

# Carbon Fiber Reinforced Polymer [CFRP] Wrap/Fabric

## Ultra High Tensile Strength [6000 Mpa]

## Ultra High E-Modulus [294 Gpa]

**Pioneer in CFRP,  
Smart & Clever for Composites**

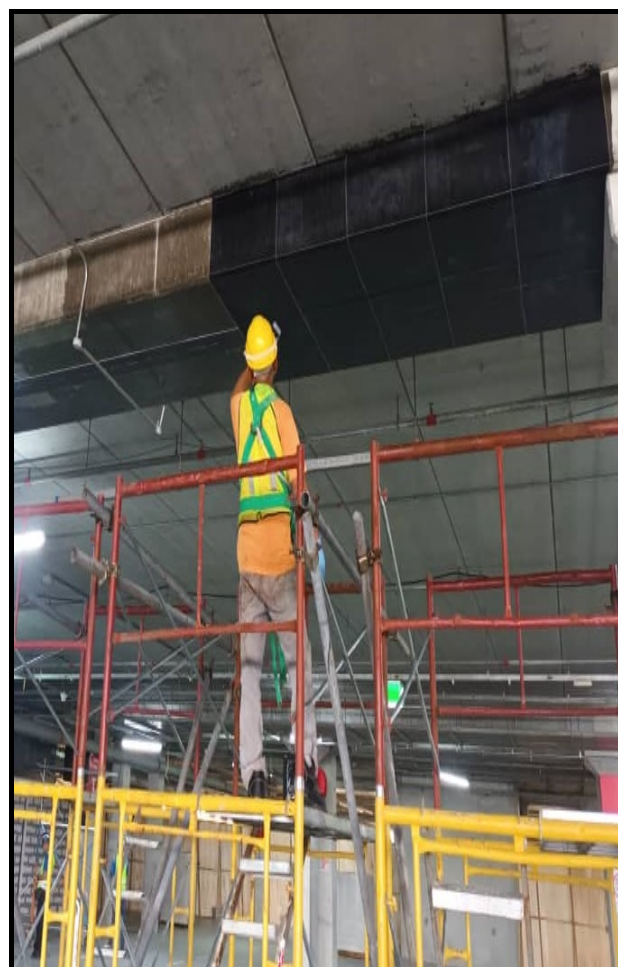
**Structural Strengthening  
Building & Civil Engineering  
[Column & Beam]**

### **Build Wrap UTS** **Fiber Weight Products List**

- 200g/m<sup>2</sup> x 500mm x 100/m roll
- 300g/m<sup>2</sup> x 500mm x 100/m roll
- 600g/m<sup>2</sup> x 500mm x 50/m roll
- 900g/m<sup>2</sup> x 500mm x 50/m roll



**Build Wrap UTS 200, 300 & 600**



**Build Wrap UTS 300 apply on Beam**

### Carbon Fiber Reinforced Polymer [CFRP] Ultra Tensile Strength [UTS]

#### Build Wrap UTS

is a fabric sheet of longitudinal oriented, continuous carbon fiber filaments which are held in position by a lightweight, open mesh, glass scrim. **Build Wrap UTS®** has robust handling and rapid wet-out characteristics which make it ideal for on-site strengthening of structural of buildings, bridges, beams, columns and marine structures. Additionally, **Build Wrap UTS®** is compatible with all commonly used resin systems which can be applied using a variety of wet-out/resin infusion techniques.

Is a composite material for the reinforcement of new and the strengthening of existing structures. The materials excellent resistance to most of forms of corrosions and the ability to dissipate energy as required in earthquake scenarios make them eminently suitable for a wide rage of applications and they contribute significantly to lowering life cycle costs and increasing safety.

