

3460000 PORTLAND CEMENT CONCRETE  
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

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Comment: (10-29-10)

Looks good except that the automated slump test provision might be premature since this technology is still developmental and it may be wise to leave it out until we are more certain of its reliability

Response: Language related to automated slump system will be removed from 346 until such time that we have more data on the technology.

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Bill Sears  
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Comments: (11-15-10)

In Section 346-8 it does not make any sense to reject the truck when the slump monitor did its job correctly. For example, when the slump monitor reads 8" and the target is 6", you perform a slump test and rejected a load of 8" slumped concrete. You also do not accept any future loads delivered by the rejected truck until the slump monitoring system is repaired or is turned off. Why reject the truck when the slump monitoring system was correct and verified as correct from the slump test? Suggest adding a sentence that anytime the slump is checked on the jobsite and is found to be more than 1" different than indicated on the slump monitoring system, the truck shall be rejected and do not accept any new loads delivered by the rejected truck until the automated slump monitoring system is repaired or is turned off. Section 346-8 When a truck using an automated slump monitoring system is not within 1 inch of the system target slump, perform a slump test. Reject concrete not meeting the specified tolerance. Do not accept any new loads delivered by the rejected truck until the automated slump monitoring system is repaired or is turned off.

Response: Language related to automated slump system will be removed from 346 until such time that we have more data on the technology.

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Bill Sears  
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Comments: (11-16-10)

In Section 346-8, reference is made to trucks with automated slump monitors. Since slump monitors are not required, suggest not addressing them in the specification. The inspectors should not look at them when performing their duties. They are only there for the convenience of the supplier and are not maintained or calibrated. Suggest the following be omitted from the specification section 346-8: When a truck using an automated slump monitoring system is not

within 1 inch of the system target slump, perform a slump test. Reject concrete not meeting the specified tolerance. Do not accept any new loads delivered by the rejected truck until the automated slump monitoring system is repaired or is turned off.

Response: Language related to automated slump system will be removed from 346 until such time that we have more data on the technology.

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Comments: (11-16-10)

The second sentence refers to the concrete temperature being below 45 F. This makes little sense since the concrete as it hydrates produces heat and I have never seen it that cold. I would restore the original sentence in this case.

Response: Changed first sentence in the subarticle for clarity. The thought has been combined into the first sentence for placement and mixing and the requirement for both is the air temperature.

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Comments: (11-18-10)

The way Table 1 under "Extremely Aggressive Environment" is displayed, Precast Box Culvert would require Type II (MH). If you could please clarify this change for me.

Response: All structural concrete in extremely aggressive environments will require Type II (MH) cement due to changes in AASTHO M 85 and ASTM C 150.

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William E. (Ed) Ellis, Jr.  
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Comments: (12-3-10)

I note that for mass concrete and Extremely Aggressive Environments, this proposed change stipulates Type II(MH) cement. The requirements for Type II(MH) cement include a maximum Heat of Hydration of 70 cal/g (290 kJ/kg) at 7 days. I would comment that I am not aware of a cement producer in Florida whose normal production Type I/II cement is reported to have a Heat of Hydration less than 70 cal/g. The existing requirement is for 80 cal/g, and this is the normal production used today. A change to 70 cal/g would entail substantial reformulation of cement production (and quite possibly significantly change the strength-gaining properties of cement, particularly at early ages). This would also likely substantially alter concrete production, in that the Type II(MH) cement would generally have to replace other types of cement in typical

concrete plants with one cement silo, for the duration of placement of mass or Extremely Aggressive Environment concretes. I would recommend leaving in place the current requirement for Heat of Hydration

Response: The 70 cal/g is an optional requirement in AASHTO M 85 or ASTM C 150. This option is not required by FDOT in Section 921.

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Comments: (12-8-10)

1. 346-2.2: Recommend Table 1 have a footnote (stronger indicator) that ALL concrete will have Pozzolan / Slag incorporation, in addition to statement in 346-2.3. Suggest “Pozzolans are required in all concrete mix designs.”

