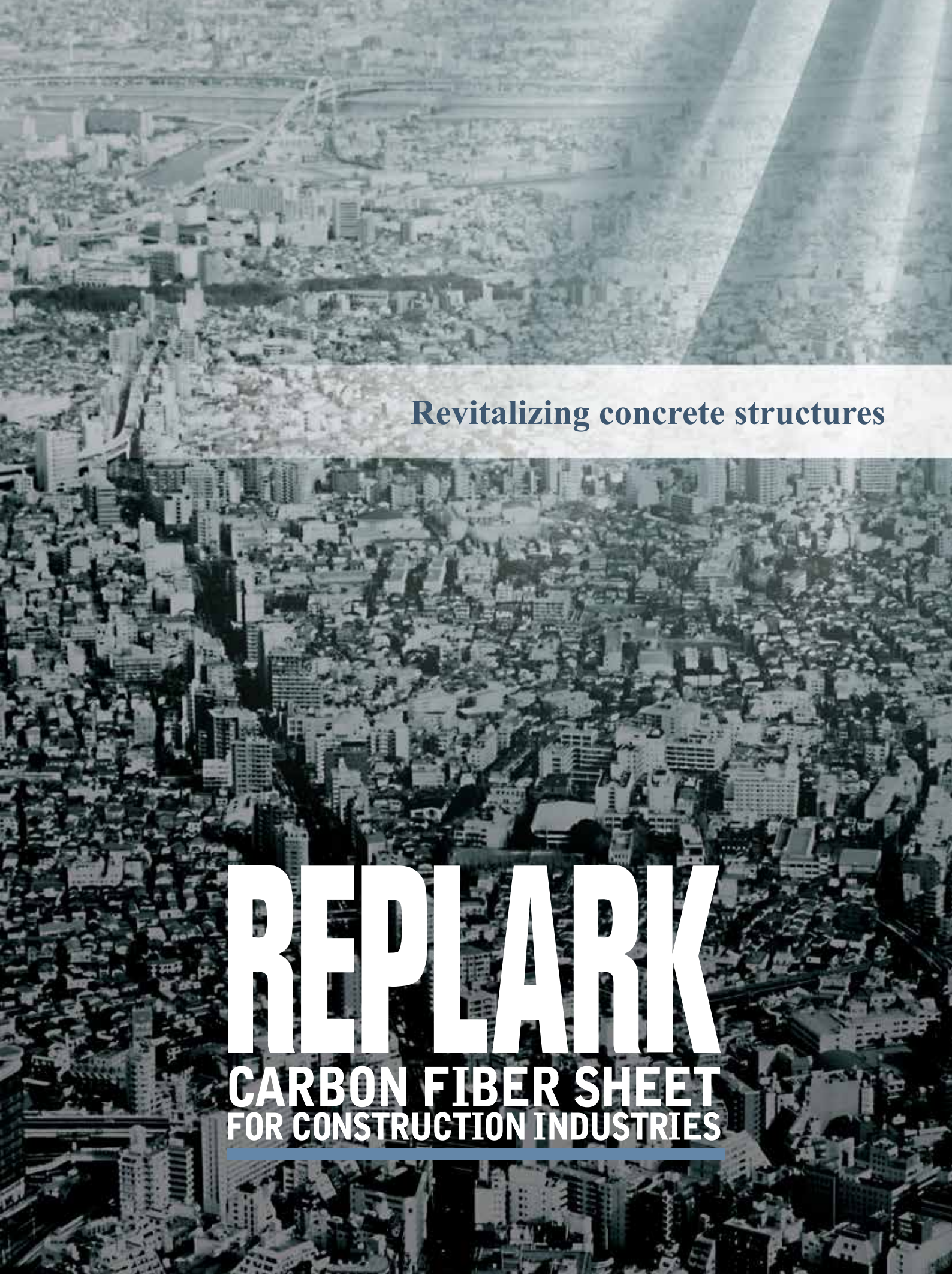


Revitalizing concrete structures

REPLARK

CARBON FIBER SHEET
FOR CONSTRUCTION INDUSTRIES

MITSUBISHI CHEMICAL INFRATEC CO.,LTD.





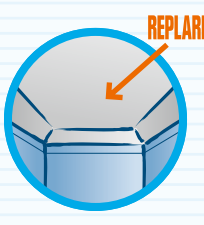



Repair New Age

Repair and strengthening with carbon fiber.

