

3460000, Portland Cement Concrete  
Response to Comments From Industry Review

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John Previte

Comments:

346-2.5, line 3: Proposed change from 'Engineer' to 'Department'? 'Engineer' is correct. See definition p. 5 of Spec Book.

Response: The Department is correct. The approval for admixtures should be done by the District Materials Office, not the Project Administrator. No change made.

346-2.5.3.1, line 6: Proposing to remove definition of 'HRWR'-need to insert in 346-3.4, line 5.

Response: The definition is not removed. It has been reworded and clarified. HRWR is not used due to removal of acronyms from the specifications. 346-3.4, line 5 acronym removed.

346-2.5.3.2, line 5:

Do we mean 'The maximum allowable difference between the *standard sizes of aggregates distribution* is less than...'?

Response: No. This sentence pertains to the aggregate distribution within the concrete when performing ASTM C 1610. No change made.

346-3.2 (4), last sentence: Do we mean: 'Agitate *the* mixer when *the concrete* is not being mixed'?

Response: Change made.

346-3.2 (5), last sentence: Do we mean: 'Verify that the *water/cement to cementitious material* ratio and *other* delivery ticket data meet ~~s-~~ the design mix requirements'?

Response: The correct term is water to cementitious material. Other will be added.

346-3.3, line 9:

The Specialty Engineer shall select the concrete design mix proportions that will generate the lowest maximum temperatures possible to ensure ~~the~~ that a 35°F differential temperature *between concrete core and exterior surface* is not exceeded. *The mass concrete maximum allowable temperature is 180°F. If either the differential temperature or maximum temperature is exceeded, event occurs, the Specialty Engineer shall be available for immediate consultation-immediately consulted.*

Response: Change made for everything except Specialty Engineer. The language as proposed changes the requirement from the Specialty Engineer to the Department.

346-3.4, line 5: Insert definition of HRWR followed by '(HRWR)'

**Response:** Acronym removed.

346-4.2.3, Proposed change from 'Specialty' to 'Professional'? 'Specialty' is correct. See definition p. 7 of Spec Book.

**Response:** Based on the definition in page 7, the Specialty Engineer is not correct for this section. No change made.

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### Henry Haggerty

#### **346-1 Description.**

Use concrete composed of a mixture of portland cement, aggregate, water, and, where specified, admixtures, pozzolan and ground granulated blast furnace slag. Deliver the portland cement concrete to the site of placement in a freshly mixed, unhardened state.

Obtain concrete from a plant that is currently on the list of Producers with accepted *Accepted* Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3. If the concrete production facility's Quality Control Plan is suspended, the Contractor is solely responsible to obtain the services of another concrete production facility with an approved *accepted* Quality Control Program *Plan* or await the re-approval *acceptance* of the affected concrete production facility's Quality Control Plan prior to the placement of any further concrete on the project. There will be no changes in the contract time or completion dates. Bear all delay costs and other costs associated with the concrete production facility's *Quality Control Plan* approval *acceptance* or re-approval *acceptance*.

**Comment:** 105-3.3 requires Prestressed and/or Precast Concrete Products and Drainage Products have an accepted Quality Control Program. 105-3.6 Producers Quality Control Plan is one requirement. If the facility's QC plan gets suspended, the contractor needs to find another producer on the Accepted Quality Control Programs list or wait until the producer's QC plan and therefore their program gets reinstated.

**Response:** Precast concrete production facility QC plan requirements are detailed in individual sections such as 449 for precast concrete drainage products. No change made.

**346-2.3 Pozzolans and Slag:** Use as desired, on an equal weight replacement basis, fly ash, silica fume, ultrafine fly ash, metakaolin, other pozzolans, and slag materials as a cement replacement in all classes of concrete, with the following limitations:

(1) Mass Concrete:

a. Fly Ash - ensure *Ensure* that the quantity of cement replaced with fly ash is 18% to 50% by weight, except where the expected core temperature is to rise above 165° F. When the core temperature is expected to rise above 165° F, . *In that case, ensure that* the percentage of fly ash is required to be 35% to 50% by weight.

b. Slag - ensure *Ensure* that the quantity of cement replaced with slag is 50% to 70% by weight. Ensure that slag is 50% to 55% of total cementitious content by weight of **total cementitious materials** when used in combination with silica fume, ultrafine fly ash

and/or metakaolin.

**Comment:** This is repetitive.

**Response:** Change made.

(4) For all other concrete uses not covered in (1), (2) and (3) above,

a. Fly Ash - ensure *Ensure* that the quantity of cement replaced with fly ash is 18% to 22% by weight.

b. Slag - ensure *Ensure* that the quantity of cement replaced with slag is 25% to 70% for Slightly and Moderately Aggressive environments, *environments* and 50% to 70% by weight when used in Extremely Aggressive environments. Ensure that slag is 50% to 55% of total cementitious content by weight of **total cementitious materials** when used in combination with silica fume, *ultra fine fly ash* and/or metakaolin.

**Comment:** This is repetitive.

**Response:** Change made.

(6) Silica Fume, Metakaolin and Ultrafine Fly Ash: -

a. Cure in accordance with the manufacturer's recommendation and *as* approved by the Engineer.

**Comment:** This section discusses requirements for pozzolans and slag (raw materials). Why is there a curing requirement in this section?

**Response:** Moved note (a) to end of subarticle so raw material requirements are discussed before curing requirement when using the raw materials.

**346-2.5 Admixture Requirements:** ~~Use Admixtures~~ *admixtures* will meet the requirements of this *in accordance with the requirements of this* subarticle. Chemical admixtures not covered in this subarticle may be approved by the ~~Engineer~~ *Department*. Submit statistical evidence supporting successful laboratory and field trial mixes which demonstrate improved concrete quality or handling characteristics.

**Comment:** Why was this changed to Department? Engineer seems to make more sense.

**Response:** The Department is correct. The approval for admixtures should be done by the District Materials Office, not the Project Administrator. No change made.

**346-2.5.3.1 General:** *When a high range water reducing admixture is used, meet the requirements of a Type F or Type I. When a high range water reducing and retarding admixture is used, meet the requirements of a Type G or Type II. Do not use Type I, II, F or G admixtures* The Contractor may propose the use of a Type F or G admixture, meeting the requirements of Section 924, in all classes of concrete, except for concrete used in drilled

shaftshaft concrete. The use of High Range Water Reducing (HRWR) admixtures in concrete mixes incorporating *When silica fume or metakaolin is incorporated into a concrete mix design, the use of a high range water reducing admixture Type I, II, F or G is mandatory.*

**Comment:** Water-reducing admixture above has the dash. Is there no dash when referring to high range water reducing or high range water reducing and retarding admixture?