#### History Carbon Fiber

Is produced by the controlled oxidation, carbonization and graphitisation of carbon-rich organic precursors which are already in fiber form. The most common precursor is polyacrylonitrile (PAN), because it gives the best carbon fiber properties, but fibers cal also be made from pitch or cellulose. Variation of the graphitisation process produces either high strength fibers (@2,600°C) or high modulus fibers (@3,000°C) with other types in between. Once formed, the carbon fiber has a surface treatment applied to improve matrix bonding and chemical sizing which serves to protect it during handling

#### Key Properties

- ❖ Ultra Tensile Strength
- ❖ High Thermal Conductivity & Electrical Conductivity
- ❖ Light Weight & Transparent to X-Rays
- ❖ Excellent Fatigue & Corrosion Resistance
- ❖ Low Friction and Wear & Low Thermal Expansion
- ❖ Resistance to High Temperatures
- ❖ Good Creep and Damping Properties
- ❖ Solvent Free Working Environment & Non-Toxic

#### Uses

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***for Strengthening Reinforced Concrete  
Masonry, Timber Wood & Steel***

#### **Loading Increase**

Increase of Supporting Live Load in Building  
Increase of Supporting Traffic Growth on Bridges  
Vibrating Machinery on Roof Slabs  
Heavy Machinery in Commercial Building

#### **Change Design for Structural System**

Dismantlement of Walls & Columns  
Dismantlement of Slabs & Beam  
Reducing of Buildings & Bridges Weight

#### **Design or Construction Defects**

Insufficient Reinforcements  
Insufficient Structural Depth

### 4 types of weight for **Build Wrap UTS** Carbon Fiber Physical Properties

Products Grade	<b>Build Wrap UTS200</b>		<b>Build Wrap UTS300</b>	
Carbon Fiber Weight	200	g/m <sup>2</sup>	300	g/m <sup>2</sup>
Roll Width	500	mm	500	mm
Roll Length	100	meter	100	meter
Sheet Thickness	[±0.005] 0.111	mm	[±0.007] 0.167	mm
Typical Binder Content	3.0	%	3.0	%
Total Roll Weight	10.00	kg	15.00	kg

Products Grade	<b>Build Wrap UTS600</b>		<b>Build Wrap UTS900</b>	
Carbon Fiber Weight	600	g/m <sup>2</sup>	900	g/m <sup>2</sup>
Roll Width	500	mm	500	mm
Roll Length	50	meter	50	meter
Sheet Thickness	[±0.009] 0.334	mm	[±0.011] 0.500	mm
Typical Binder Content	3.0	%	3.0	%
Total Roll Weight	15.00	kg	22.50	kg

### Specification Properties Data Sheet

#### “**Build Wrap UTS®**” - Carbon Fiber Filament Yarn [Actual Dry Fiber] Properties

Typical of Carbon Fiber Properties	SI / Units UK design		US / Units US design	
Tensile Strength	<b>6,000</b>	Mpa	<b>870,200</b>	psi
Tensile Modulus	<b>294</b>	Gpa	<b>42.60 x 10<sup>6</sup></b>	psi
Ultimate Elongation	<b>2.10</b>	%	<b>2.10</b>	%
Density	<b>1.80</b>	g/cm <sup>3</sup>	<b>0.0650</b>	Ib/in <sup>3</sup>
Approximate Yield (12K)	<b>1.31</b>	m/g	<b>1,950</b>	Ft/Ib
Filament Diameter	<b>6.7</b>	µm	<b>0.265</b>	mil

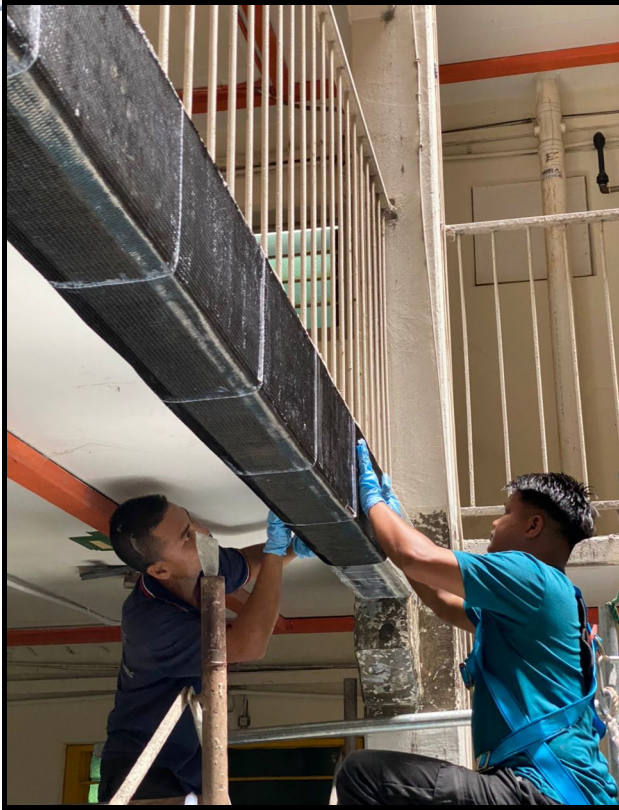
### Properties, Cured Laminates, [Final Performance] Carbon Fiber Reinforced Polymer