Response: No change made. The language is in active voice. The suggested revisions are passive and do not add any additional value to the current revision which requires pozzolans in all structural concrete.

2. 346-2.2: Will previously approved mix designs using Type II cement need re-trialed with Type II (MH) or will a substitution be allowed?

Response: The District Materials Office Concrete personnel will evaluate the mix designs on a case by case basis for extremely aggressive environments and coordinate with the State Materials Office for mix design revisions, if needed. We anticipate no re-trials to be needed.

3. 346-2.3: Section (1)c: Suggest the following adding “Fly Ash and Slag” for consistency with 1(a) and (b). See proposed change highlighted below:

c. ~~Slightly and Moderately Aggressive Environments~~ **Fly Ash and Slag**- Ensure that there is at least 20% fly ash by weight and 40% portland cement by weight for mixes containing portland cement, fly ash and slag.

Response: Change made.

4. 346-2.3: Section ( 4 )b Capitalization of environmental classification is not consistent with Section (3).

Response: Change made.

5. 346-2.3: Section (4)c: Suggest the following adding “Fly Ash and Slag” for consistency with 4(a) and (b). See proposed change highlighted below:

c. ~~As an option for Slightly Moderately Aggressive Environments~~ **Fly Ash and Slag** -

Ensure that there is at least 20% fly ash by weight and 40% portland cement by weight for mixes containing portland cement, fly ash and slag.

Response: Change made.

6. 346-3.2.1: See proposed changes highlighted below:

The Engineer may require a new slump loss test in the event that the ambient temperature changes more than plus or minus 15°F, the environmental conditions change or the volume increases. 10°F from the recorded slump loss data. If an adjustment to the admixture dosage is required, then a new slump loss test will be required.

Response: Changed 15°F to 10°F. No change made to the proposed language for admixture dosage due to current language already addressed admixture dosage changes.

7. 346-3.2.1 (1): See proposed changes in highlighted below:

(1) Begin all elapsed times when water is initially introduced into the mixer. Ensure that the initial slump is between 8.5 inches to 10 9.5 inches.

Response: No change made. See response to Jeff O'Leary's comment regarding slump range.

8. 346-3.2.1 (3): See proposed changes highlighted below:

(3) Ensure that the mix is at least 3 cubic yards and is mixed in a truck mixer with a valid mixer identification card.

Response: Change made.

9. 346-4.1: See proposed changes highlighted below:

346-4.1 Master Proportion Table: Proportion the materials used to produce the various classes of concrete in accordance with Table 3: using 3% air.

Response: No change made. This is not applicable to Section 346.

10. 346-4.2.2 Certification: Recommend this section remain.

Response: No change made. This language was not deleted, but moved from Section 346 to Materials Manual 9.2 Volume II.

11. 346-4.2.32 Control Level for Corrective Action: See proposed changes highlighted below:

If chloride test results exceed the limits of Table 4, suspend concrete placement immediately for every mix design represented by the failing test results, until corrective measures are made. Treat all concrete represented by the failing test as a defective material, in accordance with 6-4. Perform an engineering analysis to demonstrate that the

material meets the intended service life of the structure on all concrete represented by the failing chloride test results. Supply ~~this information the engineering analysis to the Engineer~~ within 30 business days of the failing test results from a Professional Engineer, registered in the State of Florida and knowledgeable in the areas of corrosion and corrosion control.

Response: No change made. Defective Material as defined by Section 6 applies to material that is bad enough to be removed and replaced. The EAR in this subarticle determines the service life loss.

12. 346-5 Table 5: Suggest adding “(for water to cementitious materials calculations)” after “Early Sampling of Fresh Concrete from Revolving Drum Truck Mixers or Agitators.”

Response: No change made. The language as shown is the title of the FM.

13. 346-5 Table 5: FDOT should be determining which size cylinders are being used. Some specifications reference 346 (i.e., 353, 547) that need certain size molds for proper test values. Suggest proposed change in black below:

**\*\*Use 4 x 8 or 6 x 12 inch cylinders for determination of the compressive strength *as directed by the Engineer.***

Response: No change made. Quality control determines the size of the cylinders and the Department matches QC.

