MasterBrace® Composite Laminates and Rod

High strength carbon fiber composite laminates and rod for the MasterBrace Composite Strengthening System

**DESCRIPTION**
MasterBrace Composite Laminates are high strength carbon fiber reinforced polymer plates, used to strengthen existing structural members. MasterBrace Composite Rod is a pultruded round carbon fiber reinforced element used in near-surface-bonded applications. Both laminates and rods are bonded using an epoxy resin specifically suited for the installation. The result is an externally bonded reinforcement system that offers outstanding long-term physical and mechanical properties.

**PRODUCT HIGHLIGHTS**
- High strength to weight ratio improves structural capacity without adding significant dead load
- Low profile installation allows for strengthening without reducing overhead clearance
- Simple installation procedure is well suited for use in areas with limited access
- Non-corroding materials provide extremely durable repairs, even in exterior applications

**APPLICATIONS**
- Increase load bearing capacity of concrete beams and slabs
- Restore structural capacity to damaged or deteriorated concrete structures
- Compensate for steel reinforcement mistakenly omitted from concrete and masonry structures
- Improve seismic response of shear walls and collector elements
- Improve blast resistance of concrete and masonry structures
- Strengthen steel and timber structures

**SUBSTRATES**
- Concrete and Masonry
- Timber
- Steel

**LOCATION**
- Horizontal, vertical, and overhead surfaces
- Interior or exterior

**PACKAGING**
- MasterBrace LAM 50/1.4CFS – 164 ft (50 meter) rolls
- MasterBrace LAM 100/1.4CFS – 164 ft (50 meter) rolls
- MasterBrace BAR 1000CFS – Custom cut lengths up to 39 ft (12 meters)

**SHELF LIFE**
3 years when properly stored

**STORAGE**
Store unopened at temperatures between 50 and 90°F (10 and 32°C) in a clean, dry area, and away from sunlight or other UV sources.

**VOC CONTENT**
0 g/L

3 years when properly stored
### TECHNICAL DATA

#### COMPOSITION

Pultruded fiber reinforced polymer (FRP) laminates and bar composed of a dense network of high strength carbon fibers bound in an epoxy matrix.

#### TEST DATA

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>MASTERBRACE BAR 1000CFS</th>
<th>MASTERBRACE LAM 50/1.4CFS</th>
<th>MASTERBRACE LAM 100/1.4CFS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fiber Type</strong></td>
<td>Carbon Fiber</td>
<td>Carbon Fiber</td>
<td>Carbon Fiber</td>
</tr>
<tr>
<td><strong>Matrix Resin Type</strong></td>
<td>Epoxy</td>
<td>Epoxy</td>
<td>Epoxy</td>
</tr>
<tr>
<td><strong>Fiber Volume Fraction</strong></td>
<td>68%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td><strong>Nominal Width</strong></td>
<td>2” (50 mm)</td>
<td>4” (100 mm)</td>
<td></td>
</tr>
<tr>
<td><strong>Nominal Thickness</strong></td>
<td>0.055” (1.4 mm)</td>
<td>0.055” (1.4 mm)</td>
<td></td>
</tr>
<tr>
<td><strong>Nominal Diameter</strong></td>
<td>0.39” (10 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Design Cross Sectional Area</strong></td>
<td>0.12 in² (78.5 mm²)</td>
<td>0.11 in² (70 mm²)</td>
<td>0.22 in² (140 mm²)</td>
</tr>
<tr>
<td><strong>Modulus of Elasticity</strong></td>
<td>22,900 ksi (158 GPa)</td>
<td>23,000 ksi (160 GPa)</td>
<td>23,000 ksi (160 GPa)</td>
</tr>
<tr>
<td><strong>Ultimate Tensile Strength</strong></td>
<td>320 ksi (2,200 MPa)</td>
<td>390 ksi (2,690 MPa)</td>
<td>390 ksi (2,690 MPa)</td>
</tr>
<tr>
<td><strong>Ultimate Elongation</strong></td>
<td>1.4%</td>
<td>1.67%</td>
<td>1.67%</td>
</tr>
<tr>
<td><strong>Approximate Epoxy Adhesive Usage</strong></td>
<td>98 ft/gal (7.9 m/L)</td>
<td>92 ft/gal (7.4 m/L)</td>
<td>46 ft/gal (3.7 m/L)</td>
</tr>
</tbody>
</table>

* Tensile properties determined by testing in accordance with ASTM D 3039. Values reported are average values minus three standard deviations as recommended in ACI 440.2R. These are the values recommended to be used in design.
HOW TO APPLY
PREPARING THE MASTERBRACE BAR AND LAMINATE

1. USE CAUTION WHEN UNPACKING MASTERBRACE LAMINATE COILS. The coils are under a high degree of tension. Prior to unpacking the material, the coil should be braced against unravelling. It is recommended to place the coil in a frame, which can be constructed of lumber for convenient unpacking and dispensing.