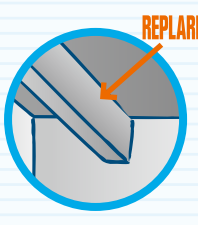
Chimney

Tunnel

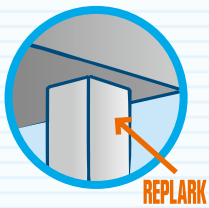


Bridge deck

Bridge column



Building beams and floors



Building column

REPLARK
CARBON FIBER SHEET
FOR CONSTRUCTION INDUSTRIES

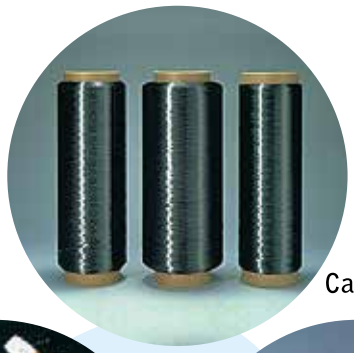
Carbon Material

Mitsubishi chemical Holdings and Carbon fiber.

Mitsubishi Chemical Holdings has been the forerunner of carbon fiber application for the construction industries.

Based on carbon fiber application techniques and resin development, Mitsubishi Chemical Holdings, as a leading comprehensive chemical company, has have developed a carbon fiber sheet, "Replark™" for repair and strengthening of concrete structures.

In view of the recent increasing need for repair and strengthening of deteriorated structures, Replark™ is highly commended for its high strength, light weight, excellent durability and ease of application to structures such as bridge columns, road deck slabs,columns, chimneys, etc.



Carbon fiber

Space and aviation

Sports and leisure

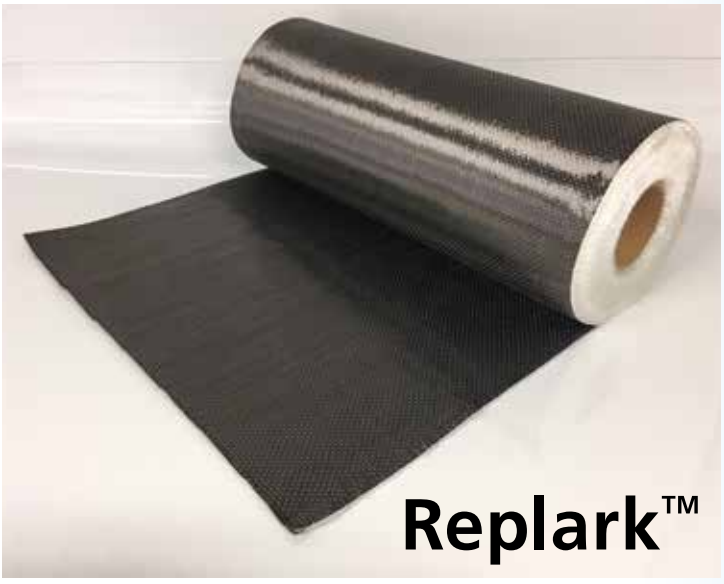
Replark™

Carbon fiber sheet Replark™

"Replark™" is made of unidirectional carbon fiber impregnated with a small amount of resin. Replark™ can be easily applied to concrete with epoxy resin "Epotherm" to make the installation easier and quicker.

Attributes of the Replark™ system

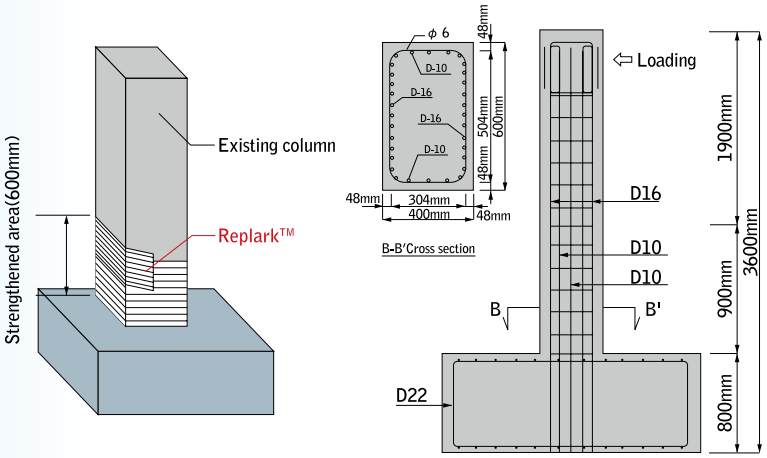
- **Weight**
  - 20% of steel
- **Strength**
  - 10 times stronger than steel
- **Elastic Modulus**
  - Reducing stress level of rebars
- **Durability**
  - Non corrosive
- **Other attributes**
  - Highly resistant to fatigue.
    Can be applied complex shapes.