14. 346-6.3: See proposed changes highlighted below:

Verify batch weights are within the required limits of the mix design ***daily at the end of concrete placement. Suspend production if*** ~~Reject any~~ concrete not within the required limits. ***Do not place the mix design until the Engineer approves corrective action.***

Response: Deleted new language from 346. This verification of the mix design limits will be added to future changes of Materials Manual 9.2 Volumes I and II at a later date.

15. 346-7.4: See proposed changes highlighted below:

346-7.4 Concreting in Cold Weather: Do not mix concrete when the air temperature is below 45°F ~~and falling~~. Do not place.....

Response: Change made.

16. 346-7.7: See proposed changes highlighted below (last sentence):

Include water missing from the ~~saddle~~ **water storage** tanks upon arrival at the project site in the jobsite water added.

Response: Change made.

17. 346-7.8 (d): Recommend changing the temperature to 10 F degree. A fifteen degree tolerance leave a 30 degree range which is too wide as it covers all seasons.

Response: Changed 15°F to 10°F.

18. 346-8, 8th paragraph: Most placement operations are 1 day; so we recommend suspending operations when 3 loads in one day are outside tolerances.

Response: No change made. This language is intended to address repeated consistency issues. We would only be testing 3 loads in one day on a large placement so this language would not normally cover small placements. Small placements would not be reviewed for repeated consistency issues.

19. 346-9.1: (1<sup>st</sup> paragraph) 6x12 or 4x8 language not needed, repeat from 346-5.

Response: Change made.

20. 346-9.1 last sentence: QC cylinders should be same as VT (Department) ... not vice versa, some spec section that reference 346 need 6x12, [see 353, 547, MM 8.4 SCC, etc.]

Response: No change made. QC determines the cylinder size and the Department matches QC. Section 547 is a TSP which requires Verification testing only. Section 353 and Materials Manual 8.4 Volume II do not specify a cylinder size. By referencing Section 346 requirements, 4"X8" or 6"X12" cylinders are allowed in both cases. Most laboratories prefer the use of 4"X8" cylinders because the smaller size causes less wear and tear on the compressive strength testing equipment, especially with high strength concrete.

21. 346-11.6.2 and -11.6.3: The font used in the equations makes the multiplication sign look identical to the variable "x" representing the number of days. Suggest removing the multiplication sign (second x) as it is implied.

Response: Change made. Xs were removed from formula.

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Comment: (12-13-10)

Specification Article 346-8 has addressed automated slump monitoring system without any description of the test method or its correlation with ASTM C 143 test method. I recommend that the test method should be included or referenced in 346-8.

Response: Language related to automated slump system will be removed from 346 until such time that we have more data on the technology.

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Comment: (12-13-10)

1. 346-2.3 now requires fly ash or slag materials as a cement replacement in all classes of concrete. In (4) d, it states that, “Class I and Class II concrete, excluding Class II (Bridge Deck), are not required to meet the minimum fly ash or slag requirements.” Is this a conflict? Are they allowed to have no fly ash or slag?

Response: No change made. This was changed to apply to slightly and moderately aggressive environments and was part of the remove restrictions changes made in previous revisions to Section 346. These classes are required to have fly ash and slag, but do not have to meet the minimum amount. As long as they have some fly ash or slag and they do not exceed the maximum amount, they meet the requirements.

2. 346-3.2.1 Slump Loss Test Requirements:

“The Engineer may require a new slump loss test in the event that the ambient temperature changes more than plus or minus 15 F, the environmental conditions change or the volume increases.”

The addition of the word “ambient” clarifies which temperature this refers to, but the “may” implies that the Engineer may not require a new slump loss test if the ambient temperature only changes 14F. This section needs further modifications. The slump loss data depends on a lot of different variables and in many cases is no longer valid before the ambient temperature reaches +/- 15F.

Response: Changed to 10 degrees. The language that it is optional to require a new slump loss remains.

