Carbon Fiber Reinforced Polymer [CFRP] Solid Rod Rebars

High Tensile Strength

Pioneer in CFRP,
Smart & Clever for Composites

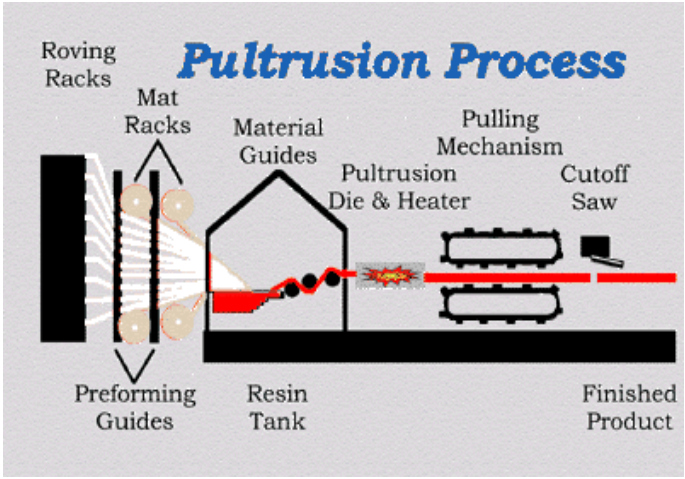
Structural Strengthening
Building, Bridge &
Civil Engineering
[Column, Beam & Slab]

Timber Strengthening

Build Rod HS

Diameter & Length Products List

7.50mmØ x 3.00/m or 5/m or 6/m
7.50mmØ x 12.00/m [Special Length]
10.00mmØ x 3.00/m or 5/m or 6/m
10.00mmØ x 12.00/m [Special Length]
12.00mmØ x 3.00/m or 5/m or 6/m
12.00mmØ x 12.00/m [Special Length]
16.00mmØ x 3.00/m or 5/m or 6/m
16.00mmØ x 12.00/m [Special Length]



Solid Rod Bar Pultrusion Process

Build Rod HS 16, install under Slab

Build Rod HS, Size: 7.5, 10, 12 & 16Ømm

Build Rod HS 16, install on top Slab

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

Build Rod HS

is Laminates Solid Rod Rebars, Carbon Fiber of Putrusion Extruded Oriented, continuous carbon filaments which are held in position by a lightweight, of **Build Rod® HS** 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 Rod HS®** is compatible with the special adhesive systems which can be applied using a variety of 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

Specification Properties Data Sheet
Build Rod® - Fabricated of Cured Rod Properties

Technical Data [Unidirectional]	Build Rod 7.5	Build Rod 10	Build Rod 12	Build Rod 16
Nominal Diameter, Ømm	7.50 Ømm	10.00 Ømm	12.00 Ømm	16.00 Ømm
Elastic Modulus [Gpa]	>140-165	>140-165	>140-165	>140-165
Tensile Strength [Mpa]	>2000-2800	>2000-2800	>2000-2800	>2000-2800
Solid Rod Linear Weight [g/m^2]	75	130	195	340
Density [g/cm^3]	>1.70	>1.70	>1.70	>1.70
Nominal Area, mm^2	44	78	113	200
Ultimate Load, kN	101	179	260	460
Ultimate deformation, %	1.80	1.80	1.80	1.80

Select Diameter x Length Of Below List Products	Diameter [mmØ]	Roll Size [Meter]
Build Rod 7.5	7.50	3.00 or 5.00/m [if require special length 12.00/m]
Build Rod 10	10.00	3.00 or 5.00/m [if require special length 12.00/m]
Build Rod 12	12.00	3.00 or 5.00/m [if require special length 12.00/m]
Build Rod 16	16.00	3.00 or 5.00/m [if require special length 12.00/m]

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 Masonry, Timber Wood & Steel

Loading Increase
Increasing of Support Live Load in Building
Increasing of Support 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

Before install of Build Rod HS,

1] Surfaces Preparation
2] Saw Cut the Concrete
3] Hack out the Loose Concrete
4] Clean all Surfaces
5] Apply Epoxy Primer

