

**Typical Data for V-Wrap Carbon Fiber Plate**

|                                 |                          |
|---------------------------------|--------------------------|
| <b>Color:</b>                   | Black                    |
| <b>Primary Fiber Direction:</b> | 0° (unidirectional)      |
| <b>Shelf life:</b>              | 10 years                 |
| <b>Fiber Type:</b>              | Carbon                   |
| <b>Matrix Type:</b>             | Epoxy Vinylester Resin   |
| <b>Fiber Volume Fraction:</b>   | 70%                      |
| <b>Tensile Strength:</b>        | 350,000 psi (2400 MPa)   |
| <b>Modulus of Elasticity:</b>   | 19,000 ksi (131,000 MPa) |
| <b>Elongation at Break:</b>     | 1.87%                    |



|                        |   |  |
|------------------------|---|--|
| <b>Laminate Width:</b> | <b>2" (50 mm)</b>                           | <b>4" (100 mm)</b>                           |
| <b>Thickness:</b>      | 0.055" (1.4 mm)                             | 0.055" (1.4 mm)                              |
| <b>Design Area:</b>    | 0.110 in <sup>2</sup> (70 mm <sup>2</sup> ) | 0.220 in <sup>2</sup> (140 mm <sup>2</sup> ) |

**DESCRIPTION:**

V-Wrap FRP Plate is a high strength, pre-manufactured carbon/epoxy laminate. These laminates are used as externally bonded reinforcement providing additional strength and stiffness to concrete, masonry, and wood structural elements. The laminates are bonded to the structural element using two-part, 100% solids, high strength structural adhesive system. The resulting repair is lightweight, non-corrosive and is much easier to install than steel.

**WHERE TO USE:**

**STRUCTURAL STRENGTHENING**

- Increases the live load capacity of floor systems
- Increases the flexural strength of reinforced and prestressed girders
- Increases the live load capacity and ductility of columns

**SEISMIC STRENGTHENING**

- Masonry shear wall strengthening

**DAMAGE TO STRUCTURAL PARTS**

- Corrects strength deficiency due to deterioration and corrosion
- Restores flexural strength of structural elements damaged by fire

**CHANGE IN STRUCTURAL SYSTEM**

- Load redistribution due to removal of walls or columns
- Reinforces slabs for new openings

**DESIGN OR CONSTRUCTION DEFECTS**

- Insufficient amount or detailing of flexural reinforcement
- Insufficient size and/or layout of reinforcement

**ADVANTAGES:**

- Non-corrosive reinforcement system
- Lightweight and flexible
- Used for shear or flexural strengthening
- High strength
- Light weight
- Reduces crack width
- Alkali resistant
- Low aesthetic impact

**PACKAGING:**

- The 2" (50 mm) wide plate is furnished in 250 ft (75 m) spools.
- The 4" (100 mm) wide plates are furnished in 300 ft (90 m) spools.

**HOW TO USE:**

**DESIGN:**

Design should comply with ACI 440 or recognized design/specification entity, and is typically based on CFRP contribution determined by detailed analysis. A minimum overlap (or lap splice) of 36" is required to achieve continuity. Design values will vary based on project requirements and applicable environmental and strength reduction factors. Contact STRUCTURAL TECHNOLOGIES to determine applicable design requirements and reduction factors.

**SURFACE PREPARATION:**

- Surfaces to receive V-Wrap FRP Plate laminates must be clean and sound. It must be dry and free of frost. All dust, laitance, grease, curing compounds, waxes, deteriorated materials, and other bond inhibiting materials must be removed from the surface prior to application.
- Large voids should be patched using an approved repair mortar. Uneven areas should be leveled with an appropriate leveling mortar or putty.
- Sandblast, pressure wash, shotblast or use other approved mechanical means to achieve an open-pore texture with a concrete surface profile of CSP 3 or better (ICRI).
- The adhesive strength to the concrete may be verified after surface preparation by random pull-off testing (ACI 503R) at the discretion of the engineer. Minimum tensile strength of 200 psi must be achieved

**CUTTING:**

Laminates can be cut to appropriate length using a reciprocal saw with a fine tooth blade or a grinder.

**EPOXY MIXING:**

V-wrap 778 epoxy is recommended for bonding the plates. Epoxy adhesive must be mixed according to the manufacturer's specifications to achieve a homogeneous mixture.

**APPLICATION:**

- Before applying the structural adhesive to the laminate, the sanded side of the laminate is wiped with acetone or other solvent until any excess residue (e.g., carbon dust) is removed. Observe proper fire and health precautions when using solvents.
- Apply thin prime coat of the epoxy adhesive to the surface approximately 1/16" (1.5 mm) thick and 1/2" wider than the plate to be used. Structural adhesive is applied to both the carbon and substrate surfaces.
- Apply 1/16" (1.5 mm) thick coat of the epoxy adhesive to the cleaned laminated surface. Plate laminates should be applied with approved epoxy adhesive.
- Press the laminates against the working surface using a hard rubber roller to achieve a void free bond line with thickness between 1/16" to 3/32" (1.5 to 2.5 mm). Excess adhesive is then removed from the sides of the laminate before it cures.
- The laminate may be coated with a protective or decorative coating.

- Test plates may be simultaneously installed adjacent to the area being strengthened and should be prepared using the same method described above. Bond pull-off tests are performed to validate proper installation. The bond strength of the plate to concrete may be verified by random pull-off testing at the discretion of the engineer. Minimum tensile strength of 200 psi must be achieved.

**LEVELING MORTARS, EPOXY ADHESIVES, AND COATINGS:**

Construction materials will vary based on project requirements and applicable environmental and surface condition. Contact STRUCTURAL TECHNOLOGIES to determine applicable leveling mortars, epoxy adhesives, and coatings for a specific use.

**LIMITATIONS:**

- Design calculations must be made and certified by an independent licensed professional engineer.
- Concrete deterioration and steel corrosion must be resolved prior to application.
- Only apply Plate laminates when the ambient temperature is within the temperature range of the approved epoxy adhesive.

**STORAGE:**

- Store out of direct sunlight in a dry place between 50°F – 90°F (10°C –32°C).
- Store laminates on original rolls or packaging until ready to use. Keep laminates dry and free from dust and oil.

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