

## **Application Guidelines for Using V-ROD® Fiberglass Rebars**

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The following general requirements and recommendations are provided for using V-ROD® FRP composite rebar in the construction of reinforced concrete structures.

### **HANDLING AND STORAGE**

V-ROD® reinforcing bars, while inherently very durable, are made with a matrix of synthetic resin rendering them liable to surface damage if abused. Deep scoring by sharp objects will reduce their durability and performance capacity; therefore care is advised in the handling of these materials during storage and placement. When conditions on the job site permit, bars should be delivered to a storage area. FRP bars should be handled, stored and placed in a similar fashion to epoxy coated bars, and more carefully than uncoated steel reinforcing bars.

The following specific storage and handling guidelines will minimize any damage to the bars or the bar handlers:

- V-ROD® reinforcing bars should be handled with heavy duty working gloves to avoid hand cuts and injuries from sharp edges and coarse sand coating.
- When storing bars outdoors, placing them directly on the ground should be avoided; timber pallets should be placed under the bars to keep the bars free from mud and to provide easy handling.
- V-ROD® is inherently highly corrosion resistant, but ultraviolet rays and chemical substances can induce undesirable surface blemish if stored in such conditions for extended periods of time. If stored outdoors for prolonged periods of time, the bars should be covered with opaque plastic or other types of cover to protect the bars from the external environment. Protection from moisture exposure is not needed.
- There are no adverse affects from stocking V-ROD® in low temperature and cold conditions have no impact on the properties or quality of the rod.
- Oil or grease that is present on the bars in significant quantities should be removed before placing concrete by wiping or spraying the bars with suitable solvents.
- V-ROD® reinforcing bars are light and flexible in comparison to steel rebar. Hoisting bundles of bars should be done carefully until all involved personnel are familiar with the way the bar reacts to handling. For longer lengths, it is desirable to use a spreader bar to facilitate handling and prevent excessive bending.
- V-ROD® bars can be quickly and easily cut with a high speed grinding cutter, quick cut saws with diamond blades, bandsaw or a hacksaw. Bars should never be sheared. Ensure safety equipment including gloves, dust masks and safety glasses are worn during cutting.

## PLACEMENT AND ASSEMBLY

Placing of V-ROD® reinforcing bars is done in a similar fashion to steel bars. Unless otherwise specified in project specifications, the bars should be placed within the tolerances specified in ACI 117 (“Standard Tolerances for Concrete Construction and Materials”). Common placing practices should apply with the following exceptions:

- Because it is lightweight, fiberglass reinforcement should be adequately secured in the forms to prevent displacement by concrete placement or workers. Plastic or non-corrosive chairs can be used to elevate the rebar on spacing determined by the bar diameter.
- Plastic or nylon ties, and plastic snap ties can be used in tying the bars in applications where corrosion resistance or total absence of metals is paramount. Standard metal tie wire, coated tie wire, and stainless steel tie wire can also be used. Fiberglass rebar can also be lap spliced to metal rebar as long as mechanical fastening devices that could damage the bar are not used.
- Whenever continuity is required in the reinforcement, lapped splices should be used. Currently, mechanically connected or welded splices are not possible with composite reinforcing bars although upon completion of testing, specially designed mechanical connectors will be available. The length of lap splices varies with concrete strength, type of concrete, rebar grade, size, spacing and cover. In the absence of other specifications, an overlap of forty (40) bar diameters should be utilized.

## BENDS

V-ROD® is a thermoset composite, and cannot be bent after it has been polymerized (cured). Since it is shipped in a fully cured form, it cannot be bent on job site. Bends can be produced during the manufacturing process in virtually any shape that can be obtained with steel rebar, although typically a little more generous bend diameter will be required. As a general guideline, multiplying the bar diameter (in inches) by a factor of 3.5 will give you an approximate minimum bend *radius* for a 90-degree bend. Similarly, multiplying the bar diameter by a factor of 7 will give you the minimum bend *diameter* for a 180-degree bend. In any job where bending dimensions are critical, contact should be made with the supplier to verify bending capability. Based on testing, approximately 50-60% of the guaranteed design strength of a straight bar is retained after making a 90 degree bend.

## QUALITY CONTROL

The manufacturing facility for V-ROD® is ISO 9001-2000 certified and compliant with the CSA S-807 FRP Specification. Through routine sampling and inspection, quality control tests are carried out during production to ensure that products meet all specifications and are within exacting dimensional tolerances. Certification of results (Bar Certs), are provided upon delivery.

Test reports are also available from third-party independent testing agencies and universities regarding specific product performance in the following areas:

- Mechanical properties, including tensile strength, tensile modulus of elasticity, fatigue strength and ultimate strain.
- Bond strength
- Durability in alkaline environments.