After installed of Build Rod HS, under Slab

6] Apply Epoxy Adhesive
7] Insert the Build Rod HS into groove lines
8] Patch with Polymer Mortar or Epoxy Grout

Build Rod HS® Mechanical Properties of Specification

Characteristic Material Properties - Pultrusion (1:1 Mat/Roving Construction)			
Property	**Symbol**	**Characteristic Value**	
Tensile Strength (longitudinal)	$\sigma_{x,t,k}$	2800	N/mm^2
Tensile Strength (transverse)	$\sigma_{y,t,k}$	>463	N/mm^2
Tensile Modulus (longitudinal).5.	$E_{x,t,k}$	140	kN/mm^2
Tensile Modulus (transverse)	$E_{y,t,k}$	>35.1	kN/mm^2
Compressive Strength (longitudinal)	$\sigma_{x,c,k}$	980	N/mm^2
Compressive Strength (transverse)	$\sigma_{y,c,k}$	485	N/mm^2
Compressive Modulus (longitudinal)	$E_{x,c,k}$	-	kN/mm^2
Compressive Modulus (transverse)	$E_{y,c,k}$	-	kN/mm^2
Shear Strength (in plane)	$\tau_{xy,k}$	117	N/mm^2
Shear Modulus (in plane)	$G_{xy,k}$	2900	N/mm^2
Flexural Strength (longitudinal)	$\sigma_{x,b,k}$	1430	N/mm^2
Flexural Strength (transverse)	$\sigma_{y,b,k}$	476	N/mm^2
Flexural Modulus (longitudinal)	$E_{x,b,k}$	95	kN/mm^2
Flexural Modulus (transverse)	$E_{y,b,k}$	47.5	kN/mm^2
Poisson's Ratio (longitudinal)	ν_{xy}	-	
Poisson's Ratio (transverse)	ν_{yx}	-	

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 3ºC which above, the current dew point temperature.

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.

Easy Installation

The easy to use Carbon Fiber system components assure fast, user friendly installation. A complete system is installed in only four (4) steps to properly prepared surfaces within appropriate working conditions.

System Recommended Use Resin Component

Epo Adhesive Strip is Epoxy Solvent Free
Two Component of Part A & Part B.
Sag Resistance until 6mm thick.
Up to 15 Mpa, Shear Strength
Up to 4 Mpa, Peel Strength
Suitable for applied on Over Head or Vertical Surfaces

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1. Roll "Epo Bond Primer"

Apply **Epo Bond Primer**, at rate applied 0.20 kg/m2 to 0.30 kg/m2, is a low viscosity of **Primer Resin** that can be applied using a roller. (Wait for ½ to 1 hours curing)

2. Apply "Epo Adhesive Strip"

Apply **Epo Adhesive Strip**; at rate applied 0.34 kg/meter linear to 1.5 kg/meter linear, paste adhesive is a high solid, non sag Epoxy Based or Polyurethane Based material that is applied using a Spatula Tools to level concrete surfaces.

Note: Min of Thickness of Adhesive shall be at least 0.5 mm
(Curing time: ½ hour to 4 hours depend of whether temperature)

3. Apply Carbon Fiber of "Build Rod HS®"

Within the open time of the adhesive, place immediately the **Build Rod HS® solid rod rebars** onto the adhesive surfaces, using roller or other tools to press the solid rod rebars onto the adhesive until is forced out on both sides of the rod rebars.
Before the adhesive curing. Immediately remove surplus adhesive on both sides

Clamp The **Build Rod HS®**. 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.

4. Apply Optional Topcoat

Where required, the Carbon Fiber high solids, high gloss, corrosion-resistant topcoat provides a protective/aesthetic outer layer. (Refer to Painting Manufacture)
Where required, the Carbon Fiber Solid Rod Rebars to protection of Fireproofing system. Please call our technical for advice.