**Response:** Change made in all cases of wording.

### **346-2.5.3.2 Flowing Concrete Admixtures for Precast/Prestressed**

**Concrete:** Use a Type I, or Type II, *F or G* admixture, meeting the requirements of Section 924, for producing Flowing *flowing c*Concrete. *If Type F or G admixture is used, verify the distribution of aggregates in accordance with ASTM C 1610 except allow for minimal vibration for consolidating the concrete. The maximum allowable difference between the aggregate distribution is less than or equal to 15 percent.* Produce flowing concrete mix with target slump of 9 inches. The use of flowing concrete admixtures is limited to the construction of precast/prestressed concrete products. Add the flowing concrete admixtures at the ready mixed concrete production batch plant/facility.

~~**Submit the proposed flowing concrete mix design and test data as specified herein and in Materials Manual Section 9.2 of the Materials Manual.**~~

**Comment:** There is now no longer reference to Materials Manual 9.2 in this Specification. I realize this requirement is in 105-3.2 Compliance with the Materials Manual. It states "Producers of Portland Cement Concrete shall meet the requirements of Section 9.2, Volume II of the Department's Materials Manual, which may be viewed at the following..." This seems to require all concrete to meet 9.2 requirements including non-structural and drainage. Is this the case?

**Response:** No. 105-3 specifies that only structural concrete requires Materials Manual 9.2 Volume II. We will include the word Structural in 105-3.2 with the link to Materials Manual Volume II to clarify.

**346-3.1 (fe)** When precast box culverts or precast drainage products require a Class III concrete, the minimum cementitious materials will be 470 lb/yd<sup>3</sup> and the target slump and air content range shall meet the requirements for a Class II concrete and note (a) above *the target slump will not apply.*

**Comment:** Minimum cementitious materials is discussed in Table 3. Why is this here? Target slump doesn't apply and the air content requirement for a Class II is n/a. It seems like this whole note could go away.

**Response:** Note (e) revised for clarification. It cannot be deleted because it is referenced in the Table for Class III concrete and deleting it will delete the exception to the table requirements it is allowing.

**346-3.2 Drilled Shaft Concrete:** When drilled shaft concrete is placed in any wet shaft, provide concrete in accordance with the following specified slump loss requirements. **Ensure that drilled shaft concrete has a target slump between of 78.5 inches and 9.5 inches when placed** and maintains a slump of 4 5 inches or more throughout the drilled shaft concreting *concrete* elapsed time. ***Maintain target slump by testing each load of concrete.***

Ensure

that the slump loss is gradual as evidenced by slump loss tests described below. The concrete elapsed time is the sum of the mixing and transit time, the placement time, and the time required for removal of any temporary casing that causes or could cause the concrete to flow into the space previously occupied by the temporary casing *and bolt/embedment installation.*

**Comment:** Concrete has a certain slump when placed. Its target slump doesn't change. It doesn't really have a target slump when placed.

**Response:** Deleted the sentence with the target slump and the following sentence since they are redundant and are intended to be used as part of the slump loss test procedure.

**Comment:** Does this mean that the Department won't allow drilled shaft concrete in the tolerance range to be placed? I think the intent of this sentence could be stated more clearly.

**Response:** Sentence reworded for clarification

### **346-3.2.1**

(4) Mix the concrete intermittently for 30 seconds every five minutes at the mixing speed of the mixer. ***Agitate mixer when not being mixed.***

**Comment:** Why was this changed? The mixer being stationary seems to more accurately represent the in place concrete in the shaft

**Response:** Sentence reworded for clarification based on other comments.

(5) Determine slump, concrete temperature, ambient temperature and air content at 30 minute intervals until the slump is 4-5 inches or less. Remix the mix for one minute at the mixing speed of the mixer before these tests are run. ***Verify the water to cementitious material ratio and delivery ticket meets the design mix requirements.***

**(6) Begin all elapsed times when water is initially introduced into the mix.**

**(7) Ensure that the concrete maintains a slump of at least 4 5 inches for the anticipated elapsed time.**

**Comment:** Shouldn't this be done prior to beginning the slump loss test? At step (3)?

**Response:** Steps reordered to match sequence in Slump Loss Guidelines.

**Comment:** I've seen confusion with the mixing time and the elapsed time even with this statement. Some people want to include the 30 seconds in the five minutes. Others mix for 30 seconds and then wait 5 minutes and then mix for 30 seconds again. This is also true for the 30 minutes and then one minute, but the overall effect isn't as great. I think this needs to be clarified.

**Response:** No change made. The specification as is defines the requirement as intermittently for 30 seconds every five minutes at the mixing speed of the mixer. The 30 seconds is not included in the five minutes.

**Comment:** 346-3.2 already states that the drilled shaft concrete will maintain at least a 5 inch slump during the elapsed time. Also, Step (5) states that the slump loss test will be performed until the slump is less than 5 inches. The slump is being determined. I don't think the contractor should be told to ensure the concrete maintains a certain slump. It sounds like we are instructing him/her to modify the concrete. It seems like (7) could be removed completely.

**Response:** Sentence in 346-3.2 removed since it is part of the procedure. We are not instructing the contractor to modify the concrete. We are specifying that he ensure the concrete is placed before the elapsed time elapses.

#### **346-3.3, 4th paragraph:**

The readings will begin when the mass concrete placement is complete and continue until the maximum temperature differential (**and not the maximum allowable temperature**) is reached and a decreasing temperature differential is confirmed as defined in the temperature control plan

**Comment:** It's already been stated that the maximum temperature isn't to be exceeded. The readings are monitoring the differential. We're not really requiring that both of these requirements be met. What happens if the maximum allowable is never reached?

**Response:** Agree. Removed the word maximum.

#### **346-3.4, 6<sup>th</sup> paragraph, last sentence.**

*Perform surface resistivity tests on the core samples or test cylinders at 28 days.*

**Comment:** In 346-3.1 (d), resistivity tests are required when silica fume, ultrafine fly ash, or metakaolin is required as a pozzolan in Class IV, Class V, Class V (Special), or Class VI concrete.

**Comment:** For precast/prestressed, this needs to be done for all classes? For SCC mixes, the Materials Manual just requires resistivity tests when it's required for the specific class of concrete.

**Response:** Yes it's needed for all classes of concrete.



### 346-3.4, 8<sup>th</sup> paragraph

*Upon the review and verification of the laboratory trial batch, field demonstration test data, inspection reports and contractor's certification statement, the Department will approve the proposed mix design*

**Comment:** What about for precast producers who want to get a mix approved without regard to a specific project or contractor? Shouldn't the mix design procedure be a part of the Materials Manual and the Specification require that the contractor follow the Materials Manual?

**Response:** Even though mix designs can be used for many projects, they must still be done in accordance with project specific requirements. No change made.

### Table 3 Notes

\*The calculation of the water to cementitious materials ratio (w/cm) is based on the total cementitious material including cement, silica fume, slag, fly ash, ultrafine fly ash, or metakaolin *and any supplemental cementitious materials that are used in the mix.*

\*\*When the use of silica fume or metakaolin is required as a pozzolan, the maximum **water cementitious** material ratio will be 0.35. When the use of ultrafine fly ash is required as a pozzolan, the maximum **water cementitious** material ratio will be 0.30.

