Carbon Fiber Reinforced Polymer [CFRP] Strip [High Tensile Strength]

Pioneer in CFRP,
Smart & Clever for Composites

Structural Strengthening
For Bridge Prestressed
Beam & Slab
Together with
Build Anchor Device

Build Strip PB

Thickness & Wide Products List

5.00mm x 100mm x 50/m roll
3.00mm x 100mm x 100/m roll
2.00mm x 100mm x 100/m roll
1.40mm x 100mm x 100/m roll
5.00mm x 50mm x 50/m roll
3.00mm x 50mm x 100/m roll
2.00mm x 50mm x 100/m roll
1.40mm x 50mm x 100/m roll

Build Strip PB 1030, install on under Bridges Deck

Carbon Fiber Reinforced Polymer [CFRP]
High Tensile Strength [HS]

Build Strip PB

is Laminates Strip/Plate/Tape, Carbon Fiber of Putrusion Extruded Oriented, continuous carbon filaments which are held in position by a lightweight, of Build Strip® PB has robust handling and rapid wet-out characteristics which make it ideal for on-site strengthening of structural of bridges prestressed beams structures. Additionally, Build Strip PB® is compatible with the [specialty] high performance adhesive systems which can be applied using a variety of dry/wet-out/adhesive infusion techniques.

Is a composite materials are finding applications 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 if 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.

Build Strip PB	Physical of Carbon Fiber & Matrix Epoxy	
Fiber Volume Content	67% (by Weight)	[Carbon Fiber Yarn]
Binder Volume Content	33% (by Weight)	[Epoxy Resin 192]
Tensile Strength	4900 Mpa	[Toray T700, Dry Carbon Fiber Yarn Filament]
E-Modulus	230-235 Gpa	[Toray T700, Dry Carbon Fiber Yarn Filament]
Density of Carbon Fiber	1.79 g/cm^3	[Yarn Filament]
Color	Black	

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

Build Strip PB	Test Method	UK Design	US Design
Tensile Strength	ASTM D3039	>2400-2800 Mpa	348,000-406,000 psi
E-Modulus	ASTM D3039	165 Gpa.	24.00 x 10^6 psi
Density Composite	ASTM D3039	1.60 g/cm3	1.60 g/cm3
Elongation at Break	ASTM D3039	1.70 %	1.70%
Temperature Resistance	ASTM D3039	110°C	110°C

Build Strip PB

CFRP Strip for Bridges

Select Thickness x Wide Of Below List Products	Thickness [mm]	Width [mm]	Roll Size [Meter]	Weight [kg/Meter] or [kg/roll]	
Build Strip PB 1050	5.00	100	50	0.800	40.000
Build Strip PB 1030	3.00	100	100	0.480	48.000
Build Strip PB 1020	2.00	100	100	0.320	32.000
Build Strip PB 1014	1.40	100	100	0.224	22.400
Build Strip PB 550	5.00	50	50	0.400	20.000
Build Strip PB 530	3.00	50	100	0.240	24.000
Build Strip PB 520	2.00	50	100	0.160	16.000
Build Strip PB 514	1.40	50	100	0.112	11.200

Key Properties

- High 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

to Strengthening Reinforced Concrete

Loading Increase

Increasing of Support Traffic Growth on Bridges
Vibrating Vehicle on Bridge Deck

Design or Construction Defects

Insufficient Reinforcements
Insufficient Structural Depth

Surfaces-applied Laminates:

Laminate Type	Cross Section	Tensile Strength At Elongation 0.60 %	Tensile Strength At Elongation 0.80 %
Build Strip HS Modulus of elasticity 165 Gpa	[mm^2]	Theoretical Tensile Strength for the Design 1,000 N/mm^2	Theoretical Tensile Strength for the Design 1,300 N/mm^2
100mm x 5.00mm	500	500.0 kN	650.0 kN
100mm x 3.00mm	300	300.0 kN	390.0 kN
100mm x 2.00mm	200	200.0 kN	260.0 kN
100mm x 1.40mm	140	140.0 kN	182.0 kN
50mm x 5.00mm	250	250.0 kN	325.0 kN
50mm x 3.00mm	150	150.0 kN	195.0 kN
50mm x 2.00mm	100	100.0 kN	130.0 kN
50mm x 1.40mm	70	70.0 kN	91.0 kN

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 more than 4% moisture content and the temperature of the substrate must be at least 3°C which above, the current dew point temperature.