System Recommended Use Epoxy Adhesive Component

Grade of Carbon Fiber	Grade of Adhesive Recommendation	Shear Strength	Peel Strength (Cleavage)
Build Rod HS	Epo Adhesive Strip (Standard) High Shear & Peel Strength	15 N/mm2	4 N/mm2
Build Rod HS	Epo Adhesive Strip 335 (Slow or Fast) Ultra High Shear & Peel Strength	35 N/mm2	12 N/mm2
Build Rod HS	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

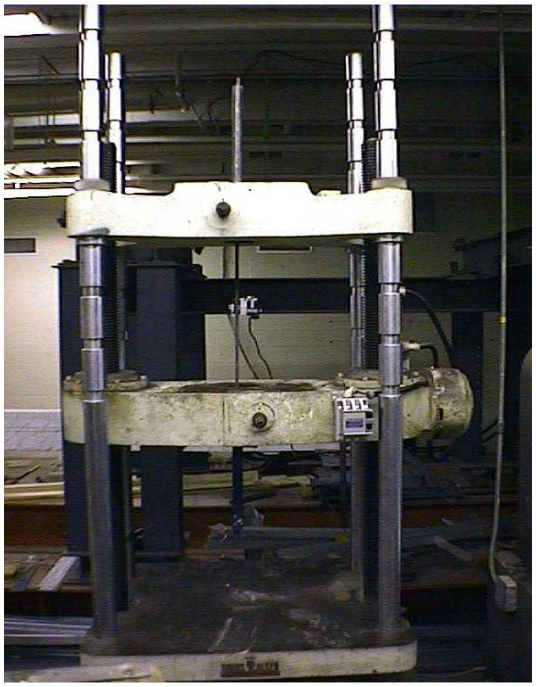
Type of Strip Laminates	Require Approximately of Epoxy Adhesive Kg/Linear Meter	Epo Adhesive Strip 5 kg pack Coverage LM/pack	Epo Bond HT 110 5 kg pack Coverage LM/pack
All 7.50mmØ	0.30-0.45 kg Per linear meter	16.50 LM/pack	16.50 LM/pack
All 10mmØ	0.60-0.90 kg Per linear meter	7.50 LM/pack	7.50 LM/pack
All 12mmØ	0.75-1.05 kg Per linear meter	6.50 LM/pack	6.50 LM/pack
All 16mmØ	0.90-1.20 kg Per linear meter	5.00 LM/pack	5.00 LM/pack

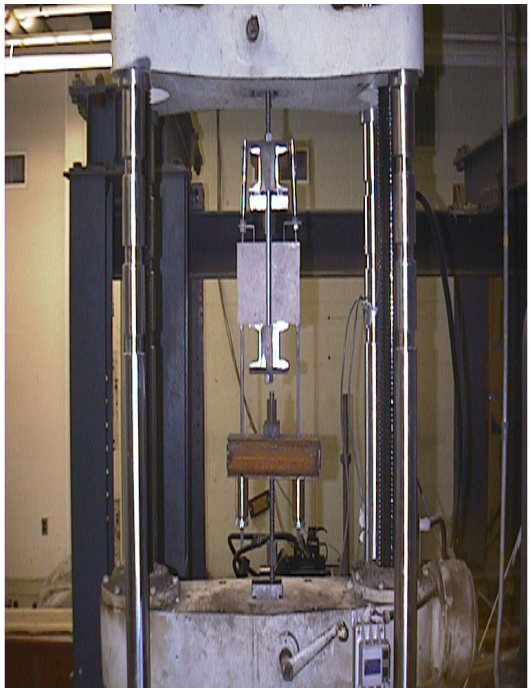
Manufacturer by:

LaMaCo System Sdn Bhd

407, Jalan Perusahaan 6,
Taman Bandar Baru Mergong,
05150 Alor Star, Kedah. Malaysia
Tel : +60-4-734 5555
Fax : +60-4-772 4444
Http : www.lamaco.com
Email : info@lamaco.com

Test Accordingly to ASTM D3039,
Cured Laminates of CFRP Polymer Matrix Composite Products
Putruction Type of CFRP Solid Rod Bars





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

American Concrete Institute®