**Comment:** water to cementitious

**Response:** Change made.

**346-4.2.1 General:** Use the following maximum chloride content limits for the concrete application or exposure environment shown:

**Comment:** and? We're not giving the choice to use concrete application or exposure environment. I guess it could be..."concrete application or concrete application and exposure environment shown:"

**Response:** Changed sentence to and/or since both conditions apply in some cases.

### 346-4.2.1, 2<sup>nd</sup> paragraph after Table 4

*Submit the chloride test results obtained from the testing lab within fourteen calendar days of concrete sampling.*

**Comment:** Is this to the Engineer? How does this apply to precast producers?

**Response:** It is intended for the contractor to ensure the results are received by the producer from the lab within the time frame. Wording changed to active voice to clarify.

**346-4.2.2 Certification: Certify for each mix design during mix design approval, as well as from the first day of production and every 30 calendar days or less thereafter to the**

**Department that all reinforced concrete produced *for the Department* meets the requirements of**

**this Section.** Section. Include in the certification all pertinent chloride test data. The Department will require properly executed certifications showing the chloride content within the required limits for acceptance of all concrete produced in accordance with these Specifications. Include all the chloride certificates that apply with the monthly certification of compliance **as required in Section 105-2** of these Specifications.

**Comment:** There is some confusion about chloride certification for precast producers. The stamp certifies that all DOT requirements have been met. Chloride results are obtained and then retained at the plant which Materials personnel inspect on a monthly basis.

**Response:** The two requirements are independent of each other. The Department has determined that it is necessary from a materials stand point to obtain the chloride results for all facility on each project. The contractors must ensure their producers comply regardless of the product. In addition the product acceptance requirements must be met. Chloride results are required on a monthly basis with certification for each project. This is independent from the precast product acceptance.

**Comment:** Is there a specific form that we are requiring?

**Response:** Yes, the example form is available on the SMO website.

### **346-4.2.3**

If chloride test results exceed the limits of Table 4, *suspend concrete delivery immediately for every mix design represented by the failing test results, until corrective measures are made.* reject *Reject* all concrete placed from the first *last* passing chloride test to the present, or perform *an* engineering analysis to demonstrate that the material meets the intended service life of the structure. In the event that an engineering analysis is proposed, supply this information within 30 business days *of the failing test results* **from a Specialty Professional Engineer registered in the State of Florida** and knowledgeable in the areas of corrosion and corrosion control. A written request for time to develop the engineering analysis may be provided to the Engineer; however, the Engineer has the sole option to accept or reject this request.

**Comment:** Did we do this to allow the EOR to do the analysis?

**Response:** No. The language is to ensure the engineer doing the analysis is qualified and has some degree of knowledge of chlorides. It would not be the EOR.

**346-6.3 Delivery Certification:** Ensure that an electronic *printed* delivery ticket is furnished with each batch of concrete before unloading at the placement site. The delivery ticket may be proprietary software or in the form of an electronic spreadsheet, but shall be printed. Ensure that the materials and quantities incorporated into the batch of concrete is *are* recorded on the delivery ticket. Include the following information on the Delivery Ticket:

**(1) Arrival time at jobsite,**

(2) Time that concrete mix has been completely discharged,

(3) Number of revolutions upon arrival at the jobsite,

(4) Total gallons of water added at the jobsite,

(5) Additional mixing revolutions when water is added,

(6) Total number of revolutions at mixing and agitating speed.

Items 3 through 6 do not apply to non-agitating concrete transporting vehicles.

Ensure the batcher responsible for production of the batch of concrete signs the delivery ticket, certifying the batch of concrete was produced in accordance with the Contract Documents.

**Sign the delivery ticket certifying that the maximum specified water to cementitious materials ratio was not exceeded due to any jobsite adjustments to the batch of concrete, and that the batch of concrete was delivered and placed in accordance with the Contract Documents.**

**Comment:** The requirements for the delivery ticket are already listed in 9.2. Is the arrival time at the jobsite required for precast producers?

This also doesn't apply to precast producers. The contractor doesn't sign off on the delivery ticket.

**Response:** If the concrete is delivered from a ready mix plant, a signature is needed. If not, the contract documents require the delivery ticket signature for certification purposes. The precast producer should sign as a sub for the contractor to certify that the concrete meets the requirements of the contract documents. No change made.

#### **346-6.4, Last sentence**

If the Contractor does not implement adjustments at the earliest possible time, the Engineer **will** reject the concrete and terminate further production until the Contractor makes corrections.

**Comment:** Why are we restricting this to a will? We usually state the Department's actions as a "may."

**Response:** Agree. Changed will to may.

**346-7.7 Adding Water To to Concrete at the Placement Site:** Perform an initial slump before the addition of water at the jobsite. *If the slump is delivered within the target range, no water will be added to the load. If the slump is outside the target range but is within the tolerance range, that load may be accepted, but water added at the site will be reduced to maintain a slump within the target range on successive loads.* After adjusting the slump, perform a test to confirm that the slump of the concrete is within the target range as defined in

Table 6. If the slump exceeds the target range but is within the tolerance range, that load may be accepted, but water added at the site will be reduced to maintain a slump within the target range on successive loads. If the slump is delivered within the target range, no water will be added to the load. Confirm with another test that the next load is within the target range **after the addition of water at the placement site**. Repeated incidents of concrete being placed outside the target range will result in revocation of that portion of the QCP. No concrete represented by plastic test results outside of the tolerance range will be accepted for placement.

**Comment:** At the site? or at the plant?

If water is added at the site (the concrete is on the dry side) and then the slump is out of target, but within tolerance (concrete is now on the wet side), then this sentence makes sense.

This is confusing. It makes more sense if this is at the beginning of the sentence or it could just be removed.

**Response:** Change made based on other comments.

### **346-7.8 c**

*Obtain all other samples from the discharge of the mixer delivering concrete to the pump. Ensure the plastic properties of the concrete being delivered to the pump are within **the comparative sampling correlation**.*

**Comment:** ...are within the plastic properties tolerances with the applied comparative sampling correlation

**Response:** Change made based on other comments.

### **346-8, 4<sup>th</sup> and 5<sup>th</sup> paragraphs**

Furnish sufficient concrete of each design mix as required by the Engineer for verification testing. When the Engineer's verification test results do not compare with the QC plastic properties test results, **within the limits defined by the Independent Assurance (IA) checklist comparison criteria**, disposition of the concrete will be at the option of the Contractor.

**If any of the QC plastic properties tests fails, reject the remainder of that load, terminate the LOT and notify the Engineer. Make cylinders representing that LOT from the same sample of concrete.**

**Comment:** Can the Specification indicate where this checklist can be found?

**Response:** Change made.

**Comment:** The location of where the failing concrete was placed needs to be recorded.

**Response:** Since it is the Department's responsibility to record the failing concrete location, this is not pertinent to the Specification. It should already be included in internal Department documents. No change made.