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For filing surface irregularities such as blowholes, honeycombs & etc. Please hacking or cutting – off unloose concrete, air blowing those dust, and clean all concrete surfaces, keep over night for dry.

Using 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 for filled. Using high pressure Air-Less Pump for injecting and penetration into structural crack lines, to achieve load bearing and adhesion bonding system.

Once patching, pumping or injecting works have been done, before laying Carbon Fiber Laminates, all surfaces must be Hammer Test 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 Adhesive	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.

Method of Installation Statement

1 Mapping measuring and marking of the wanted position line for “Anchor Device Holes” on underneath of bridge pretressed beam

2 Preparation the underneath beam, by diamond gridding equipment on surfaces flat & Smooth, once finishing the surfaces preparation, see below…….

2.1 First-cut on face side with diamond blade, maximal depth of cut <20mm

2.2 Complete the mill-cuts on all sides, but don’t cut over the markings on face side

2.3 Removal of concrete inside the area

3 Drill the holes from 8-12mmØ with depth 50-75mm on underneath beam, clean the internal holes by air and wash with water

4 Insert the epoxy adhesive by gun type such as [Epo Adhesive Strip 335], Note: inserting of anchor according to Guideline

5 Immediately insert of SS Anchor Bolt, 6-10mmØ with length 100-150mm

6 Install the Anchor Device & fix the fastener bolt & nut

7 Install of Build Strip PB, CFRP Strip on both side of Anchor Device, immediately jacking Anchor Device with tighter, The base plate is pressed into the space and the screws are tightened temporarily

8 Within the open time of the adhesive, place immediately the Build Strip PB laminates onto the adhesive surfaces, using roller or other tools to press the laminates into the adhesive until is forced out on both sides of the laminates.

9 Clamp The Build Strip PB. The joint component should be assembled and clamped as soon as the Adhesive has been applied. An even contact pressure throughout the joint area will ensure optimum cure.

10 Fixing the U channel device to holding the Build Strip PB on each 600mm

11 Apply Optional Topcoat, If require of Protecting Coating, such as Fireproofing

Where required, the Carbon Fiber Strip Laminates to protection of Fireproofing system. Please call our technical for advice.

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

System Recommended Use Epoxy Adhesive Component

Grade of Carbon Fiber	Grade of Adhesive Recommendation	Shear Strength	Peel Strength (Cleavage)
Build Strip PB	Epo Adhesive Strip 335 (Slow or Fast) Ultra High Shear & Peel Strength	35 N/mm2	12 N/mm2
Build Strip PB	Epo Bond HT 110 (Slow or Fast) If application on High Temperature More Than > 100-130°C on Structure Reinforced	15 N/mm2	4-6 N/mm2

Consumptions of Epoxy Adhesive

Type of Strip Laminates	Require Approximately of Epoxy Adhesive Kg/Linear Meter	Epo Adhesive Strip 5 kg pack Coverage LM/pack	Epo Bond HT 110 5 kg pack Coverage LM/pack
All 50mm wide	0.30-0.45 kg Per linear meter	16.50 LM/pack	16.50 LM/pack
All 100mm wide	0.60-0.90 kg Per linear meter	7.50 LM/pack	7.50 LM/pack

Manufacturer by:

LaMaCo System Sdn Bhd

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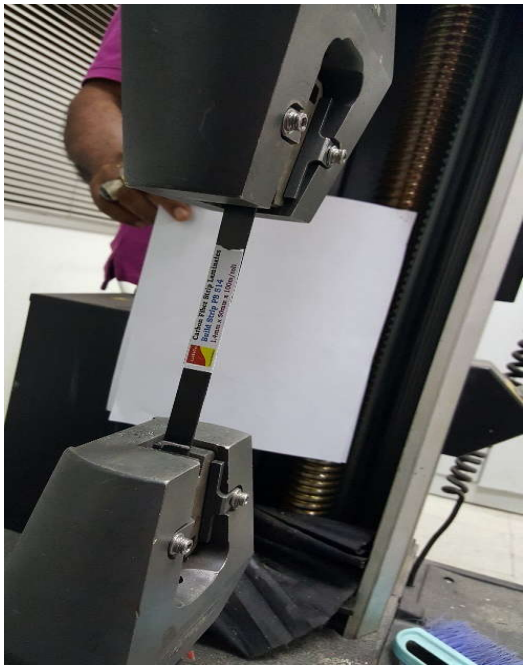
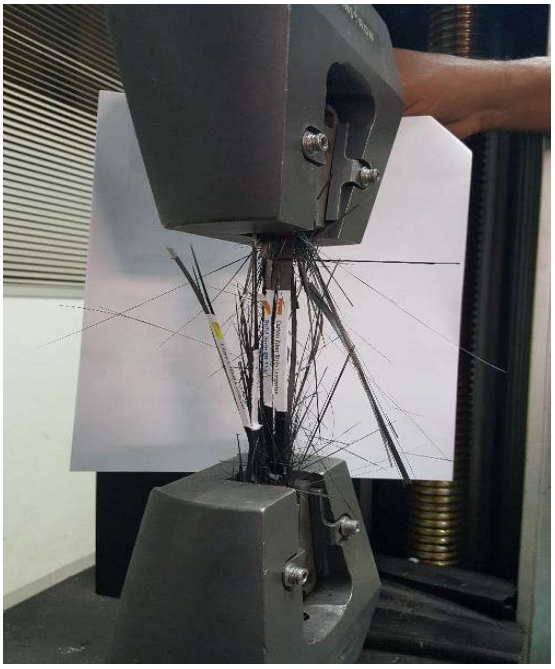
Test Accordingly to ASTM D3039,
Cured Laminates of CFRP Polymer Matrix Composite Products
Putruction Type of CFRP Strip / Plate / Tape

Achieving Test Result

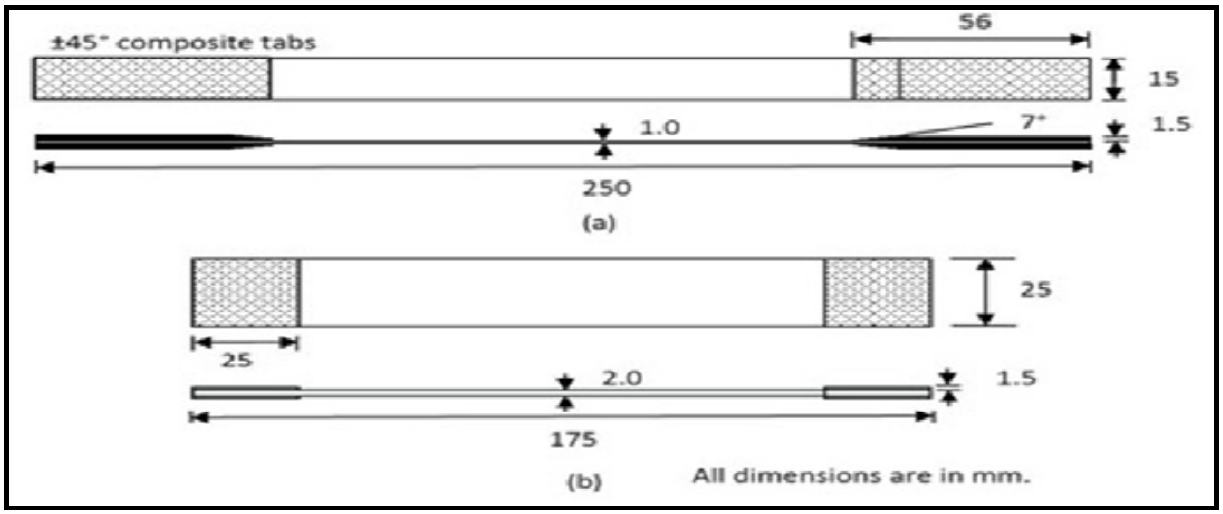
			A	B		C
Product Name	Tensile Strength [Mpa]	E-Modulus [Gpa]	Fiber Thickness mm	Fiber Width mm	Fiber Length mm	Max Tensile Load [kN]
Build Strip PB 1050 or 550	2400	140-165	5.00	10	250	120,000
Build Strip PB 1030 or 530	2400	140-165	3.00	10	250	72,000
Build Strip PB 1020 or 520	2400	140-165	2.00	10	250	48,000
Build Strip PB 1014 or 514	2400	140-165	1.40	10	250	33,600