<b>Build Wrap UTS</b>	Test Method	UK Design	US Design
Tensile Strength	ASTM D3039	>3300 Mpa	507,600 psi
E-Modulus	ASTM D3039	210 Gpa.	30.46 x 10 <sup>6</sup> psi
Flexural Strength	ASTM D790	1850 Mpa	268,250 psi
Fiber Volume [by weight]	ASTM D3039	70%	70%
Epoxy Resin Volume	ASTM D3039	30%	30%
Density Composite	ASTM D3039	1.60 g/cm <sup>3</sup>	1.60 g/cm <sup>3</sup>
Elongation at Break	ASTM D3039	1.61-2.2 %	1.61-2.20%

Temperature Resistance    ASTM D3039    >150°C    >150°C

### Carbon Fiber Wrap/Fabric Sheet for Dry and Wet Lay up

<b>Technical Data [Unidirectional]</b>	<b>Build Wrap UTS 200</b>	<b>Build Wrap UTS 300</b>	<b>Build Wrap UTS 600</b>	<b>Build Wrap UTS 900</b>
Carbon Fiber Weight [g/m <sup>2</sup> ] main direction	<b>200</b>	<b>300</b>	<b>600</b>	<b>900</b>
Density [g/cm <sup>3</sup> ]	1.78	1.78	1.78	1.78
Elongation at Rupture [%]	2.1	2.1	2.1	2.1
Design Thickness [Fiber Weight/Density] [mm]	0.111	0.167	0.334	0.500
Theoretical Design Cross Section 100mm Width [mm <sup>2</sup> ]	111	167	334	500
Reduction Factor for Design [Manual Lamination/UD Sheet]	1.2 (recommended by LAMACO)	1.2 (recommended by LAMACO)	1.2 (recommended by LAMACO)	1.2 (recommended by LAMACO)
Tensile Force of 1000mm Width Ultimate [kN]	$\frac{111 \times 3300}{1.2} = 305$	$\frac{167 \times 3300}{1.2} = 459$	$\frac{334 \times 3300}{1.2} = 918$	$\frac{500 \times 3300}{1.2} = 1375$
Tensile Force of 1000mm Width at 0.6% ε for Design [kN]	305	459	918	1375
<b>Application</b>	Flexural Enhancement (low quality of substrate) Axial Load Enhancement of Columns Replacement of Stirrups in Columns			



**Build Wrap UTS 300, apply on Beam**



**Build Wrap UTS 300, apply on Column**

## Application Method

### **Surfaces Preparation**

Reinforced concrete surfaces shall be clean, structurally sound and free from foreign materials, contaminants, oily and other debris. Concrete surfaces shall not be more than 4% in moisture content and the temperature of the substrate must be at least 3°C (or) and above the current dew point temperature.

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For filling surface irregularities such as blowholes, honeycombs & etc. Please hack or cut off any unloose concrete, air blow excess dust, clean all concrete surfaces, and remain dry over night.

Use patching method of Polymer Cementitious Mortar or pumping of High Strength Cementitious Grout. But only for concrete surfaces cracks 0.25mm, must be injected with Low Viscosity of Epoxy Resin to be filled. Using high pressure Air-Less Pump for injecting and penetration into structural crack lines, to achieve load bearing and adhesion bonding system.

Once patched, pumped or injected, before laying Carbon Fiber Laminates, all surfaces must be Hammer Tested for Polymer Cementitious Mortar, High Strength Cementitious Grout and Pull-Off Test for Cracks Lines. For achievement of strength requirement please consult your local Engineer.

### **Over Head Application**

#### **Vertical Application**

Applied on Over Head or Vertical Beam and Slab, either Primer, Adhesive & Resin, Waste of materials are approximately 15%.