3. 346-4.2 Chloride Content Limits for Concrete Construction:

~~“Ensure that the chloride content of all produced reinforced concrete does not exceed the maximum allowable limits specified in Table 4. When the source of any component material, including admixtures, for the concrete is changed, sampling for chloride determination shall restart the first day of production of the mix with the new component material.~~

~~Ensure the chloride test results from the testing lab are submitted to the concrete production facility within fourteen calendar days.”~~

Why was this language, which did not have to do with certification, also removed? It is difficult to comment on what was removed without knowing what was added in Materials Manual 9.2.

Response: No change made. This language was not deleted, but moved to Materials Manual 9.2 Volume II which speaks to the Producer. The Industry Review for Materials Manual 9.2 Volume II has been completed.

#### 4. 346-6.3 Delivery Certification:

“Verify that the chloride test results on the delivery ticket meet the requirements of Table 4.”

If the chloride results are being removed from the tickets, this statement needs to also be removed.

Response: Chloride certifications have not been removed from the delivery ticket. The language was moved to Materials Manual 9.2, Volume II.

#### 5. 346-7.3 Mixing at the Site:

“Include provisions in the QCP for the mixing at the site. Use a mixer of sufficient capacity to prevent delays that may be detrimental to the quality of the work. Ensure that the accuracy of batching equipment is in accordance with requirements of this Section.”

This section is still vague. It is confusing what is meant by this section, what is allowed, and what isn't.

Response: No change made. The language is intended to be applied for many different types of applications, from a small mixer on the jobsite to possibly a full blown concrete plant. Each application will have to be assessed individually to ensure that the material produced meets 346 and the application requirements.

#### 6. 346-7.4 Concreting in Cold Weather:

“Do not mix concrete when the air temperature is below 45°F and falling.”

The requirement to take the ambient temperature in the shade, and away from artificial heat has been removed. Was this done intentionally? Should this still be a requirement?

Response: Changes made to clarify language based on earlier comments. First sentence now includes mixing and placement below 45°F and falling.

7. 346-8 Plastic Concrete Sampling and Testing: (8<sup>th</sup> paragraph)

“Suspend production when any five loads in two days of production of the same design mix are outside the specified tolerances.”

Why was the suspension for 3 loads on one day removed? After 3 consecutive loads, I would think production should be suspended. How will the 5 loads for a mix be kept track of? If this is for more than one project, I would think this is a producer responsibility and may need to be in the Materials Manual.

Response: No change made. This language is intended to address repeated consistency issues. This language would apply on a contract basis.

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Comments: (12-13-10)

1. 346-4.2.32 Control Level for Corrective Action:

If chloride test results exceed the limits of Table 4, suspend concrete placement immediately for every mix design represented by the failing test results, until corrective measures are made. Perform an engineering analysis to demonstrate that the material meets the intended service life of the structure on all concrete represented by the failing chloride test results. Supply this information within 30 business days of the failing test results from a Professional Engineer, knowledgeable in the areas of corrosion and corrosion control.

1a. We would like better clarification on what type of engineering analysis.

Response: No change made. Clarification is as follows: the engineering analysis would be for every element type exposed in the same moderate or aggressive chloride environment. This is basically a calculation of time to failure of the elements based on the cover, higher internal chloride, and permeability of concrete indicating that the element will not corrode before the 75 year design life. When an engineering analysis is needed, the State Materials Office Corrosion and Materials Durability section coordinates the engineering analysis requirements with the producer and the project personnel of all projects affected.

1b. Need better clarification on what is “all concrete represented by the failing.....”. Is this all concrete from the mixes listed on the test report? Is it from the date of sample or from the date of the test results?

Response: No change made. Clarification is as follows: a single chloride test report can represent multiple mix designs using the same basic material components, so all concretes placed represented by the last passing chloride test would be expected to be covered by the engineering analysis.

