

**4554200 – MIXING, PUMPING AND TESTING CEMENT GROUT  
COMMENTS FROM INDUSTRY REVIEW**

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**Comment**

Specification should follow normal CQC guidelines and include verification testing similar to concrete section 346. There have been many problems with this specification where it indicates contractor sampling and department testing. Contractor sampling and testing under an approved QCP would improve the end product and verification testing resolve acceptance issues.

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**Bob Hipworth**  
District 5 FDOT

**Comment:**

We need to make sure the CO ACIP software development team is aware of the proposed revisions to this ACIP portion of the 455 spec. The latest ACIP software being developed, and likely the associated ACIP pilot training course, reflect the current spec 455 (2x2 cubes and 18-14 sec testing). I've cc'd Sastry & Tom on this reply. So, hopefully this is something CO & MO are working together on. I don't have particular comments regarding the spec 455-42 changes, except:  
I'm not sure if the 21 sec minimum on the flow test is reasonable or not (possibly the 18-20 sec grout was considered too fluid, etc.?). In my opinion, the ACIP Contractors (ex. Ebsary, etc.) should be contacted/included on these type of developments, as we have done during the recent spec changes, and associated ACIP software development efforts - it's good to get the reaction and input from their side of the fence, or in this case sound wall!

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**Ghulam Mujtaba**

**General Comment:**

The word “LOT” simplifies the sampling and testing quantity. In addition, all national standards such as ASTM & AASHTO use this terminology. In case if it is unnecessary to use the terminology “LOT” in FDOT Specification, in the beginning of the Specification, a general note should be included to indicate such a use for all materials.

## Specific Comment:

1. 455-43 Testing Cement Grout, Paragraph 1, Sentences 1 & 2  
The requirements for less than 50 yd<sup>3</sup> should also be included. The results of the test cylinders should be correlated with the results of cubes. Lower strength is expected when testing cylinders in comparison with cubes tests or in the plans cylinder test should be included in lieu of cube tests.
2. 455-43 Testing Cement Grout, Paragraph 1, Sentence 3  
Since the Department personnel are performing sampling and testing of the grout , it should be called QA, Verification, or IA samples
3. 455-43 Testing Cement Grout, Paragraph 1, Sub-item (a)  
Change “QC sample” to QA Sample”
4. 455-43 Testing Cement Grout, Paragraph 4, Sentence 2  
Change “QC, verification, or IA” to the “quantity represented by the sample”

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**Dan Haldi**  
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## Comments

The actual change looks good except for the following:

455-42: No range on the consistency will make more difficulty achieving a goal ... usually as loose as obtainable ... the likelihood of hitting 21 exactly and being acceptable. I suggest a target of 21 +/- 3 seconds ... "range" is customary or all other cementitious material uses.

Is 21 from a 3/4 inch orifice (prior) the same as from a 1/2 inch orifice (current)? Doesn't seem likely to me.

455-43: Why change sample to "QC" whenever other areas indicate "Acceptance". Traditionally QC and Acceptance have different uses and connotation. I suggest sample be deemed an Acceptance sample, since traditionally these are for pay and leave in-place. Acceptance samples generally over-rule QC samples.

Not included in current changes, but ideas of concern:

455-40, -41, -42 and -43: Many places conflicting terminology; IE: Fluidizer vs Fluidifier, Grout vs Concrete, QC vs Acceptance. I suggest choose one and be consistent. Proper term for coarse aggregate-less material is grout. ASTM C 937 et. al. uses "Fluidifier".

455-42: Should consider grout could be Ready-mix as well as Site-mixed. Current spec only discusses Site-mix procedures. Ready-mix incorporation is simple. I suggest: Change 2. by adding in front of current verbiage ... For Site mix, accurately measure all materials ....(all else remains same). Afterward, ADD ... For Ready mix follow Sections 346 and MM 9.2.

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### Comments

455-42: No range on consistency is difficult to achieve. I suggest retain a target range say 21 +/- 3 sec, customary of cementitious material usage. Furthermore ... Is 21 from a 3/4 inch orifice same as from a 1/2 inch orifice?

-43: QC sample is not compatible with Acceptance sample. Traditionally Acceptance samples are for pay ... QC for quality check.

-40, -41, -42, -43: Many places conflicting terminology, IE Fluidizer vs Fluidifier, Crout vs Concrete, QC vs Acceptance. Choose best and be consistent. Coarse Aggregate-less material is grout, ASTM C 937 et. al. uses Fluidifier.

-42: Consider Grout can be Ready-Mix and Site-Mix. Current only identifies with site-mix. Ready-Mix incorporation is simply ... CHANGE '2.' by ADDING in front of current verbiage ... "For Site-Mix", accurately measure ..., and afterwards ADD "For Ready-Mix follow Section 346 and MM 9.2 for batching sequence" etc.

End of Comments ... Thank-you.

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**Michael K. Epifano**  
Rinker Materials of Florida, Inc.

### Comments

1. 455-42. Mixing and Pumping Cement Grout.

Item 2. The batching methods described are inappropriate. The sentence, "The order of placing materials in the mixer shall be as follows: 1) water, 2) fluidifier, 3) other solids in order of increasing particle sizes." should be deleted.

Item 3. If the flow is to be stated as a minimum, suggest stating the minimum to be 24 seconds. This corresponds to the high end of the previous specification range as opposed to the prior target.

Suggest not deleting the reference to a flow cone with a "3/4 inch diameter outlet". Previously approved auger cast pile grouts have been designed for flows using the 3/4 inch diameter outlet. Flow cones typically have bolt on flanges for both 1/2 inch and 3/4 inch diameter outlets

2. 455-43. Testing Cement Grout

Grout testing procedures listed in the specification (4" x 8") cylinders are inappropriate for auger cast pile grouts. More appropriate compressive strength

test methods are ASTM C109, (2" x 2" cubes). Other applicable standards that reference ASTM C-109 cube testing include:

1. Concrete in Practice "What, Why & How? Grout" published by the National Ready Mixed Concrete Association (NRMCA).
2. ASTM C942 "Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory".
3. ASTM C939 "Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete". Note: reference to ASTM C109 for compressive strength.
4. ASTM C938 "Standard Specification for Proportioning Grout Mixtures for Preplaced-Aggregate Concrete".
5. FSTM 1-T 106 "Florida Method of Test for Compressive Strength of Hydraulic Cement Mortar."
6. AASHTO T-106 "Compressive Strength of Hydraulic Cement Mortar (Using 50 mm or 2 in. Cube Specimens.)"

It is our experience and recommendation that compressive strength determinations for auger cast pile grouts be performed via 2" x 2" cubes. Testing of auger cast pile grouts in any cylinder with an L/D of 2 can result in substantially lower strength when compared to cube specimens. The requirement for testing auger cast pile grouts in 4"x 8" cylinders will lead to lower compressive strength measurements that will have to be offset by a considerable increase in total cementitious content on a per yard basis.

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