

3460000FRC, Fiber Reinforced Concrete
Comments from Industry Review

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Comments:

1. 346-1, Paragraph 1, Sentence 1 Change “concrete decks” to “concrete bridge decks”.
2. 346-2.1, Paragraph 2, Last Sentence The last sentence has mentioned regarding the submittal of the samples to the State Materials Office. It is not clear whether the samples of the fiber or concrete should be sent to the State materials Office. Also, mention that for which type of verification the samples shall be submitted to the Sate materials Office.
3. 346-2.4 The coarse aggregate has been limited to only 89 coarse aggregate. Other larger sizes should be included.
4. 346-2.5.1, Paragraph 1, Sentence 1 Specify the Standard ASTM specification for shrinkage reducing admixture. Change “...is required.” To “...are required.”
5. 346-6.1 Change to read: “For polymeric fiber and steel fiber reinforced concrete, start the finishing and curing process prior to the drying of the concrete surface.” Include the details of the mixing, batching, delivery, placement, finishing and curing methods of the polymeric and steel fiber reinforced concrete in the quality control plan.
6. 346-6.2 Establish Subarticle 346-6.2.2 to read : “346-6.2.2 Polymeric Fiber and Steel Fiber Reinforced Concrete Mix Designs” . Move this information under 346-2.2.2. Also include information about materials data sheet, including, configuration, chemistry, content, length of the fibers and test results of the compressive strength, flexural strength, impact, and residual strength of fiber reinforced concrete..
7. 346-6.2, Number 4 Describe the type of registration or registration agency name. Is it FDOT QPL?
8. 346-6.2, Number 5 Change “meeting or exceeding ASTM C 1116” to “meeting the requirements of ASTM C 1116.”
9. 346-7.1.1, Paragraph 2, Sentence 2 Change “Prove” to “Demonstrate”.
10. 346-7.1.1, Paragraph 3, Sentence 1 This indicates that the Engineer will perform the field trail batch of fiber reinforced concrete prior to start of the project. It is not clear if the cost of the trail will be part of the project construction activities or it will be done by the department’s own

expenses. The terminology (Pre-project) may be confusing. Make it the contractor's responsibility to demonstrate the use of fiber reinforced concrete prior to the concrete placement. Change the first sentence to read: "Perform field demonstration and inspection of the polymeric fiber concrete and steel reinforced concrete during batching, delivery, placement and post-placement to ensure that the concrete meets the plastic and hardened properties and results in acceptable finishing surface."

11. 346-71.1, Paragraph 3, Last Sentence Delete "...subject to verification by the Engineer." All inspections and testing are subject to verification by the Engineer. This may be a redundant sentence.

12. 346-7.1.2, Number 2, Paragraph 2, Sentence 3 Change "Prove" to "Demonstrate".

13. 346-7.1.2, Last two paragraphs See comment numbers 10 and 11 related to the utilization and verification by the Engineer Change.

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Comment:

Article 346-1: is the Contractor allowed the option of using polymeric fiber on a project with moderately or slightly aggressive superstructure environment?

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Comments

Text: Comments from Amy Scales, P.E. D5-Interstate Construction Engineer 386-943-5729 346-7.1.1 The Engineer will utilize pre-project trials to determine acceptable surface finishability and ability to introduce polymeric fibers without clumping. Place Polymeric fiber reinforced concrete only if the surface evaporation rate, as affected by ambient air temperature, concrete temperature, pavement temperature, relative humidity, and wind velocity, is 0.2 lbs/ft² per hour or less as determined by Section 308 of the ACI Manual of Concrete Practice. Determine and document the atmospheric conditions, subject to verification by the Engineer. How is this paid for? Where will these trials take place? A similar paragraph is in 346-7.1.2

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Comments by Mike Ruland, P.E. Daytona Resident Engineer 386-943-5761 Do we really want mixes to go to the SMO? Seems like it should be DMO instead SUBARTICLE 346-6.2 (of the Supplemental Specifications) is expanded by the following: For polymeric fiber and steel fiber reinforced concrete, includesubmit the following information with the mix design to the State Materials Office prior to for approval: We need to decide what we want and not be so vague- don't leave the door open by say unless otherwise app'd by the Engineer- it leaves to field arguments 346-7.1.1 Polymeric Fiber Reinforced Concrete: Follow the requirements of the manufacturer's recommendation for mixing sequence, number of revolutions at mixing speed, and mixing procedure. Batch polymeric fiber reinforced concrete in whole cubic yard quantities. Add fibers at the concrete plant, unless otherwise approved by the Engineer. Limit the size of the transit mixer to three-quarters (¾) of its rated capacity, unless the Engineer approves a larger size. I recommend including the pertinent info from the ACI manual that's being referred to in the spec- the field personnel don't carry an ACI manual The Engineer shall will utilize pre-project trials to determine acceptable surface finishability and ability to introduce polymeric fibers without clumping. Place Polymeric fiber reinforced concrete only if the surface evaporation rate, as affected by ambient air temperature, concrete temperature, pavement temperature, relative humidity, and wind velocity, is 0.2 lbs/ft2 per hour or less as determined by Section 308 of the ACI Manual of Concrete Practice. Determine and document the atmospheric conditions, subject to verification by the Engineer. Should probably say document the atmospheric conditions and submit the results to the Engineer and specify what timeframe they are to be submitted- not sure why verification is mentioned- this needs review. Same comments apply from above to the following - Place Ssteel fiber-reinforced concrete only if the surface evaporation rate, as affected by ambient air temperature, concrete temperature, pavement temperature, relative humidity, and wind velocity, is 0.2 lbs/ft2 per hour or less as determined by Section 308 of the ACI Manual of Concrete Practice. Determine and document the atmospheric conditions, subject to verification by the Engineer.