## 2. 346-6.3 Delivery Certification:

*..... Verify batch weights are within the required limits of the mix design. Reject any concrete not within the required limits*

This needs to be changed or removed. There is no latitude given and loads that were just slightly out of tolerance would have to be rejected. Procedures for out of limit weights are covered by other standards (9.2.6.5), and this requirement is contrary to this other standard. Current Materials Manual requirement; 9.2.6.5 Batching Accuracy The failure to maintain batching operations of the plastic concrete within the tolerance for each component material requires immediate investigation and corrective action by the concrete producer. A failure to immediately investigate and implement corrective measures may be cause for suspension of the QCP. If there was an insistence to add a sentence about the weights, then maybe it should just state wording similar to 9.2.15: “Verify the recorded information is compliant with the approved design mix”.

Response: Deleted new language from 346. This verification of the mix design limits will be added to future changes of Materials Manual 9.2 Volumes I and II at a later date.

## 3. 346-7.4 Concreting in Cold Weather:

*Do not mix concrete when the air temperature is below 45°F and falling. Mix and Do not place concrete when the air concrete temperature in the shade, and away from artificial heat, is below 450 °F and rising.*

Since there is no longer guidance for what air temperature we can resume mixing and placing, shouldn't we either remove the air temperature restriction, or remove the phrase “and falling”?

Response: Changes made to clarify language based on earlier comments. First sentence now includes mixing and placement below 45°F and falling.

## 4. 346-8 Plastic Concrete Sampling and Testing:

*..... Remove the mixer identification cards when a truck mixer is discovered to be in noncompliance with the mixer card deficiencies. When the mixer identification card is removed for noncompliance, make note of the deficiency or deficiencies found, and forward the card to the District Materials and Research Engineer that has Producer QC Plan acceptance authority.*

As noted in review of Material Manual 9.2- The change from “may remove” to “remove” does not allow latitude for any issue other than a non-working counter. This will only result in

additional project delays and result in additional demand on FDOT personnel to visit the assigned plant to re-inspect the truck. With the current method of noting deficiencies on the DOT card the FDOT inspector can allow a minor repair without need to mail the card off, such as if a rating plate became unattached from the vehicle, a pinched water sight tube, other minor, easily repairable issue that does not affect the quality of the concrete after repair on subsequent deliveries.

Response: Changed to address deficiencies that can be repaired on the site.

5. Also, what does the term “with the mixer card deficiencies” mean? The wording in Materials Manual 9.2.9.3 (5<sup>th</sup> paragraph) states this similarly, but without this phrase. This should be reworded to match the 9.2.9.3 wording.

9.2.9.3 **Truck Mixers**

The Contractor will remove the identification cards when a truck mixer is discovered to be in noncompliance. When the identification card is removed for noncompliance, the Contractor shall note the deficiency on the identification card and forward.....

Response: No change made. Change to 346 language should clarify if a mixer identification card should be removed or not.

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Comment: (12-16-10) 1. **346-2.2 Types of Cement:** Unless a specific type of cement is designated elsewhere, use Type I, Type IP, Type IS, Type II, *Type II (MH)* or Type III cement in all classes of concrete. *Use Type II (MH) for all mass concrete elements. Will this be designated on the mill certification.*

Response: Yes it will.

2. **346-4.2.1 General:** Use the following maximum chloride content limits for the concrete application and/or exposure environment shown: *Should there be a statement that it is tested per M.M. 9.2 Volume II.*

Response: No change made. Contractors are required to use a concrete production facility in compliance with Materials Manual 9.2 Volume II per Section 105. By requiring this, there is no need to mention to the Contractor any of the producer requirements from Materials Manual 9.2 Volume II. We are working to remove all producer language from Section 346 and speak only to Contractor requirements in Section 346.

3. *Verify batch weights are within the required limits of the mix design. Reject any concrete not within the required limits. What required limits is this talking about and should we have the inspectors rejecting the load or should they notify the plant to give them a chance to correct the issue and should the inspector notify the District Materials Office*

Response: Deleted new language from 346. This verification of the mix design limits will be added to future changes of Materials Manual 9.2 Volumes I and II at a later date.

