

# V-Wrap Carbon FRP Rod

## Typical Data for V-Wrap Carbon Fiber Rod

Storage Conditions:	Store dry at 50°F – 90°F
Color:	Black
Primary Fiber Direction:	0° (unidirectional)
Shelf life:	10 years
Fiber Type:	Carbon
Matrix Type:	Resin
Fiber Volume Fraction:	70%
Tensile Strength:	270,000 psi (1860 MPa)
Modulus of Elasticity:	18,500 ksi (127,500 MPa)
Elongation at Break:	1.4%



Rod Sizes:	#3	#4
Rod Diameter:	0.36" (9 mm)	0.47" (12 mm)
Design Area:	0.101 in <sup>2</sup> (65 mm <sup>2</sup> )	0.19 in <sup>2</sup> (122 mm <sup>2</sup> )

## DESCRIPTION:

V-Wrap Carbon FRP Rod is a family of high strength, pre-manufactured composite carbon/resin rods. These rods are used as internal or external reinforcement providing additional strength and stiffness to concrete and masonry structural elements. As a strengthening system, V-Wrap Carbon FRP Rods are utilized for a technique known as "Near Surface Mounted" or NSM reinforcement. This strengthening system consists of the FRP rods embedded in grooves made on the surface of the member. The rods are bonded in the grooves, below the surface, using V-Wrap 778 Adhesive resin and V-Wrap 700 Resin. Because it is embedded below the surface, V-Wrap Carbon FRP Rods are especially attractive for strengthening of surfaces that could be subject to abrasive or mechanical damage, such as parking decks, slabs and walkways. For masonry structures, the rods can be installed in the existing joints, thus upgrading the capacity without negative aesthetic impact.

## WHERE TO USE:

- **NSM Structural strengthening**
  - When member surface is exposed to vehicular, snow plow, or pedestrian traffic
  - When use of externally bonded fabric and laminates is not feasible due to poor concrete surfaces that require extensive preparation
  - When member surface is exposed to mechanical impact
  - Where final aesthetics of FRP sheets is not acceptable
  - For anchoring the end of FRP sheets
- **Masonry strengthening**
  - Masonry wall strengthening for increasing in-plane or out-of-plane bending capacity
  - For increasing wall in-plane or out-of-plane shear capacity

## ADVANTAGES:

- Reinforcement protected from mechanical and environmental damage
- Effective topside strengthening system for slabs and beams
- FRP rods can be effectively anchored into adjacent members
- Used for shear or flexural strengthening
- Non-corrosive reinforcement system
- Light-weight
- High-strength
- Low impact on member appearance and aesthetically pleasing

## PACKAGING:

V-Wrap Carbon FRP Rod is furnished in 20 ft. (6 m) long pieces.

## HOW TO USE

### Design:

- Design should comply with ACI 440 and is typically based on CFRP contribution determined by detailed analysis. The design should be based on force equilibrium and strain compatibility principles. The minimum dimension of the grooves should be taken at least 1.5 times the diameter of the FRP rod. Design parameters will vary based on project requirements and applicable environmental, groove surface condition, and strength reduction factors. Contact VSL Engineers to determine applicable design requirements and reduction factors.

### Surface Groove Installation and Preparation:

- Integrity of the surface concrete should be checked prior to installing the rod. Corrosion of internal steel reinforcement should be adequately addressed prior to installing the strengthening system.

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- Make grooves onto the surface of the slab. Minimum groove width and depth is 1.5 times the rod diameter.
- The inside faces of the groove should be roughened using sand blasting or pressure washing to ensure adequate bond properties. All grooves shall be cleaned to remove loose particles and dust.
- Groove surfaces 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.
- Adhesive resin shall be allowed to cure per manufacturer's specifications prior to applying live loads to the structure.
- After allowing initial resin cure to occur, perform a visual test to ensure that all the grooves are filled with adhesive resin.
- Voids shall be repaired with the same adhesive resin used to bond the rods.
- The grooves may be coated with a protective or decorative coating.
- Test rods may be simultaneously installed adjacent to the area being strengthened and should be prepared using the same method described above. Coring through test rods may be performed to validate proper installation and that the V-Wrap Carbon FRP Rod is fully encapsulated in adhesive resin.

### Cutting V-Wrap FRP Carbon Rod:

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

### Installation:

- V-Wrap FRP Carbon Rod must be installed by an approved installer. Please contact your VSL representative for more information.
- Install FRP per approved drawings. Note FRP rod length, size, number of rods, and rod spacing.
- Fill each groove half way with V-Wrap 778 Carbon FRP Rod Adhesive or manufacturers' approved equivalent using a manual or pneumatic gun capable of delivering a consistent bead of resin. Mixing of the V-Wrap 700 Resin or manufacturers' approved equivalent adhesive resin shall be in accordance with the manufacturer's specifications.
- Install one FRP rod into the middle of the groove and lightly press in place to allow the adhesive to flow around the rod and cover the sides of the groove.
- Fill the grooves with the same resin or manufacturers' approved equivalent adhesive resin and level the surface.
- If needed, sand may be broadcast onto the adhesive resin surface to create rough surface.

### Adhesives and Coatings:

Construction materials will vary based on project requirements and applicable environmental and surface condition. Contact VSL Engineers to determine applicable adhesive resin 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 V-Wrap Carbon FRP Rod when the ambient temperature is within the specified temperature range of the adhesive resin.

### STORAGE:

- Store out of direct sunlight in a dry place between 50 – 90°F.
- Store rods in original packaging until ready to use. Keep dry and free from dust and oil.

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