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Comments:

346-2.5.1 Would a type K cement be permitted ? If so, please include.

346-7.1.1 1st paragraph (para.) *Limit the ~~size~~ “volume” of the transit mixer batch to three-quarters (¾) of its rated capacity, unless the Engineer approves a larger~~size~~ “volume”.* [[change size to “volume”, and add “batch”. Batch can also be load.]]

346-7.1.1 2nd para. Recommend doing “demonstration” batches to determine satisfactory fiber disbursement since trials imply laboratory size loads and therefore only partial bags (ounces) used, whereas demos imply plant or site batches [of a minimum size – say 3cy] and whole bags used per specification.

346-7.1.1 3rd para. Change “trial” to “demonstration batches”. Use verbiage in 346-Flowing Concrete for example of “demonstration batches”.

346-7.1.2 1. *With the mixer rotating at full [ADD “mixing”] speed,....*

346-7.1.2 4th para. Use “demonstration batches” to assure fiber distribution [not trial mixes]. Use the same demo batches to determine finish-ability as no fiber clumping.

346-7.1.1 and 346-7.1.2 If possible to not repeat, combine in conclusion paragraph ACI 308 for both fiber types.

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Comments:

Do we really want mixes to go to the SMO? Seems like it should be DMO instead

SUBARTICLE 346-6.2 (of the Supplemental Specifications) is expanded by the following:

For polymeric fiber and steel fiber reinforced concrete, includesubmit the following information with the mix design to the State Materials Office prior to for approval:

We need to decide what we want and not be so vague- don't leave the door open by say unless otherwise app'd by the Engineer- it leaves to field arguments

346-7.1.1 Polymeric Fiber Reinforced Concrete: Follow the requirements of the manufacturer's recommendation for mixing sequence, number of revolutions at mixing speed, and mixing procedure. Batch polymeric fiber reinforced concrete in whole cubic yard quantities. Add fibers at the concrete plant, unless otherwise approved by the Engineer. Limit the size of the transit mixer to three-quarters (¾) of its rated capacity, unless the Engineer approves a larger

size.

I recommend including the pertinent info from the ACI manual that's being referred to in the spec- the field personnel don't carry an ACI manual

*The Engineer shall will utilize pre-project trials to determine acceptable surface finishability and ability to introduce polymeric fibers without clumping. Place Polymeric fiber reinforced concrete only if the surface evaporation rate, as affected by ambient air temperature, concrete temperature, pavement temperature, relative humidity, and wind velocity, is 0.2 lbs/ft2 per hour or less **as determined by Section 308 of the ACI Manual of Concrete Practice.***

*Determine and document **the atmospheric conditions, subject to verification by the Engineer.***

Should probably say document the atmospheric conditions and submit the results to the Engineer and specify what timeframe they are to be submitted- not sure why verification is mentioned- this needs review.

Same comments apply from above to the following - *Place Ssteel fiber-reinforced concrete only if the surface evaporation rate, as affected by ambient air temperature, concrete temperature, pavement temperature, relative humidity, and wind velocity, is 0.2 lbs/ft2 per hour or less as determined by Section 308 of the ACI Manual of Concrete Practice. Determine and document the atmospheric conditions, subject to verification by the Engineer.*

Michael (Mike) Bergin, P.E.
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Comments:

346-2.1

1. ** Note - Why was polypropylene/polyethylene requirement removed?
2. Paragraph between ** note and *** note – change last sentence from:

Perform the ARS test at the time the mix design is developed and submit samples to the State Materials Office for testing.

To:

Submit concrete samples to the State Materials Office for an ARS test at the time the mix design is being developed.

346-2-4 – Change wording from "*size 89 coarse aggregate*" to "Size No. 89 coarse aggregate".

346-2.5.1 –

1. What test method can be used to evaluate the SRA?
2. Change is required to are required in the first sentence.

346-6-1 – Change quality control plans to quality control plan.

346-6.2 –

1. The list of documents should be submitted along with the mix design. It's not part of the mix design. Change "include" to "submit".
2. Note 3 - What if this is not available? What if there are no projects where it was used?

346-7.1.1 – Entire subarticle:

1. Combine requirements for steel and polymeric fibers since the language in both subarticles is the same except for when the fibers are introduced into the mix.
2. Do not allow the addition of fibers at the jobsite.
3. Since this is an overlay bridge deck, won't the surface have to be ground and grooved? If so, there is no need to demonstrate the surface finishability.
4. The demonstration in paragraph two is at trial mix time. The demonstration in paragraph three is on the project.

Suggested language:

346-7.1.1 Fiber Reinforced Concrete: Follow the requirements of the manufacturer's recommendation for mixing sequence, number of revolutions at mixing speed, and mixing procedure. Batch fiber reinforced concrete so that whole bags of fibers are used. Add polymeric fibers at the concrete plant prior to all ingredients. Add steel fibers at the concrete plant after all other ingredients, including the water, have been added and mixed. Limit the size of the transit mixer to three-quarters of its rated capacity as a maximum.

Add the fibers in a clump-free state so that the mixer blades can carry the fibers into the mixer. Demonstrate at the plant satisfactory method of introducing the fibers into the mixture

during the trial mix.

At the project, demonstrate the ability to introduce fibers without clumping. Place fiber reinforced concrete only if the surface evaporation rate, as affected by ambient air temperature, concrete temperature, pavement temperature, relative humidity, and wind velocity, is 0.2 lbs/ft² per hour or less as determined by Section 308 of the ACI Manual of Concrete Practice. Determine and document the atmospheric conditions, subject to verification by the Engineer. Clean-up operations after placement of Fiber-Reinforced Concrete and between loads shall insure that the truck is free of residual fibers.