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

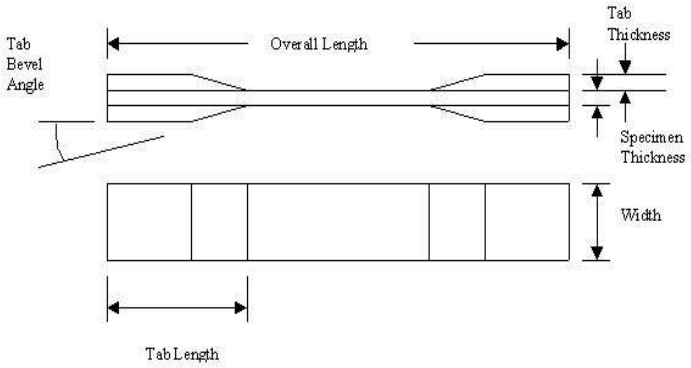




Testing Equipment, Method of Tester Installed,
Once Tested the CFRP Cured Laminates Breaking



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	25 [1.0]	250 [10.0]	2.5 [0.100]	emery cloth	—	—
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.)

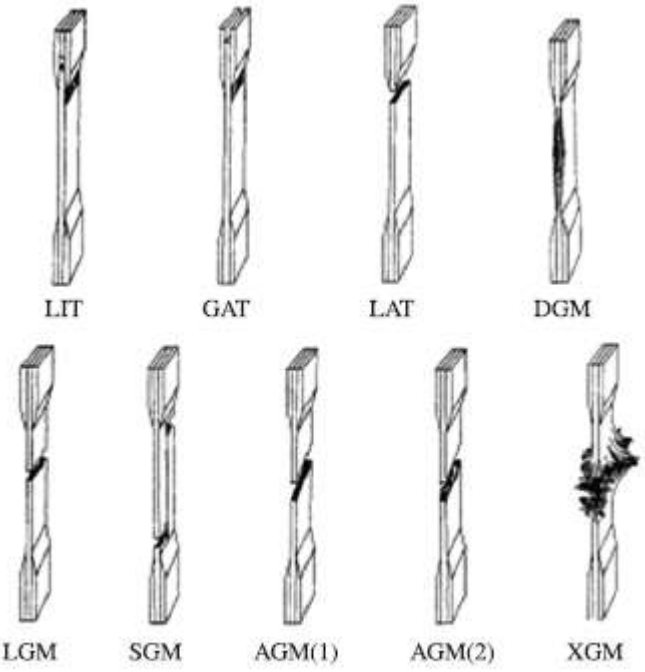
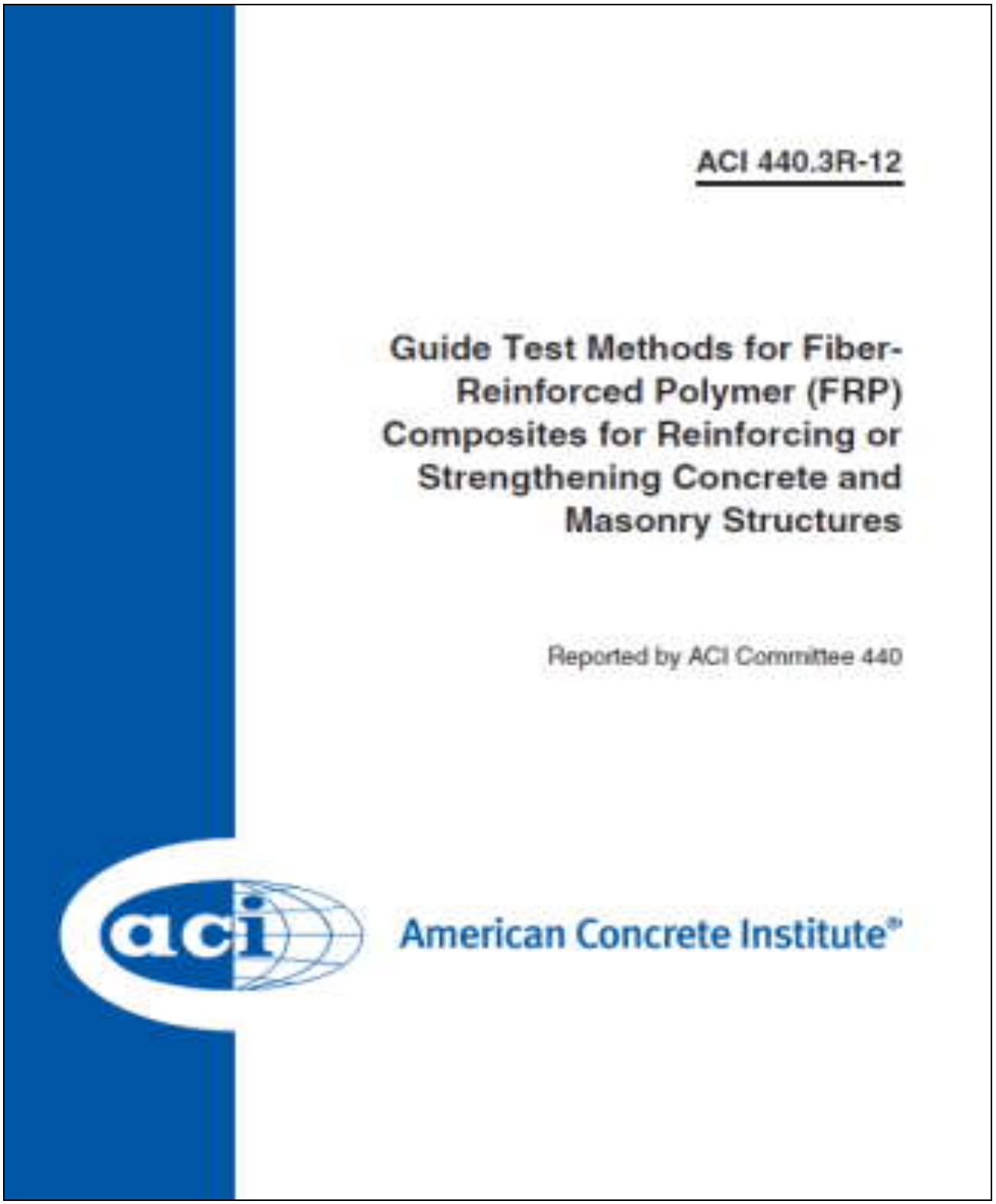


Figure 1. Representation of some typical failure modes and codes observed in tensile tests of composites[9].


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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