

Document: 440.5 Specification for Construction with Fiber-Reinforced Polymer Reinforcing Bars

No.	Public Commenter Name	Pg #	Line #	Item #	Public Comment	Committee Response
1.	W. L. Gamble				This is on CONSTRUCTION. Seriously need Standard on DESIGN for this to be very useful.	No change to document, committee is working on design standard
2.	Keith Kesner	2	29	Sec. 1.1	Why is this intended to be used with ACI 301? ACI 301-16 does not appear to recognize FRP bars. This standard should be used with ACI 563. ACI 563 / ACI 562 allow use of FRP bars.	No change to document, ACI 301 is used for anything non-GFRP in the construction project. This construction spec was written with new construction in mind, not repair.
3.	Keith Kesner	3	37	Sec. 1.4	Add ACI 563-18 to list of references.	Not needed, this construction spec is for new construction with internal GFRP bars, not for repair.
4.	Amy Trygestad	3	44		Add new submittal item for field cutting not shown on Construction Documents: location and reason	Persuasive. Add a new section.... 1.5.3 Field cutting of GFRP reinforcing bar – Submit a request for field cutting not indicated in Contract Documents, including location and reason for field cutting. Renumber current 1.5.3 <i>Inspection and quality control</i> to 1.5.4. Also change 1.5.1-1.5.3 to 1.5.1 to 1.5.4 in 1.5
5.	Amy Trygestad	3	48		1.5.1.3 Add location to splice submittal	Persuasive. update to 1.5.1.2 and 1.5.1.3 1.5.1.2 <i>Placing drawings</i> —Placing drawings showing fabrication dimensions and placement locations of GFRP reinforcing bars and reinforcement supports. Placing drawings shall indicate locations of splices and lengths of lap splices. 1.5.1.3 <i>Splices</i> – List of splices and request to use splices not indicated in Contract Documents Locations and details of splices not indicated in Contract Documents.
6.	David Biggs	4	21	1.7.3	It says the Testing Agency should report deficiencies to A/E. If the A/E is responsible for acceptance, all results should be reported. Deficiencies should be reported <u>immediately</u> .	1.7.3 is in conflict with 1.7.4, rewrite to 1.7.3 Owner’s testing agency will inspect, and test materials as required, and report results to Architect/Engineer.
7.	David Biggs	4	23	1.7.4	If Testing Agency does not report all results for A/E acceptance as noted in my previous comment, they are in essence accepting the work is conflict with this item.	Persuasive, see response to #6

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8.	W. L. Gamble	4	29	2.1.1	Move a comma to read "... deformed or sand coated, or both, to provide ..."	Persuasive. 2.1.1 GFRP reinforcing bars —GFRP reinforcement shall be deformed _f or sand coated, or both _s to provide bond with concrete unless otherwise specified. GFRP reinforcement shall be the types and sizes required by Contract Documents and shall conform to ASTM D7957.
9.	Amy Trygestad	4	32		Section 2.1.2 Permitted Damage should be included under 2.1.1 and not a separate section; similar to ACI 301 when referring to maximum allowed damage. Include "The 2 percent limit on maximum allowed damage shall include previously repaired areas damaged before shipment. Repair in accordance with Section 3.3."	Persuasive. 2.1.1 GFRP reinforcing bars —GFRP reinforcement shall be deformed, or sand coated, or both to provide bond with concrete unless otherwise specified. GFRP reinforcement shall be the types and sizes required by Contract Documents and shall conform to ASTM D7957. 2.1.2. Permitted damage —The maximum total unrepaired visible damage permitted on each linear foot of each GFRP reinforcing bar shall not exceed 2% of the surface area in that linear foot of bar. The depth of the permissible damage shall not exceed 0.04 in. Repair in accordance with Section 3.3. Renumber 2.1.3 and 2.1.4 to 2.1.2 and 2.1.3
10.	David Biggs	4	35	2.1.4	Editorially fix the title to delete bolding. The same goes for 3.2.4.4.	Persuasive, get rid of bolding of 3.2.4.4
11.	David Biggs	4	39	2.2.2	Surface area of 4 in ² seems very small. If it's total surface area, a 1 inch cube has 5 surfaces with 5 in ² total exposed and would not be acceptable. If the intent is each surface of the support is limited to 4 in ² , it's not explained. Please clarify.	No change – current provision says "NOT LESS THAN 4in ² "
12.	Amy Trygestad	4	39		Add: Reinforcement supports shall conform to CRSI RB4.1.; Include reference standard in Section 1.4.	No change. Disagree, just because they conform to CRSI RB4.1 does not make them ok. This specification has additional limitations (for example, we do not want steel reinforcement in precast concrete supports). There for a blanket statement of