The Department **may will perform** Independent Verification testing at any time to evaluate the QC of the concrete *to verify compliance with specification requirements*. The comparison between the Independent Verification testing and the QC testing is identified in the IA Checklist Criteria. When a test does not compare, the Contractor will revise the QCP as deemed necessary by the Engineer. *When the Department's Independent Verification tests results do not meet the requirements of this Section, the Contractor will revise the QCP as deemed necessary by the Engineer.*

**Comment:** 346-9.2 and other references to IV tests states "may." Why was this one instance changed?

**Response:** Changed back to may.

**Comment:** I think this needs to be more specific. This isn't referring to the IA Checklist comparisons? It's just the IV's results?

**Response:** Language revised for clarification.

### **346-9 Acceptance Sampling and Testing.**

**346-9.1 General:** Perform plastic properties tests in accordance with 346-8 and cast a set of three QC cylinders (either 4 inch by 8 inch or 6 inch by 12 inch cylinders are acceptable), for all structural concrete incorporated into the project. Take these acceptance samples randomly as determined by a random number generator (acceptable to the Department). The Department will independently perform *verification* plastic properties tests and cast a set of verification cylinders. The verification cylinders will be the same size cylinder selected by the Contractor, from a separate sample from the same load of concrete as the Contractor's QC sample.

*The Department may perform inspections of the precast plants producing Class I and II concrete in lieu of plastic properties tests ~~for~~ For Class I and Class II concrete, excluding Class II (Bridge Deck) Class I and Class II concrete (excluding Class I Pavement and Class II Bridge Deck), the Department may perform inspections of the plants producing Class I and II concrete in lieu of plastic properties tests.*

**Comment:** We don't need to state Class I and Class II concrete twice. End the sentence with tests and incorporate the excluding Class II (Bridge Deck) earlier in the sentence.

**Response:** Change made based on other comments.

**Comment:** Did we mean to limit this to precast plants? If so, do precast producers use Class II Bridge Deck?

**Response:** Change made based on other comments.

**Test the QC laboratory cured samples for compressive strength at the age of 28 days, or any other specified age, in a laboratory meeting and maintaining at all times the qualification requirements listed in Section 105**

**Comment:** 346-5 Table 5 lists the method that must be followed to perform compressive strength tests. Is there or does there need to be a requirement that QC and VT use the same acceptable method to achieve planeness? If QC caps, saw-cuts, or uses neoprene pads, should VT use the same method? Could using different methods cause problems in the comparison criteria?

**Response:** Test method recognizes for all types mentioned. No change made.

The Department will average the QC compressive strength test data, *average the Verification compressive strength test data*, and compare this data to the averages of the Verification compressive strength test data and, ~~based~~ *Based* on this comparison value at 28 days, *the Department will determine if the Comparison Criteria as shown in Table 8 has been met. In the event that one set of compressive strength data for a set of cylinders falls outside the range of the other set of cylinders, use the lower Range of Average Compressive Strength to determine the comparison criteria.*

**Comment:** I would place this as the second sentence of this paragraph to explain the comparison criteria. Since the Department is averaging the test data, replace "use" with "the Department will use...as shown in Table 8. Based on this comparison, the Department will determine if the Comparison Criteria has been met."

**Response:** Change made.

### **346-9.2 Sampling Frequency for Quality Control Tests:**

As a minimum, sample and test concrete of each design mix for water to cementitious materials ratio, air content, temperature, slump and compressive strength *once per LOT* in accordance with these specifications *as defined by Table 9. The Engineer will randomly verify one of every four consecutive LOTs of each design mix based on a random number generator*, and may perform additional Independent Verification tests. All QC activities, calculations, and inspections will be randomly confirmed by the Department.

**Comment:** Does this apply to incidental precast concrete?

**Response:** For incidental precast Verification frequency is defined in Section 8.2 of the Materials Manual. This does not apply to incidental precast concrete.

**346-9.5 Resolution Procedure:** The Department may initiate an IA review of sampling and testing methods. The resolution procedure may consist of, but need not be limited to, a review of sampling and testing of fresh concrete, calculation of **water cementitious** materials ratio, handling of cylinders, curing procedures and compressive strength testing. *Core samples* of the hardened concrete may be required.

**Comment:** water to cementitious

**Response:** Change made.

*The resolution investigation will determine the strength test results for each of the four or less LOTS. When the QC strength test results are deemed to be the most accurate, the QC strength test results will represent the four or less consecutive LOTS and the Department will pay for the resolution testing and investigation. **When the verification strength test results are deemed to be the most accurate, the Contractor will pay for the resolution testing and the resolution investigation will determine the strength test results for each of the four LOTS.**the Department will assess a 5 percent reduction of payment for the quantity represented by the Resolution Investigation.*

**Comment:** Who pays for the resolution testing and investigation in this instance?

**Response:** The Contractor pays by means of assessing the payment reduction. In the case of the precast production facilities, when resolution favors the Department, the Department and the producer determine the final disposition of the element. In some cases we accept the element for a credit. No change made.

The results of the resolution procedure will be forwarded to the Contractor within five days *after completion of the investigation*. If the Department finds deficiencies based on the Contractor's QCP, the Engineer may suspend that part of the QCP. When the QC plan is suspended, submit corrective actions for approval of the **Engineer**. The Engineer may take up to five working days to review corrective actions to the QCP. The Engineer will not allow changes **to Contract Time** or completion dates. Incur all delay costs and other costs associated with QC plan suspension and re-approval.

**Comment:** to the Engineer

**Response:** Change made.

**Comment:** Previously wasn't capitalized (Contract Time).

**Response:** Contract Time was previously capitalized. No proposed changes made.

**346-9.6 Small Quantities of Concrete:** When a project has a total plan quantity of less than 50 yd<sup>3</sup>, that concrete will be accepted based on the satisfactory compressive strength of the QC cylinders. Provide certification to the Engineer that the concrete was batched and placed in accordance with the Contract Documents. **Submit a quality control plan for the concrete placement operation in accordance with Section 105.**

**Comment:** Is this referring to a section in the project's QCP or a separate QCP?

**Response:** This is referring to the project QCP.

**346-10.2 Determination of Structural Adequacy:** If core strength test results are less than 500 psi or 10%, whichever is greater, below the specified minimum strength, consider the concrete represented by the cores structurally adequate. If the core strength test results are more than 10% or 500 psi, whichever is greater, below the specified minimum strength, the Department will consider the concrete represented by the cores structurally questionable. Submit a structural analysis performed by the Specialty Engineer. If the results of the structural analysis **indicates** adequate strength to serve its intended purpose with adequate durability, and is approved by the **Department**, the Contractor may leave the concrete in place subject to the requirements of 346-11, otherwise, remove and replace the LOT of concrete in question at no additional expense to the Department.

**Comment:** indicate

**Response:** Change made.

**Comment:** Engineer

**Response:** Change not made.

**346-11.5 Core Strength Representing Equivalent 28 Day Strength:** For cores tested no later than 42 days after the concrete was cast, **the Engineer will accept** the core strengths obtained as representing the equivalent 28-day strength of the LOT of concrete in question. The Engineer will calculate the strength value to be the average of the compressive strengths of the three individual cores. The Engineer will accept this strength at its actual measured value.