### **Mixing of Primer**

Use a low speed (300 to 500 rpm) electric drill fitted with a paint mixer or a wing type paddle Pour one unit of Part A & B into drum and mix for at least 3 minutes until the mix is uniform and free. (Note: Once been mixed, the Primer must be applied within 30 minutes of Pot Life).

### **For Uneven Surfaces**

#### **Mixing of Paste Putty**

Use a low speed (300 to 500 rpm) electric drill fitted with a paint mixer or a wing type paddle. Pour one unit of Part A & B into drum and mix for at least 5 minutes until the mix is uniform and free. (Note: Once have been mixing, the Paste Putty must be applied within 60 minutes of Pot Life).

### **Mixing of Resin Wrap**

Use a low speed (300 to 500 rpm) electric drill fitted with a paint mixer or a wing type paddle. Pour one unit of Part A & B into drum and mix for at least 3 minutes until the mix is uniform and free. Note: Once have been mixed, the Epoxy Resin or Polyurethane Resin must be applied within 60 minutes of Pot Life.

### **System Recommended**

#### **Use Resin Component**

**Epo Resin Wrap** is Epoxy Solvent Free (Bisphenol-F)

Two Component of Part A & Part B.

Suitable for applying on Over Head or Vertical or Horizontal Surfaces

### **Easy Installation**

The easy to use Carbon Fiber Wrap/Fabric system components assure fast, user friendly installation. A complete system is installed in only six (6) steps to properly prepared surfaces within appropriate working conditions.

#### **1. Preparation of Structure, Level the Un-even Surfaces with "Cem Strength"**

Apply **Cem Strength**, applied at rate 2 kg/m<sup>2</sup> to 12 kg/m<sup>2</sup>, polymer cementitious mortar is a material that is applied using a squeegee or trowel to level uneven concrete surfaces. (Curing time: ½ hour to 4 hours depend of whether temperature)

#### **2. Roll "Epo Bond Primer"**

Apply **Epo Bond Primer**, applied at rate 0.20 kg/m<sup>2</sup> to 0.30 kg/m<sup>2</sup>, and applied using a roller. (Curing time: 2-4 hours)

#### **3. Apply First Coat of "Epo Resin Wrap"**

Apply **Epo Resin Wrap**, applied at rate 0.25 kg/m<sup>2</sup> to 1.00 kg/m<sup>2</sup>, is a high solids Epoxy Based Resin that can be applied using a roller to begin saturation of the fiber reinforcement sheet. (Curing time: ½ hour to 4 hours depend of whether temperature)

#### **4. Apply Carbon Fiber Wrap/Fabric Sheet of "Build Wrap UTS"**

The backbone of the Carbon Fiber composite strengthening system, carbon fiber fabric sheet, to be placed into the first layer of wet saturant and backing paper is removed. During the laying of Carbon Fiber Fabric Sheet, Keep the fiber direction properly.

#### **5. Apply Second Coat of "Epo Resin Wrap"**

Apply **Epo Resin Wrap**, applied at rate 0.25 kg/m<sup>2</sup> to 1.00 kg/m<sup>2</sup>, is a high solid Epoxy Based that can be applied using a roller to begin saturation of the fiber reinforcement sheet. (Curing time: ½ hour to 4 hours depend of whether temperature)

**6. Note: Apply Optional Topcoat**

Where required, the Carbon Fiber high solids, high gloss, corrosion-resistant topcoat provides a protective/aesthetic outer layer. (Refer to Manufacture)

*In the case of two layers and several layers of "Build Wrap UTS". For multiple plies repeat steps 3, 4 and 5. All direction of fiber overlapping must be at least 100mm*

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**Health & Safety** Some of the components of this product may be hazardous during mixing and application. Please consult the relevant Health & Safety Data Sheets, available from LAMACO Malaysia on request and sent with each delivery.