4. 346-7.8 - Develop a comparative sampling correlation between the discharge of the mixer and the end of the pump line for slump and air results. *From five different loads, obtain five one samples from the discharge of the pump line using the full length of pump line and five one samples from the discharge of the mixer. Obtain one sample from each location for each load. Average the five samples from each sample location and compare the two averages to establish the comparative sampling correlation. Ensure the plastic properties of the concrete sampled from the pump line are within the target tolerance range. This can't be done if your using a pump truck to place the concrete in the shaft.*

Response: No change made. The State Materials Office will research plastic property effects from the pumping process. The language will remain as is for now. The State Materials Office and District Materials Offices will discuss the pump truck scenario to determine how to apply the sample correlation.

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Jeff O'Leary  
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Comment: (12-21-10)

**1. 346-3.2.1:** The 15°F ambient temperature change will require multiple slump loss test to be performed on each mix. A 60°F range will certainly require 2 tests, and that is if the resultant +/- 15°F range for the tests do not overlap or have a gap. Why is this necessary?

Response: Changed 15°F to 10°F based on other comments. The language allows for the Engineer to request a new slump test if the conditions that were in place during the original slump test have changed enough that the results may not be applicable.

**2. 346-3.2.1 (1);** What is the technical support for the 8.5" minimum initial slump? What about an 8" or 7.5" initial slump?

Response: Changed to initial slump not to exceed 10" with no lower end to the range. It will be up to the producer and the contractor to determine the minimum slump.

**3. 346-3.2.1 (2);** This section, which allows a 90°F mix to be used at lower temperatures, contradicts the previous section calling for a retest when the temperature changes 15°F.

Response: No change made. This is not a contradiction. The slump loss is not required to be rerun if the Engineer does not request it or if the lower temperature does not require any admixture adjustments.

**4. 346-4.1 (Table, note 2):** The 752 lbs/cy limit will prevent achieving the surface resistivity required in section 3.1 (d) and the w/c ratio in Table 3 for drilled shaft.

Response: No change made. 346-3.1 (d) does not apply to Class IV Drilled Shaft. The

maximum amount for the cement is needed to address heat issues in mass concrete. The footnotes will not typically apply to drilled shaft operations. It would be more likely that with drilled shaft mass concrete with high cementitious content, there will be issues with very high heats.

**5. 346-6.3:** The delivery ticket is to certify the materials/properties of the concrete delivered. Requiring a test result from a previous delivery (ie chloride test result) is not appropriate. As with mill certification of cementitious materials, gradations of aggregates, previous strength results, etc. a previous chloride content should not be included on the delivery ticket.

Response: No change made. The chloride test result on the delivery ticket should be representative of the chloride tests run for that mix design (or every mix design if the mix design with the highest cementitious materials content option is used).

**6.** Rejecting a load or possibly a few loads in the middle of a placement simply because the weight of a material is 0.1% out of a limit is ridiculous. Allow for some provision to evaluate the batch weights after a placement (or end of the day) or allow for a tiered system. Limits are good, but common sense needs to be practiced. Also, I believe this should be addressed in a more appropriate section/document.

Response: Deleted new language from 346. This verification of the mix design limits will be added to future changes of Materials Manual 9.2 Volumes I and II at a later date.

**7. 346-7.7:** The term “saddle tank” is not correct. Fuel tanks are considered saddle tanks, (ie semi tractors with tanks on both sides that are connected). Use “water tank”.

Response: Change made based on previous comments.

**8. 346-8:** The automated slump monitoring system utilizes the hydraulic pressure, which is shown on the pressure gauge. If an automated water addition system, which appears to be what this section is addressing, is allowed to be used to indicate the actual slump, then why not allow the pressure gauge currently present on almost all trucks?

Response: Language related to automated slump system will be removed from 346 until such time that we have more data on the technology.

**9.** This section appears to allow the slump meter to be used in some fashion for more than internal use by the producer. Since a slump test is the only method to determine the slump of any batch of concrete, a slump indicating system shall not be considered nor addressed in 346. If a producer wants to use various methods to achieve a specified slump, then so long as the water used can be recorded, the final slump is always to be tested.

Response: Language related to automated slump system will be removed from 346 until such time that we have more data on the technology.

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