**346-11.6 Core Strength Adjustments:** For cores tested later than 42 days after the concrete was cast, **the Department** will establish the equivalency between 28 day strength and strength at ages after 42 days based on test data developed by a Department approved testing laboratory to relate strength at the actual test age to 28 day strength for the particular class of concrete and design mix represented by the cores. Obtain such data at no additional expense to the Department. When such data is not available and cannot be produced, as determined by the Department, the **Department** will determine the equivalent 28 day strength by adjusting the tested core strengths according to the following relationship:

**Comment:** Engineer accepts the core strengths. It seems that the responsibilities in this section should also be for the Engineer.

**Response:** In this case, the Engineer is appropriate. Changes made.

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Review Comments:

1. 346-2.5.2 This shows that bridge deck belongs to the category of precast concrete.

**Response: Agree. Change made.**

2. 346-2.5.3 The title shows viscosity modifying admixture and there is nothing in the body of the section about this admixture.

**Response: Change made.**

3. 346-2.5.3.2 ASTM C 1610 does not use the terminology of “aggregate distribution”. The proper term is “static segregation”.

**Response: Change made.**

4. 346-3.1. Paragraph 2 The terminology “may be allowed” should be changed to “is allowed if approved by the engineer”.

**Response: Change made.**

5. 346-3.1, Paragraph 2 Change “the design strength and acceptance data” to “specified strength of the substituted higher class and the acceptance compressive strength test results”.

**Response: Change made.**

6. 346-3.1, (b) Add also Types I and II admixture.

**Response: Change made.**

7. 346-3.1, (e) The Table 2 does not require air content for Class II. Both, the air content and slump are not applicable.

**Response: Change made.**

8. 346-3.2.1, Paragraph 1, Last Sentence Change “using personnel” to “by personnel”.

**Response: Change not made. Sentence is clearer as is.**

9. 346-3.1.2, (5) Change “material” to “materials”, “delivery ticket” to “information on the delivery ticket”, and “meets” to “

: Change meet”.

Response made.

10. 346-3.3, Paragraph 2 Please verify if the temperature of 180° is safe. It may cause cracks. When fresh concrete is exposed to temperatures exceeding 150° that may cause a delayed ettringite formation.

Response: Change not made. More research is needed to change the requirement to 150.

11. 346-3.3, Paragraph 2 The “either event” should be explained that they are related to the maximum and differential temperatures.

Response: Change made.

12. 346-8, Paragraph 2 It has not been mentioned that who is removing the identification card. It should state that the Engineer will remove the identification card of noncompliant trucks.

Response: Change made. The Contractor should actually remove the card and forward to the DMRE.

13. 346-9, Paragraph 2 Bridge decks are usually cast-in-place, not precast. This paragraph is related to the precast concrete plant.

Response: Change made.

14. 346-9.6, Second to the Last Sentence Change the sentence to read “obtain the acceptance sample from the middle portion of the batch”.

Response: Change made.

15. 346-9.6, Last Sentence The provision is in conflict with the requirements of ASTM C 172, which requires the samples from the middle portion.

Response: Agree. Change made.

\*\*\*\*\*

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**Comments:**

1. In 346-3.2 it removes the slump range of 7 inches to 9.5 inches and replaces it with 8.5 inches as the target slump. Is there  $\pm$  range or should all concrete outside the 8.5 inch target be rejected?

**Response: The range is in Table 6. No change made.**

2. In 346-3.3 Mass Concrete is the Specialty Engineer be required to be on site during concrete placement?

**Response: No, the Specialty Engineer is not required to be on site, but a representative is required to be on site. The representative must be identified in the mass concrete plan.**

3. In 346-5 Table 5 in the notes don't the QC and VT need to use the same size cylinders weather it 4x8 or 6x12. You don't want one using 4x8 and the other using 6x12. It states in 346-9 that the VT should use the same size cylinders that are selected by the contractor. Should that be stated in both places?

**Response: Removed from notes in Table 5 because it is redundant to specification language requirement in 346-9.**

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**Comments:**

**346-1 Description.**

Use concrete composed of a mixture of portland cement, aggregate, water, and, where specified, admixtures, pozzolan and ground granulated blast furnace slag. Deliver the portland cement concrete to the site of placement in a freshly mixed, unhardened state.

Obtain concrete from a plant that is currently on the list of Producers with **accepted** *Accepted* Quality Control Programs. Producers seeking inclusion on the list shall meet the requirements of 105-3. If the concrete production facility's Quality Control Plan is suspended, the Contractor is solely responsible to obtain the services of another concrete production facility with an **approved a** *Accepted* Quality Control Program **Plan** or await the re-approval *acceptance* of

the affected concrete production facility's Quality Control Plan prior to the placement of any further concrete on the project. There will be no changes in the contract time or completion dates. Bear all delay costs and other costs associated with the concrete production facility's *Quality Control* **Plan Program** approval *acceptance* or **Quality Control Plan** re-approval *acceptance*.

**Correct spelling – change lower case p in Portland to capital “P”; it is a surname and deserves the respect.**

**Response:** The correct terminology is defined in AASHTO M 85 which uses a lower case p.

**346-2.3 Pozzolans and Slag:**

(1) Mass Concrete:

c. For Slightly and Moderately Aggressive environments - , ensure *Ensure* that there is at least 20% fly ash by weight and 40% ~~Portland~~ **portland** cement by weight for mixes containing ~~Portland~~ **portland** cement, fly ash and slag.

(3) Precast concrete – *Ensure that the precast concrete will have has* a maximum of 25% fly ash or a maximum of 70% slag. In **eE***Extremely aggressive environments, ensure that the precast concrete has a minimum of 18% fly ash or a minimum of 50% slag.*

b. Slag - ensure *Ensure* that the quantity of cement replaced with slag is 25% to 70% for Slightly and Moderately **Aa***aggressive environments, environments* and 50% to 70% by weight when used in Extremely **Aa***aggressive environments*. Ensure that slag is 50% to 55% of total cementitious content by weight of total cementitious materials when used in combination with silica fume, *ultra fine fly ash* and/or metakaolin.

c. As an option for Slightly and Moderately **Aa***aggressive environments* ensure that there is at least 20% fly ash by weight and 40% ~~Portland~~ **portland** cement by weight

for mixes containing ~~Portland~~ *portland* cement, fly ash and slag.

**Response:** Changes made except for portland.

**346-2.4 Coarse Aggregate Gradation:** Produce all concrete using Size No. 57, 67 or 78 coarse aggregate. With the Engineer's approval, Size No. 8 or Size No. 89 may be used either alone or blended with Size No. 57, 67 or 78 coarse aggregate. The Engineer will consider requests for approval of other gradations individually. Submit sufficient statistical data to establish production quality and uniformity of the subject aggregates, and establish the quality and uniformity of the resultant concrete. Furnish aggregate gradations sized larger than nominal maximum size of 1.5 inch as two components. ~~Ensure the maximum coarse aggregate size does not violate the reinforcement spacing provisions given for reinforced concrete in the AASHTO LRFD Bridge Design Specifications.~~

*Do NOT remove last statement. All academia (ie ACI, PCA, AASHTO, etc.) recommends using largest size aggregate available to prevent shrinkage and structural cracking. The specs could state use largest provided it doesn't fill  $\frac{3}{4}$  space between rebar;  $\frac{1}{3}$  depth of slabs; or  $\frac{1}{5}$  width of walls. If anything remove statistical data verbiage.*

**Response:** The requirement was removed from the specification because it is included in the Structures Design Guidelines.