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### Test Accordingly to ASTM D3039, Cured Laminates of CFRP Polymer Matrix Composite Products Pultrusion Type of CFRP Strip/Plate/Tape

**Achieving Test Result**

			A	B		C
Product Name	Tensile Strength [Mpa]	E-Modulus [Gpa]	Fiber Thickness mm	Fiber Width mm	Fiber Length mm	Max Tensile Load [kN]
Build Wrap UTS 200	3300	210	0.111	25	250	9,157
Build Wrap UTS 300	3300	210	0.167	25	250	13,777
Build Wrap UTS 600	3300	210	0.334	25	250	27,555
Build Wrap UTS 900	3300	210	0.500	25	250	41,250

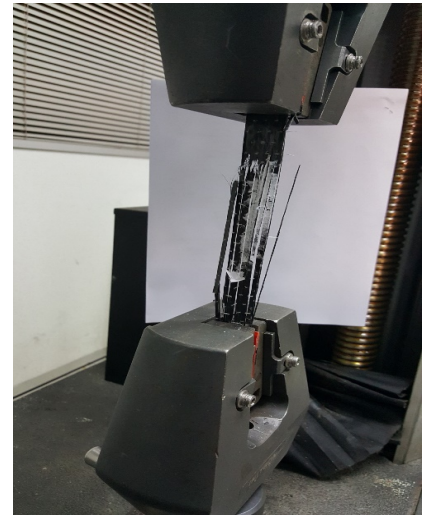
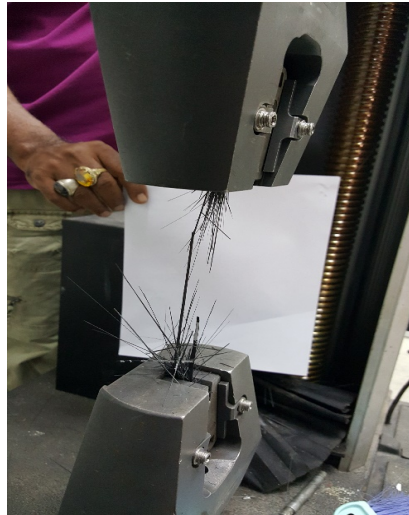
\*Tensile capacity was calculated as  $\frac{C}{A \times B}$



Specimen Sample: CFRP Wrap for 300gsm/m2

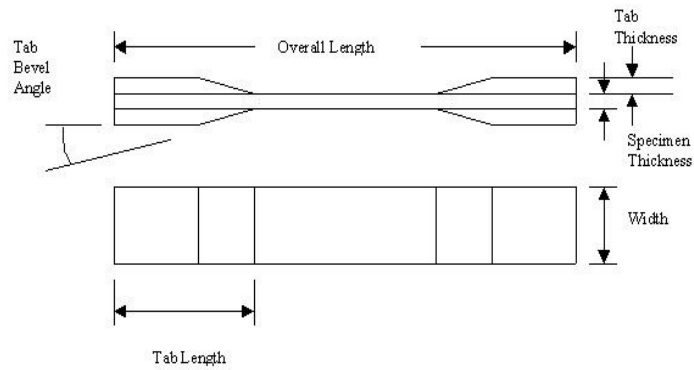


Sample Tested: CFRP Wrap for 300gsm/m2



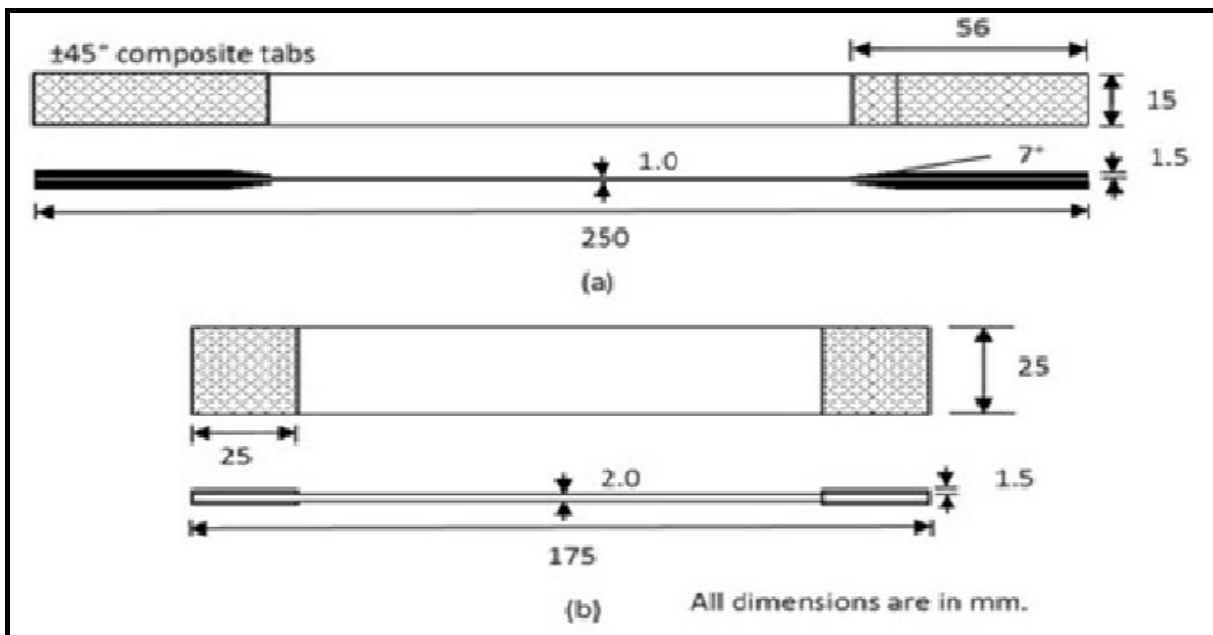
Tensile Strength Testing Equipment, Method of Tester Installation, Once Tested the CFRP Cured Laminates or CFRP Pultrusion Laminates Breaking