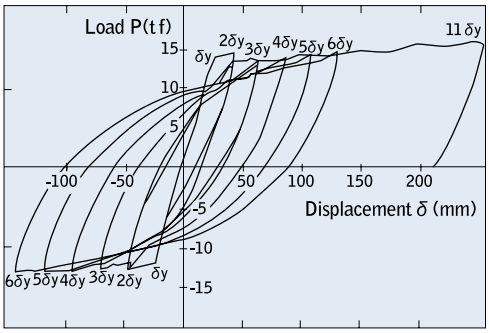


Effect of Reinforcement

Enhanced ductility of a concrete column

Carbon fiber sheet applied horizontally at the base of column: 2 plies of Replark™
The shear strengthening ratio of carbon fiber in a rectangular section (Pf) is 0.06%



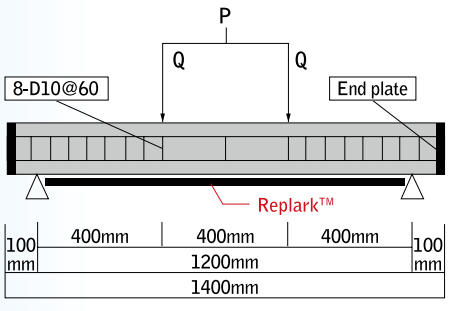


Test Result

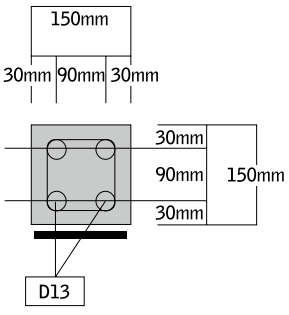
The specimen sustained the strength up to 11δy (the maximum capacity of the loading apparatus).
The carbon fiber sheet confined and prevented the base concrete from compressive failure.

Enhanced flexural strength of a concrete beam

Note: The tensile strengthening ratio of carbon fiber in a rectangular section is 0.13% for both High Modulus and Standard Modulus Types