**346-2.5.1 Water Reducer/Water Reducer Retardant Admixtures:** *When a Use wwater-reducing admixture is used, meet the requirements of ~~it~~, Type A. When a ~~water~~ water reducing and retarding admixture is used, meet the requirements of ~~it~~, Type D. Use in accordance with the manufacturer's recommended dosage rate.*

**346-2.5.3 High Range Water Reducing Admixtures and Viscosity Modifying Admixtures:**

**346-2.5.3.1 General:** *When a high range water reducing admixture is used, meet the requirements of ~~it~~ Type F or Type I. When a high range water reducing and retarding admixture is used, meet the requirements of ~~it~~ Type G or Type II. Do not use Type I, II, F or G admixtures ~~The Contractor may propose the use of a Type F or G admixture, meeting the requirements of Section 924, in all classes of concrete, except for concrete used in drilled shafts/shaft concrete. The use of High Range Water Reducing (HRWR) admixtures in concrete mixes incorporating~~ When silica fume or metakaolin is incorporated into a concrete mix design, the use of a high range water reducing admixture Type I, II, F or G is mandatory.*

**346-2.5.5 Accelerating Admixture for Precast Concrete:** *The use of non-chloride admixtures Type C and Type E is allowed in the manufacturing of precast concrete products that are used in slightly aggressive environments. Use only non-chloride accelerating admixtures or non-chloride accelerating and water reducing admixtures.*

**Response:** Changes made.

IV 5,500 3 (b) 1.0 to 6.0 **DOES the (d) apply? When required to use SF or MK I think coulomb testing should be required, know we getting value from its' cost & use. If not required, then no special testing.**

IV (Drilled

Shaft) 4,000 8.5 0.0 to 6.0

V (Special) 6,000 3 (b) **(d)** 1.0 to 5.0

V 6,500 3 (b) **(d)** 1.0 to 5.0

VI 8,500 3 (b) **(d)** 1.0 to 5.0

**(d)** When the use of silica fume, ultrafine fly ash, or metakaolin is required as a pozzolan in **Class IV**, Class V, Class V (Special) or Class VI concrete, ensure that the concrete exceeds a resistivity of 29 KOhm-cm at 28 days, when tested in accordance with FM 5-578. Submit three 4 x 8 inch cylindrical test specimens to the Engineer for resistivity testing before mix design approval. Take the resistivity test specimens from the concrete of the laboratory trial batch or from the field trial batch of at least 3 yd<sup>3</sup>. Verify the mix proportioning of the design mix and take representative samples of trial batch concrete for the required plastic and hardened property tests. Cure the field trial batch specimens similar to the standard laboratory curing methods. Submit the resistivity test specimens at least 7 days prior to the scheduled 28 day test. The average resistivity of the three cylinders, eight readings per cylinder, is an indicator of the permeability of the concrete mix.

Response: Note d added to Class IV.

### **346-3.2 Drilled Shaft Concrete:**

#### **346-3.2.1 Slump Loss Test Requirements:**

**(9)** Obtain the Engineer's approval of slump loss test results in terms of elapsed time **and average maximum concrete and ambient temperatures** before concrete placements.

Response: Change made.

### **346-3.3 Mass Concrete:**

Use a Specialty Engineer competent in the design and temperature control of concrete in mass elements. The Specialty Engineer shall follow the procedure outlined in Section 207 of the ACI Manual of Concrete Practice to formulate, implement, administer and monitor a temperature control plan, making adjustments as necessary to ensure compliance with the Contract Documents. The Specialty Engineer shall select the concrete design mix proportions that will generate the lowest maximum temperatures possible to ensure the 35°F differential temperature is not exceeded. *The mass concrete maximum allowable temperature is 180°F. If either **temperature** event occurs, the Specialty Engineer shall be available for immediate consultation.*

Response: Change made based on other comments.

The Specialty Engineer, or a qualified technician employed by the Specialty Engineer, must personally inspect and approve the installation of monitoring devices and verify that the process for recording temperature readings is effective for the first placement of each size and type mass component. Submit to the Engineer for approval the qualification of all technicians employed to inspect or monitor mass concrete placements. For placements other than the first, designate an employee(s) approved by the Specialty Engineer, as qualified to inspect monitoring device installation, to record temperature readings, to be in contact at all times with the Specialty Engineer if adjustments must be made as a result of the temperature differential *or the maximum allowable temperature* being exceeded, and to immediately implement adjustments to temperature control measures as directed by the Specialty Engineer. Read the monitoring devices and record the readings at intervals no greater than 6 hours. The readings will begin when the mass concrete placement is complete and continue until the maximum temperature differential (*and not the maximum allowable [implies 180 F deg is permitted whenever the next might be higher]* temperature) is reached and a decreasing temperature differential is confirmed by two or more lowering temperatures as defined in the temperature control plan.

Response: Change made.

*Do not remove the temperature control mechanisms [ should this include formwork – whether it is steel or insulated, since most is lined, acts as insulation or needs to have insulation removed inorder to extract it from beneath – removing formwork often loses enough heat to cause over differential because can't regain the loss] until the core temperature is within 35°F of the ambient temperature. Furnish a copy of all temperature readings to the Engineer as they are determined, recorded, the determined temperature differentials and a final report within three days of completion of monitoring of each element.*

Response: Language added to have contractor describe methods of preventing thermal shock as opposed to specifying particular actions.

#### **346-4 Composition of Concrete.**

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

TABLE 3

IV 658 0.41 *[does \*\* belong here? If SF or MK is required, low cementitious may need low W/C to assure value and passing coulomb test see Table 2, add (d)]*

IV (Drilled

Shaft) 658 0.41

V (Special) 752 0.37\*\*

V 752 0.37\*\*

VI 752 0.37\*\*

**Response: Change made. \*\* added to Class IV.**

### **346-4.2 Chloride Content Limits for Concrete Construction:**

**346-4.2.1 General:** Use the following maximum chloride content limits for the concrete application or exposure environment shown:

TABLE 4

Application/Exposure Environment

Maximum Allowable

Chloride Content,

lb/yd<sup>3</sup>

Non Reinforced Concrete No Test Needed

Reinforced Concrete Slightly aggressive environment 0.70

Moderately or ***eE***xtremely aggressive environment 0.40

Prestressed Concrete 0.40

**Response: Change made.**

### **346-5 Sampling and Testing Methods.**

Perform concrete sampling and testing in accordance with the following methods:

TABLE 5

Description Method

Slump of Hydraulic Cement Concrete ASTM C 143

Air Content of Freshly Mixed Concrete by the Pressure Method\* ASTM C 231

Air Content of Freshly Mixed Concrete by the Volumetric Method\* ASTM C 173

Making and Curing Test Specimens in the Field ASTM C 31

Compressive Strength of Cylindrical Concrete Specimens\*\* ASTM C 39

Obtaining and Testing Drilled Core and Sawed Beams of Concrete ASTM C 42

3460000

All Jobs

**Early Sampling of Fresh Concrete During the Initial Placement FM 5-501 *[ADD “and determination of Water to Cementitious materials ratio” to guide technicians to this method for the appropriate math and calculations.]***

**Response: Title changed to match FM 5-501. Also language added to 346-8.**

Low Levels of Chloride in Concrete and Raw Materials FM 5-516  
Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete ASTM C 138  
Temperature of Freshly Mixed Portland Cement Concrete ASTM C 1064  
Sampling Freshly Mixed Concrete ASTM C 172  
Static Segregation of Self Consolidating Concrete using Column  
Techniques ASTM C 1610  
Slump Flow of Self Consolidating Concrete ASTM C 1611  
Passing Ability of Self Consolidating Concrete by J-Ring ASTM C 1621 **[Did Self  
Consolidating Concrete become removed earlier? Or change to imply Flowing  
concrete.]**

**Response: The SCC was not removed. It was moved to another section. The test methods are needed here. No change made.**

Concrete Resistivity as an Electrical Indicator of its Permeability FM 5-578

\*Use the same type of meter for QC tests as the Department uses for Verification testing. When using pressure type meters, use an aggregate correction factor determined by the concrete producer for each mix design to be tested. Record and certify test results for correction factors for each type of aggregate at the concrete production facility.

\*\*The Department will use the same size cylinder molds as the Contractor uses for his QC tests.. Use 4 x 8 or 6 x 12 inch cylinders for determination of the compressive strength. **[ADD “use throughout entire job – for consistency of test results.]**

**Response: Change not made. If this is an issue, then it should be addressed with Construction utilizing the Contractor's QC Plan on a project by project basis.**

### 346-6.3 Delivery Certification:

Sign the delivery ticket certifying that the design mix maximum specified water to cementitious materials ratio was not exceeded due to any jobsite adjustments to the batch of concrete, and that the batch of concrete was delivered and placed in accordance with the Contract Documents.

Response: Change made.

Air Content As shown in the range in Table 2

Reject concrete with slump or air content exceeding the above tolerances. Do not allow concrete to remain in a transporting vehicle to reduce slump. Water may be added only upon arrival of the concrete to the jobsite and not thereafter.

If the slump varies from the target range as described in Table 6, immediately adjust the concrete mixture to correct the slump of succeeding batches. The Engineer will allow a reasonable time [ what do we mean – won't reject if failing?] for adjustment. Test each load to ensure only concrete meeting the specification

is placed. The Engineer will take into consideration [ what do we mean – won't reject if failing?] trucks already in route from the concrete production facility after the facility has been notified. If the Contractor does not implement adjustments at the earliest possible time, the Engineer will reject the concrete and terminate further production until the Contractor makes corrections. [If corrections are made, but concrete still fails, rejection still happens?]

Response: If it's outside the tolerance, it should be rejected.

#### TABLE 7

Non-Agitator Trucks Agitator Trucks

45 minutes 60 minutes

3460000

All Jobs

75 minutes\* 90 minutes\*

\*When a water reducing and retarding admixture (Type D, ~~Type F~~, Type G or Type II) is used. [ Type F is not retarding. Will need to make exception everywhere else. If a Type F is used with a Type D then combination, but then so will the D above work; an F is just a double B]

Response: Type F removed.

**346-7.7 Adding Water To to Concrete at the Placement Site:** Perform an initial slump before the addition of water at the jobsite. If the slump is delivered within the target range, no water will be added to the load. If the slump is outside the target range but is within the tolerance range, that load may be accepted, but water added at [ADD" the plant or"]the site will be reduced to maintain a slump within the target range on successive loads. After adjusting the slump, perform a test to confirm that the slump of the concrete is within the target range as defined in Table 6. If the slump exceeds the target range but is within the tolerance

range, that load may be accepted, but water added at the site will be reduced to maintain a slump within the target range on successive loads. If the slump is delivered within the target range, no water will be added to the load. Confirm with another test that the next load is within the target range after the addition of water at the placement site. Repeated incidents of concrete being placed outside the target range will result in revocation of that portion of the QCP. No concrete represented by plastic test results outside of the tolerance range will be accepted for placement.

**Response:** Subarticle revised based on other comments.

**346-7.8 Sample Location:** *Describe concrete placement and sampling methods in the QCP.* Obtain samples from the point of final placement.

Where concrete buckets are used to discharge concrete directly to the point of final placement or into the hopper of a tremie pipe, samples will be obtained from the discharge of the bucket. When the concrete is discharged directly from the mixer into the bucket, within a minimal lapse of [25% of the allowable transit time] ***[ is this the remainder of the 90 minute transit time for that particular load, or is it a quarter fraction of the 90 minute transit period ?]*** before discharge of the bucket, samples may be obtained from the discharge of the mixer.

**Response:** It is the total of the allowable transit time, not the remainder. Language added to clarify.

### **346-8 Plastic Concrete Sampling and Testing.**

Ensure that each truck has a valid ***inspection card ( in other spec sections this is termed the “truck ID card” [identification card]*** issued by the Department, the revolution counter on the mixer is working properly, and calibration of the water dispenser has been performed within the last twelve months and verify batch weights within required limits of the mix design. Reject any concrete batches that are delivered in trucks that do not have **Department identification cards.** When the **identification card** is removed for noncompliance, forward the **identification card** to the District Materials Engineer in the District where the plant is located.

**Response:** Change made.

Perform plastic concrete tests on the initial delivery of each concrete design mix each day. Ensure QC technicians meeting the requirements of Section 105 are present and performing tests throughout the placement operation. Ensure one technician is present and performing tests throughout the placement operation at each placement site. If a placement site has multiple concrete trucks, identify the number of technicians in the Quality Control Plan. If a placement site has multiple trucks placing concrete, then have at least two technicians present at that site. Ensure ~~all that the equipment utilized~~ *used for delivery, placement and finishing* meets ~~this the requirements of this Specification.~~ Do not proceed with the placement operation *until QC tests confirm that the delivered concrete complies with the plastic properties specified.* When a truck

designated for QC testing arrives at the site of discharge, subsequent trucks **and current concrete** may not discharge until QC testing results are known. ~~until the delivered concrete complies with plastic properties specified.~~

**Response:** This requirement may disturb the pumping operation. No change made.

After placement begins, perform **random** QC tests to ensure compliance with Specification requirements. Reject non-complying loads which cannot be adjusted at the jobsite. Ensure that corrections are made on subsequent loads.