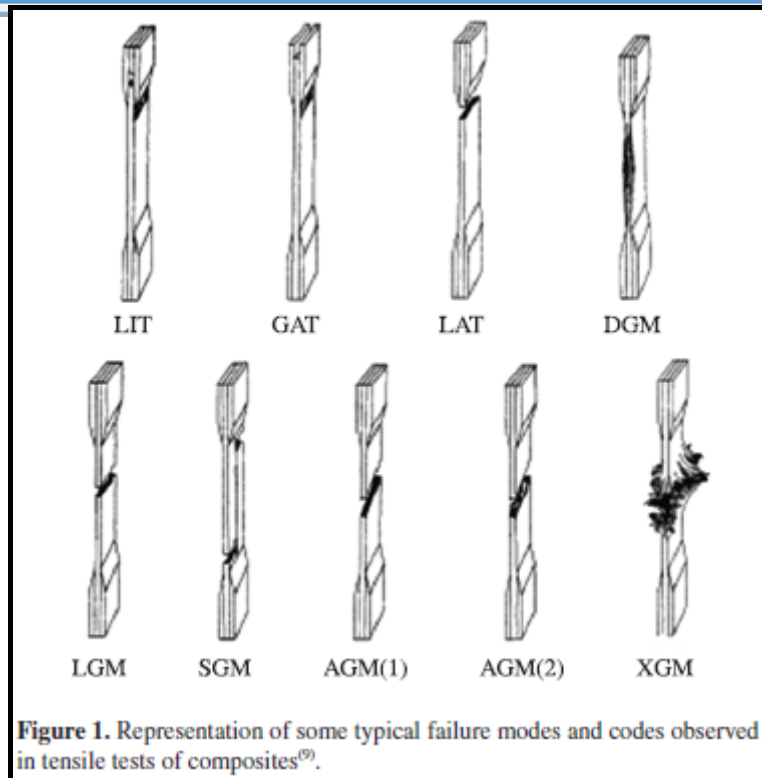
## Composite tensile specimen for measurement of longitudinal properties $E_1$ and $S_L^{(+)}$



Fiber Orientation	Width, mm [in.]	Overall Length, mm [in.]	Thickness, mm [in.]	Tab Length, mm [in.]	Tab Thickness, mm [in.]	Tab Bevel Angle,°
0° unidirectional	15 [0.5]	250 [10.0]	1.0 [0.040]	56 [2.25]	1.5 [0.062]	7 or 90
90° unidirectional	25 [1.0]	175 [7.0]	2.0 [0.080]	25 [1.0]	1.5 [0.062]	90
balanced and symmetric random-discontinuous	25 [1.0]	250 [10.0]	2.5 [0.100]	emery cloth	—	—

Specimen geometry for ASTM D3039/D3039M-08 standard tensile test. (Dimensions from ASTM D3039/D3039M-08. Copyright ASTM International. Reprinted with permission.)





**ACI 440.3R-12**

**Guide Test Methods for Fiber-Reinforced Polymer (FRP) Composites for Reinforcing or Strengthening Concrete and Masonry Structures**

Reported by ACI Committee 440



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