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						reinforcement supports conforming to CRSI RB4.1 is not appropriate. The document provides the requirements for reinforcement supports unique to GFRP reinforcement.
13.	Dr. Halim Kerim Bas	4	39	2.2.2	Item 2.2.2 is difficult to understand. Consider replacing it with the following statement. <i>2.2.2 Precast concrete reinforcement supports</i> – Use concrete supports that have a surface area of not less than 4 in. ² and are made of a concrete that matches or exceeds the specified compressive strength and durability of the concrete being placed.	Persuasive, See response to comment 20
14.	David Biggs	4	4	1.6	Is there are restriction on the bars being wet as the concrete is paced?	No change to document. Surface dampness of GFRP reinforcement is unrestricted during placement.
15.	David Biggs	4	8+9	1.6.2	The requirement for evenly spaced pick points as listed does not give enough direction. Reinforcement bars are generally lifted with some cantilever. Is it intended that there will be pick points at the very end of the bars with no cantilever? Can the pick points be moved 1 foot, 2 feet or more away from ends? Please clarify.	No change – The wording is clear. 2 evenly spaced pick points for bars 40ft or less, 3 evenly spaced for bars greater than 40ft.
16.	Amy Trygestad	5	16		Section 3.2.4 should use language for execution. Recommend revising to “Install reinforcement supports...”	Persuasive. 3.2.4 <i>GFRP reinforcement supports</i> — Use <u>Install</u> reinforcement supports
17.	Kyle Stanish	5	16	3.2.4	Clause 3.2.4 does not have any trigger language to trigger the optional requirements. It should be ended with “” ...through 3.2.4.7, <u>unless otherwise specified.</u> ”	Persuasive. 3.2.4. <i>GFRP reinforcement supports</i> – Use reinforcement supports in accordance with 3.2.4.1 through 3.2.4.4, <u>unless otherwise specified.</u>
18.	W. L. Gamble	5	17	3.2.4.1	The support spacing should also depend on bar size, as 30 in. might be rather large for a small bar.	Persuasive. Remove 3.2.4.1 3.2.4.1 GFRP reinforcement shall be supported at least every 30 in. And renumber 3.2.4.2 through 3.2.4.7 Rationale: there are two other provisions in the document that essentially take care of this 3.2.1 <i>Tolerances</i> —Place, support, and fasten GFRP reinforcement to maintain its location during

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						<p>concrete placement as shown on the Project Drawings. Do not exceed the placing tolerances specified in ACI 117 before concrete is placed. Placing tolerances shall not reduce cover requirements except as specified in ACI 117.</p> <p>And 3.2.6.4 Support GFRP mat reinforcement during placing of concrete to maintain specified elevation in the slab.</p> <p>How the contractor satisfies these two provisions is really a “means and methods” issue for the contractor and not something that should or needs to be specified.</p>
19.	Amy Trygestad	5	21		Section 3.2.4.4. This is not a reinforcement support sub-section. Possibly a separate section under installation.	<p>Persuasive. Make 3.2.4.4 part of 3.2.5</p> <p>3.2.4.4. 3.2.5 <i>Embedded steel items</i> - Steel reinforcement and embedded steel items used with GFRP reinforcing bars shall be zinc-coated (galvanized) or coated with nonmetallic materials, or stainless steel or stainless steel clad.</p> <p>And renumber the rest of 3.2</p>
20.	Amy Trygestad	5	23		Section 3.2.4.5 This section should be under Section 2.2 Accessories, not under installation	<p>Persuasive. Also affected by comment 13 which cleaned up the wording.</p> <p>2.2.2 Precast concrete reinforcement supports—Use concrete supports that have a surface area of not less than 4 in.² and a compressive strength and durability properties equal to or greater than the specified compressive strength and durability properties of the concrete being placed.</p> <p><u>2.2.2</u> <i>Precast concrete reinforcement supports</i>— Use concrete supports that have a surface area of not less than 4 in.² and a compressive strength and durability properties equal to or greater than the specified</p>