2. Uncoil the required length of laminate to be installed, and cut the laminate to the proper length. The laminate can be cut using a hacksaw or an angle grinder with a metal cutting wheel. Use caution when cutting the laminate, which can splinter when being cut. The use of proper personal protective equipment (gloves, protective eye/facewear, respiratory protection) is required.

3. Remove the peel ply from the laminate or bar to be installed, and keep material clean and dry until installation.

SURFACE MOUNTED INSTALLATION (LAMINATE ONLY)

SURFACE PREPARATION

1. Substrate must be fully cured, clean, sound and dry.

2. For concrete and masonry substrates, mechanically prepare the substrate to remove coatings, laitance and any other surface contaminants and to provide a proper surface profile. Surface profile should be a minimum of CSP-3, per ICRI 310.2R.

3. For steel substrates, abrasive blast to “white metal” in accordance with Society for Protective Coatings (SSPC) Specification SP-5-89 or NACE No. 1, using clean, dry abrasive to obtain a minimum 3 mil profile.

4. The surface flatness should not vary by more than ¼ inch over a 3 foot length (3 mm per meter). The length is measured along the direction that the laminate is to run.

5. Surface irregularities can be leveled with MasterEmaco ADH 327 or MasterEmaco ADH 1420. Allow the leveling material to cure no longer than 24 hours before installing the laminate over it.

APPLICATION

1. MasterBrace laminates are typically surface mounted using MasterEmaco ADH 327 or MasterEmaco ADH 1420. Consult with the data guide for the MasterEmaco adhesive for mixing and handling instructions.

2. The adhesive is applied directly to the side of the laminate from which the peel ply has been removed. When applied properly, the adhesive will be uniform along the length of the laminate and will form a curved profile across the width of the laminate with ⅛ inch (1.5 mm) thickness at the edges and ⅛ inch (3 mm) in the center. The profile can be created using a drawdown template or a flexible plastic spreader.

3. Using light finger pressure, position the laminate in the desired location with the adhesive-coated side against the substrate. Using a smooth rubber roller and moderate pressure, press the laminate against the substrate until adhesive begins to exude from under both edges of the laminate.

4. Excess adhesive on the substrate can be removed with a steel trowel. Any adhesive on the exposed side of the laminate can be cleaned using acetone or MEK prior to cure of the adhesive.

5. The consistency of the adhesive typically allows the laminate to be placed on overhead or vertical surfaces without the need for supports to hold the laminate in place. However, under some conditions the laminate may tend to debond while the adhesive is curing. In these situations, temporary supports should be put in place until initial cure of the adhesive is attained.

6. Additional loads should not be put on the structure until the adhesive is fully cured. Cure times will vary depending on ambient temperature and humidity. For detailed information on cure times, consult the data guide for the adhesive used.

NEAR SURFACE MOUNTED INSTALLATION OF MASTERBRACE BARS

SURFACE PREPARATION

1. In the location where the MasterBrace Bar is to be installed, saw cut a ¾ inch wide, ½ inch deep groove into the substrate (Note that groove dimensions may vary based on project requirements, including locations where two bars overlap.).

2. Using compressed air or other suitable means, remove any accumulated dust from the sawcut groove.

APPLICATION

1. MasterBrace Bar is typically near surface mounted, using MasterEmaco ADH 326, MasterEmaco ADH 327 or MasterEmaco ADH 1420. MasterEmaco ADH 326 is a liquid, and should be used only for topside installations. Consult the data guide for the adhesive used for mixing and handling instructions.

2. Fill the sawcut groove to approximately half its depth with adhesive.

3. Place the MasterBrace Rod into the groove, and move the rod laterally and vertically in the groove to ensure the the adhesive fully covers the rod and the bottom of the groove.

4. Fill the remaining space in the groove with adhesive. Remove excess adhesive with a steel trowel. Adhesive smeared on nearby surfaces can be cleaned with acetone or MEK.

5. Additional loads should not be put on the structure until the adhesive is fully cured. Cure times will vary depending on ambient temperature and humidity. For detailed information on cure times, consult the data guide for the adhesive used.

FOR BEST PERFORMANCE

• Refer to the data sheet for the epoxy adhesive used for temperature limitations and cure times.

• For professional use only; not for sale to or use by the general public.

• Make certain the most current versions of product data sheet and SDS are being used; visit www.master-builders-solutions.basf.us to verify the most current versions.

• Proper application is the responsibility of the user. Field visits by BASF personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.
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