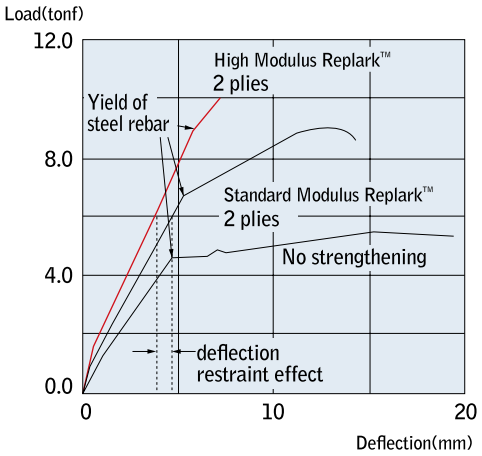


Specimen shape and dimensions



Modulus of Elasticity

High Modulus : 6.4×10^5 N/mm²
Standard Modulus : 2.3×10^5 N/mm²

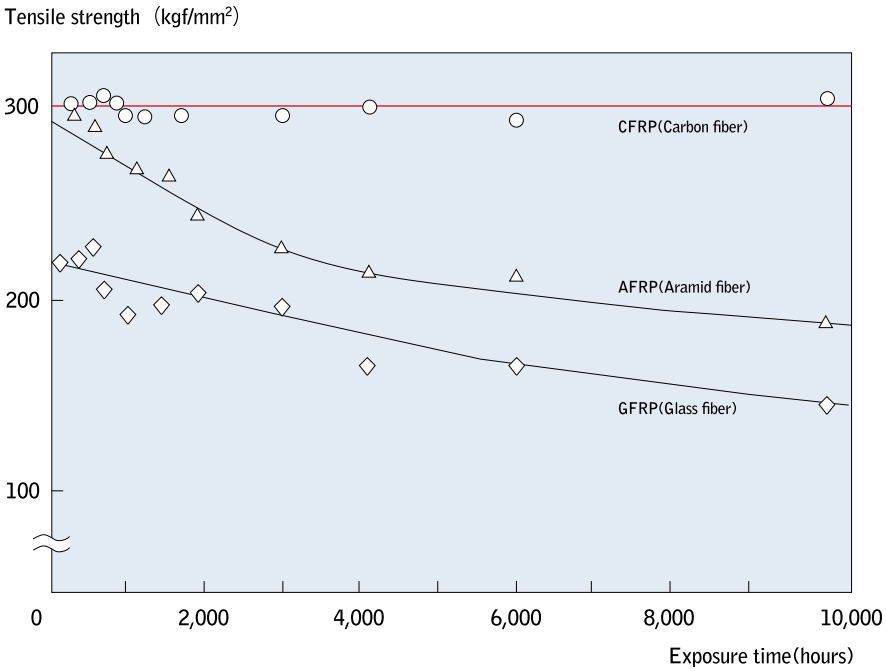


Test Result

Application carbon fiber sheet is proven effective in:
(1) Reducing stress level of rebars,
(2) Reducing the number of piles, if Type HM is used, and
(3) Reducing mid-span deflection, if Type HM is used.

Durability

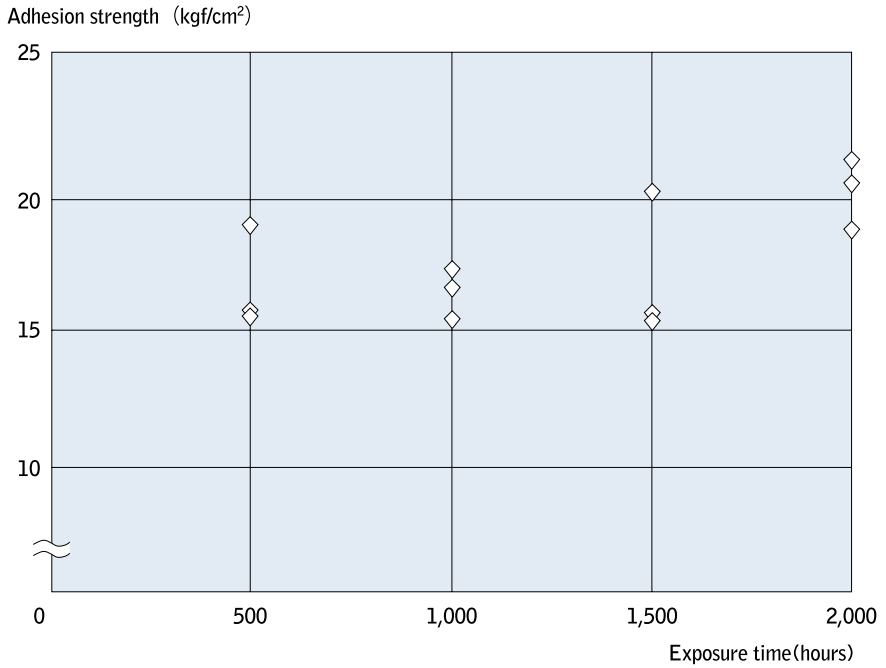
Strength retention of various FRP in accelerated



Test Result

After 10,000 hours of accelerated exposure which is regarded as equivalent to between 30 and 50 years of actual outdoor exposure, no reduction in tensile strength was observed.

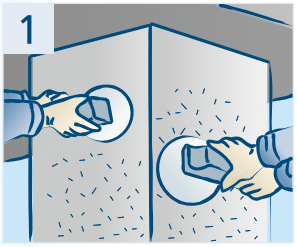
Adhesion strength retention after outdoor exposure



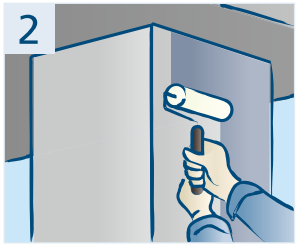
Test Result

After 2,000 hours of outdoor exposure no reduction in adhesion strength was observed.