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						compressive strength and durability properties of concrete being placed are made of a concrete that matches or exceeds the specified a compressive strength and durability of the concrete being placed. Steel wires or dowels embedded in precast concrete reinforcement supports for GFRP reinforcement shall be coated with dielectric material or made of stainless steel.
21.	Amy Trygestad	5	28		Section 3.2.5 should use language for execution. Recommend revising to “Fasten GFRP bars with polymer coated or plastic tie wire.”	No change. This changes the meaning.
22.	Amy Trygestad	5	31		Table 3.2.3.1 not included.	Table 3.2.3 needs to be renumbered to Table 3.2.3.1
23.	W. L. Gamble	5	31	3.2.6.1	Should be Table 3.2.3. There is no 3.2.3.1.	See response to #22
24.	David Biggs	5	35	3.2.6.5	This item should be unnecessary based upon 3.2.6.4. If you want to keep it for emphasis, I’d suggest combining into 3.2.6.4.	<p>Persuasive.</p> <p>3.2.6.4 Support GFRP mat reinforcement during placing of concrete to maintain specified elevation in the slab. <u>GFRP mat reinforcement shall not be placed on grade and subsequently raised into position in concrete.</u></p> <p>3.2.6.5. Do not place GFRP mat reinforcement on grade and subsequently raise into position in concrete.</p> <p>Note this will actually be 3.2.7.4</p>
25.	W. L. Gamble	5	35	3.2.6.5	Is “Do not place” properly imperative?	See response to #24
26.	David Biggs	5	4	3.1.2	The requirement for wiping to clean is too limiting. What if a muddy bar won’t come clean by wiping? Suggestion: “When needed, bars shall be cleaned. Wire brushes and other potentially abrasive tools shall not be used.” Seems like it’s not necessary emphasize wiping.	<p>Persuasive.. Replace 3.1.2 as shown</p> <p>3.1.2 When needed, bars shall be cleaned by wiping the bar with a cloth or similar material. Wire brushes and other potentially abrasive tools shall not be used.</p> <p><u>3.1.2 GFRP bars shall be clean and free of dirt and oil. Wire brushes and other potentially abrasive tools shall not be used.</u></p>
27.	David Biggs	5	7	3.2.1	Hard to imagine fastening GFRP to precast support that is only 4 in ² . Need to resolve comment 4 to make sense of this.	See response to #11

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28.	James Jensen	5	7	3.2.8	Section discusses “no field bending or straightening”. Steel bars can be made to fit in tight quarters by prying or pushing on the bar. How much “persuasion” can a GFRP tolerate?	No change to document. GFRP bars are less stiff than steel bars and linear elastic to failure, so it is no problem to persuade them into place. No change to document
29.	W. L. Gamble	6	10	Table	A steel #5 bar in a slab exposed to weather can have 1.25 in. cover, with proper concrete. Why 1.5 in. here?	No change to document. The additional cover is to protect against bond issues due to thermal cycling
30.	James Jensen	6	4/5	3.3.2	Is there a physical repair method other than that given in Item #3.3.3? I am thinking of the “touch-up” epoxy used on epoxy coated bars.	No change to document. Answer to question - Not at this time. Cosmetic damage to the outside resin need not be repaired if under the prescribed amount. Damage to the gross cross section is of interest, particularly cut fibers. Currently the only way to repair this is to splice in a repair.
31.	Amy Trygestad	6	6		Section 3.3.3 Lapping a bar splice for repair needs to require submittal for approval.	Persuasive. <u>Add 1.5.5 GFRP reinforcing bar repairs – List of locations and details for all GFRP reinforcing bar repairs.</u>
32.	David Biggs	7		2.1.1G	Optional Checklist: The checklist should not be introducing new criteria. The 2 nd sentence should be modified for inclusion in specification 3.2.9.	Persuasive <i>3.2.9 GFRP reinforcement through expansion joint—Do not continue GFRP reinforcement or other embedded GFRP items bonded to concrete through expansion joints. GFRP dowels that extend through a joint or waterstop shall <u>not be deformed or sand coated, and shall</u> be unbonded or bonded to only one side of a joint or waterstop.</i> Note, this will actually end up as 3.2.10
33.	David Biggs	7		3.2.6	Optional Checklist: This conflicts with 3.2.9 which says to <u>not</u> extend through a expansion joint. I suggest modifying the first sentence of 3.2.9 to end with “.....through expansion joints, <u>unless indicated on the Contract Documents.</u> ”	Disagree. No change. 3.2.9 which is not specific to mat reinforcement states that reinforcement/dowels that extend through an expansion joint shall not be bonded on both sides. 3.2.6.3 is the trigger language for the optional checklist 3.2.6. 3.2.9 does not say reinforcement can not extend through an expansion joint. It says BONDED reinforcement can not extend through an expansion joint.

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34.	W. L. Gamble	7			Optional checklist, 3.2.3. The correct Table is 3.2.3.	Change table title to 3.2.3.1 See response to #23
35.	W. L. Gamble	7			Optional checklist, 2.1.1G. Question the use of "should" in second sentence. Suggest "shall" instead.	Persuasive. Optional Requirements checklist 2.1.1 Specify where GFRP reinforcing bars shall not be deformed or sand coated. Smooth GFRP bars should shall be used as dowels where the intent is to transfer shear force while allowing bar sliding.