**Response:** This language has been removed as it is redundant to 346-8.

### **346-9 Acceptance Sampling and Testing.**

**346-9.1 General:** Perform plastic properties tests in accordance with 346-8 and cast a set of three QC cylinders (**either 4 inch by 8 inch or 6 inch by 12 inch cylinders are acceptable**)/ ~~remove, stated in Table 5~~, for all structural concrete incorporated into the project. Take these acceptance samples randomly as determined by a random number generator (acceptable to the Department). The Department will independently perform *verification* plastic properties tests and cast a set of verification cylinders.

The verification cylinders will be the same size cylinder selected by the Contractor, from a separate sample from the same load of concrete as the Contractor's QC sample.

**Response:** Removed redundant language removed from Table 5 and left in the body of the specification.

**346-9.5 Resolution Procedure:** The Department may initiate an IA review of sampling and testing methods. The resolution procedure may consist of, but need not be limited to, a review of sampling and testing of fresh concrete, calculation of water cementitious materials ratio, handling of cylinders, curing procedures and compressive strength testing. Core *samples* of the hardened concrete may be required.

The Engineer will determine through the resolution procedure whether the QC strength test results or the verification strength test results can be relied upon. When the Engineer cannot determine that either the QC or verification strength test results are in error, the concrete represented by the four consecutive LOTs will be evaluated based on the QC data. The Engineer will inform the QC and the Verification lab **within four working days** of the acceptance compressive strength test to transport their "hold" cylinders to the resolution lab ~~within five working days~~. *The QC and Verification laboratories will transport their own hold cylinder to the resolution testing laboratory* **within 72 hours after the Engineer notifies the Contractor that a resolution is required**. In addition, the Engineer will ensure that the QC and verification "*hold*" cylinders are tested **within seven days of the 28 day acceptance strength tests. [sum of days exceed 7 permitted. Make four @ two (ideal) or three; make 72 hours @ two days, so Resolution Lab can have time to condition poorly (dry/cold) transported cylinders and do some concrete internal investigation and report]**

*The resolution investigation will determine the strength test results for each of the four or less LOTS.*

Response: The recommended changes will require another Industry Review due to being more restrictive. No change made. The current time frames are obtainable. The time frame applies to testing the hold cylinders, not to the entire resolution procedure. There is no time requirement for completing the resolution investigation.

\*\*\*\*\*

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**Comments:**

346-3 “...When the compressive strength acceptance data is less than the minimum compressive strength of the higher design mix, investigate the difference between the design strength and acceptance data.”

The department is already getting a better than required product, as long as it meets the specifications, why should it matter. Regardless this is a producer matter and if an investigation needs to be done on acceptable concrete than it should be the producers doing the investigating.

Response: Agree. Changed to Contractor notifying engineer when compressive strength for mix design is not met, but minimum strength for acceptance is met.

346-3.2.1 Note #8 – Why test cylinders to determine 500 psi on each mix design? Are we going to entertain the idea of sample pick up timeframes for each mix design on each project? Is this really needed?

Response: This requirement applies to drilled shaft. This requirement is to have additional cylinders besides the test cylinders to determine when the concrete is 500 psi so the acceptance cylinders are not moved until they reach 500 psi.

346-7.7 Adding water – Not every pour is a mass pour. Most concrete operations are one or two truck operations and are not “bad” loads if they can be adjusted. If we are talking about a several hundred yard operation and random loads are inconsistent, I can somewhat understand the concern. If a load shows up, it is the only load being placed that day, and we have the ability to adjust that load to make it acceptable (allowable water), why can’t it be used. We are throwing away perfectly good materials.

Response: Due to this version of the specification having limited review by Industry, no changes will be made to targets and tolerances. The Department will change this concept with the next revision of 346 to allow industry representatives to have more opportunity to comment. No change made at this time.

**346-7.7 Last sentence first paragraph** – “No concrete represented by plastic test results outside of the tolerance range will be accepted for payment.” What about drilled shaft concrete? Initial testing is 7 inches but the middle third of the truck is 6” when the sample is taken. Is the department not going to pay for that material?

**Response:** 346-7-7 does not address payment. This language is not in this subarticle. No change made.

**346-7.8 #a, b, c, and d** – What is the value of this testing? When exactly is it supposed to happen? Should the contractor rent a pump prior to the placement operation buy five loads of concrete and pump it on the ground to determine the correlation? Will the engineer then require it to be done again when the pump breaks down and a different one is rented or the temperature changes? What is the benefit to the construction, the material is either acceptable at the point of placement or it is not. The producers need to supply the material that meets the requirements.

**Response:** This testing shows how much time the concrete has before it starts to set up. The demonstration shows that the concrete has enough slump during the entire placement time. The proposed language clarifies a current requirement. It does not add new requirements. No change made.

**346-8 Second paragraph** – Who is collecting concrete mixer truck tags for non-compliance? The language is written to the contractor. Is it now the contractors responsibility to reject concrete trucks from being used on department projects?

**Response:** Yes, under Contractor Quality Control, it is the contractor's responsibility to reject concrete that does not meet specifications. No change made.

**346-8 Third paragraph** – The added language now would require the entire placement operation to stop until all the plastic properties are determined. “when a truck designated for QC testing arrives at the site of discharge, subsequent trucks may not discharge until QC results are known.” Two pumps are working and two trucks are dumping into each pump, when one of those trucks is an acceptance sample the remaining trucks cannot be used until the plastic properties are determined and verbalized? Trucks are sampled in the middle third of the load... The truck has to unload to the point of sampling, while every truck that arrived after it did has to sit and wait? Is it really the departments intent to effectively shut down the pour every time a sample is taken?

**Response:** It is not the Department's intent to stop every placement during sampling. It is the intent to not allow placement of concrete that is out of compliance. Until sample results are known, concrete should not be placed. The testing is required to be completed within 15 minutes. No change made.

**346-8 Last two paragraphs** – What will the contractor due to his QCP if the IV testing does not meet the section? If there is a problem with an individual on a project how does that affect the QCP? Perhaps some different language is needed here. i.e. “Address any deficiencies found during an independent verification by submitting corrective measures taken to the engineer. Repeated deficiencies will result in a QCP suspension.”

**Response:** This does not address Independent Assurance. This applies to the Department testing material that does not appear to meet specifications. This occurs outside the normal QC/Verification acceptance process. If a deficiency is found by Independent Verification, the Engineer may request the Contractor to revise the QC Plan to address the deficiency. No change made.

**346-9.5 Third paragraph** – 5% pay reduction for the material represented by a resolution test, that's a bit excessive. We could be talking about 4 lots and as much as 200 yards of concrete. This is a fine on passing materials that did not compare. What happened to loser pays for the testing?

**Response:** The Resolution Investigation to determine the most accurate test results can be more costly and time consuming than breaking the hold cylinders. The cost of this investigation is part of resolution and the loser pays applies to the entire process, not just testing. If QC is upheld the cost of the entire investigation is absorbed by the Department. If verification is upheld, the Contractor will be assessed the 5% payment. No change made.