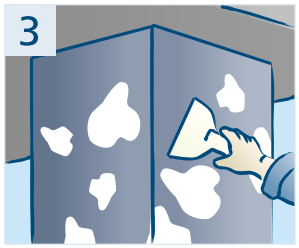
Construction Procedure



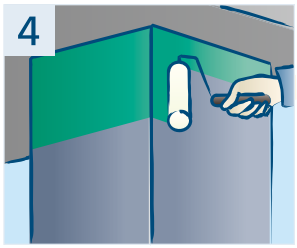
Concrete surface preparation by grinding



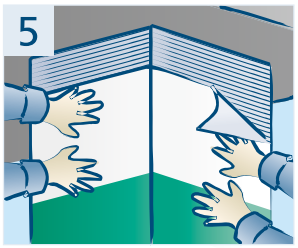
Priming



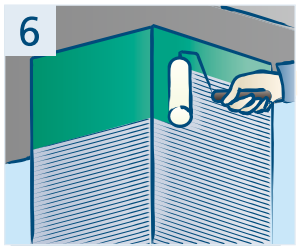
Putty application (optional)



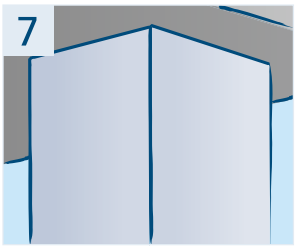
Resin application (undercoating)



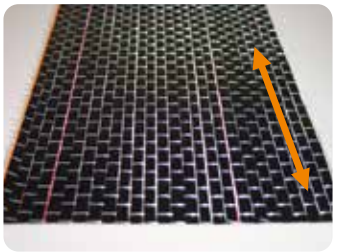
Carbon fiber sheet "Replark™" application



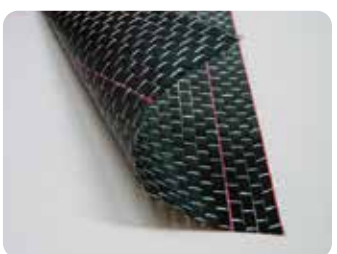
Resin application (overcoating)



Finishing and / or painting



Width 500mm × Length 50m = 25m²/roll



Type of fabric

Packing

Specification of Replark™

REPLARK
CARBON FIBER SHEET
FOR CONSTRUCTION INDUSTRIES

◆ Properties of Replark™ sheet

	Fiber areal weight (g/m²)	Thickness (mm)	Tensile strength (N/mm²)	Tensile modulus (KN/mm²)	Available size	
					width (cm)	length (m)
Type 20 (MRK-M2-20)	200	0.111	3,400	245	50	50
Type 30 (MRK-M2-30)	300	0.167	3,400	245		
Type 40 (MRK-M2-40)	400	0.222	3,400	245		
Type 60 (MRK-M2-60)	600	0.333	3,400	245		
Type MM (MRK-M4-30)	300	0.165	2,900	390		
Type HM (MRK-M6-30)	300	0.143	1,900	640		
Type 2D20 (MRK-2D2-20)	200 (horizontal:100 vertical :100)	0.0556/0.0556	2,900	230	100	50

Specification of Epotherm™

	Standard quantity	Capacity
Epotherm™ Primer (XPS-400)	0.20 kg/m²	15 kg (Main agent 12 kg, Hardener 3 kg)
Epotherm™ Putty (L-600)	1.0～1.2 kg/m²	15 kg (Main agent 10 kg, Hardener 5 kg)
Epotherm™ Resin (XL-800)	0.6～1.2 kg/m²	15 kg (Main agent 12 kg, Hardener 3 kg)

◆ Characteristic of Epotherm™

	Test method	Primer	Putty	Resin
Tensile strength (N／mm²)	JIS K7113 JIS K7161	—	—	≧ 30
Flexural strength (N／mm²)	JIS K7203 JIS K7171	—	—	≧ 40
Lap shear strength (N／mm²)	JIS K6850	—	≧ 10	≧ 10
Compressive strength (N／mm²)	JIS K7208 JIS K7181	—	≧ 50	—
Compressive modulus (N／mm²)	JIS K7208 JIS K7181	—	≧ 1,000	—
Bond strength to concrete (N／mm²)	JIS A6909 JIS A6916	≧ 1.5	≧ 1.5	≧ 1.5

*JIS : Japanese Industrial Standard

MITSUBISHI CHEMICAL INFRATEC CO.,LTD.

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