

SECTION 00531 – GLASS FIBER REINFORCED POLYMER BAR REINFORCEMENT FOR CONCRETE

(Follow all instructions and make all edits with “Track Changes” turned on. This Section is not published in the Oregon Standard. If there are no instructions [purple text] above a subsection, paragraph, sentence, or bullet, then include it in the Project, unless the item(s) that are included in the subsection, paragraph, sentence, or bullet are not required on the Project and then they should be deleted. In general do not re-number or re-letter subsections when item(s) are deleted. Delete all purple text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)

Section 00531 is not a Standard Specification and is included in this Project by Special Provision.

Description

00531.00 Scope - This Work consists of furnishing and placing glass fiber reinforced polymer (GFRP) bar reinforcement of the size shown or specified.

00531.02 Submittals - Submit a product certificate to the Engineer at least 21 Calendar Days before delivering GFRP reinforcement to the Project Site for each size of GFRP reinforcement. Provide test data for each of the mechanical, physical and durability properties for product certification for each bar diameter of the Material furnished. Provide the following information:

- The testing agency and the representative responsible for the test results.
- The resin matrix, filler and additives.
- The fiber type.
- The test results and the test method for each of the following properties:
 - Mechanical Properties:
 - Tensile Modulus of Elasticity
 - Ultimate Tensile Strength
 - Ultimate Strain
 - Bond Strength
 - Transverse Shear Strength
 - Physical Properties:
 - Fiber Mass Content
 - Glass Transition Temperature
 - Bar Diameter

- Bar Area
- Durability Properties:
 - Moisture Absorption
 - Alkaline Resistance

Submit order lists and bending diagrams according to 00531.11.

Materials

00531.10 General - Furnish GFRP reinforcement from the QPL.

00531.11 Order Lists and Bending Diagrams - Before ordering Material, submit all order lists according to 00150.37 and unstamped Working Drawings and bending diagrams according to 00150.35 for approval. Do not order Material until such lists, Working Drawings and bending diagrams have been approved. The review of order lists, Working Drawings and bending diagrams by the Engineer in no way relieves the Contractor of responsibility for the correctness of such lists and diagrams. Revise lists, Working Drawings and diagrams as required to comply with the design drawings at no additional cost to the Agency.

00531.12 Fabrication - Create bends as shown during GFRP bar manufacturing. Use a minimum inside bend diameter of 3 times the bar diameter for #4 - #8 bars and a minimum inside bend diameter of 4 times the bar diameter for #9 and #10 bars.

Provide identification marks on each GFRP reinforcement or affix a durable tag to each bundle for Production Lot traceability and nominal bar size designation.

Construction

00531.40 Protection of Material - Store GFRP reinforcement above the surface of the ground on dunnage. If stored outdoors for more than 2 months, cover the GFRP reinforcement with opaque plastic or other types of cover that protects the bars from ultraviolet rays. Prevent exposure of GFRP reinforcement to temperatures above 120 °F during storage.

Protect GFRP reinforcement from damage at all times. Ensure GFRP reinforcement is free of dirt, paint, oil and other foreign substances. When handling GFRP reinforcement, use Equipment that avoids damaging or abrading the GFRP reinforcement. Lift bundles of GFRP reinforcement at multiple pickup points. Do not drop or drag GFRP reinforcement.

If visual inspection reveals discoloration due to UV exposure or loss of grit on GFRP reinforcement, the GFRP reinforcement is rejected.

00531.41 Placing and Fastening - Place all reinforcement within the tolerances recommended in the *CRSI Manual of Standard Practice* unless otherwise specified. Hold reinforcement firmly during the placing and setting of concrete. If GFRP reinforcement is not adequately supported or tied to resist settlement, floating upward, or movement in any direction during concrete placement, halt concrete placement until corrective measures are taken.

(a) Ties and Supports - Keep reinforcement properly positioned during placement of concrete according to the following:

- Use precast mortar or plastic blocks to support GFRP reinforcement. When precast mortar blocks are used, furnish mortar blocks that have the same or greater compressive strength as the concrete to be placed and have cast-in wire ties meeting the requirements of 02513.60 mortar blocks.
- Furnish plastic/nylon zip tie or stainless steel tie wire meeting the requirements of 02513.60.
- For bridge decks, use precast mortar or plastic blocks to support the bottom mat of GFRP deck reinforcement from deck formwork. Use stainless steel reinforcement supports to support the top mat of deck reinforcement as shown. Place all reinforcement in designated position and securely hold in position while placing and consolidating concrete.
- Wire bars together with ties at all intersections for both top and bottom mats.

(b) Clearances:

- Unless otherwise specified, furnish concrete cover for GFRP reinforcement as shown.
- Provide the same surface clearance for ties and splices as shown or specified for the reinforcement.
- Maintain clearance distance from the forms and between layers of reinforcement as shown or specified with stays, precast concrete blocks, ties, hangers, or other approved supports.
- Ensure bridge deck clearances meet the requirements of 00540.48(g).

(c) Approval - After placing GFRP reinforcement for each section of work or in any member, have it inspected and approved by the Engineer before placing concrete. Concrete placed in violation of this provision may be rejected and removal required.

00531.42 Splicing - Do not use mechanical splices for GFRP reinforcement.

(a) General - Furnish full length bars for the specific length shown or the calculated length for those designated "full length".

If specific locations are designated for splices, make splices only at those locations, or use full-length bars.

In the absence of other directions, including bars designated "continuous", furnish GFRP reinforcement to provide the minimum practical number of bars.

(b) Lapped Splices - In lapped splices, place the bars in contact and fasten together according to 00531.41 with at least three ties per splice.

00531.43 Field Cutting and Bending - Field cut GFRP reinforcement only when specifically permitted using high speed grinding cutter, fine blade saw, diamond blade, or masonry blade. Do not use shear or flame cutting. Seal cut ends according to GFRP bar manufacturer's

recommendations. Allow the Engineer to inspect all surface damage due to cutting. Repair the damage according to the manufacturer's recommended method. Do not field bend or straighten GFRP reinforcement.

00531.44 Damage and Repair of GFRP Reinforcement - GFRP reinforcement with the following damage is rejected:

- Visible fibers (other than at cut ends).
- Cut deeper than 0.04 inches.
- Damage area is larger than 2% of the surface area in that linear foot of bar.

For damage not exceeding the list above, lap splice a new GFRP reinforcing bar adjacent to the damaged portion with the appropriate lap length on either side of the damage area.

Measurement

00531.80 Measurement - No measurement of quantities will be made for Work performed under this Section.

When laps are made for splices for the convenience of the Contractor, the extra reinforcement will not be included in the pay quantities.

The estimated quantity of GFRP reinforcement is:

Structure	Bar Size	Quantity (Foot)
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Bridge No. _____

Bridge No. _____

Payment

00531.90 Payment - The accepted quantities of GFRP Reinforcement will be paid for at the Contract lump sum amount for the item "___ GFRP Reinforcement".

The bar diameter of GFRP reinforcement is inserted in the blank.

Payment for reinforcement will be made when the reinforcement is incorporated into the concrete.

Payment will be payment in full for furnishing and placing all Materials, and for providing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

No separate or additional payment will be made for clips, wire, separators, chairs, and other Material used in fastening the reinforcement in place.