9210000 PORTLAND CEMENT AND BLENDED CEMENT
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

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Comments: (4-40-20/Internal)

921-1 General.

→ Cement shall conform to the requirements of AASHTO M85 or AASHTO M240, as applicable, except as modified herein defined below or as specifically restricted in Section 346.

→ → **921-1.1 Type of Cement:** Cement may be Types I, II, II (MH), III, IV, V (as defined by AASHTO M85), or IL, IP, IS (as defined by AASHTO M240). Cement type shall be selected based on component and environmental conditions in accordance with Section 346. Different brands of cement, cement of the same brand from different facilities, or different types of cement shall be stored separately, identified, and shall not be mixed.

→ → **921-1.2 Alkali Content:** Portland cement containing a maximum of 0.60% alkali, or less, calculated as Na_2O (% Na_2O plus 0.658% K_2O), may be used with no further testing.

→ → → Cement with an alkali content greater than 0.60% but less than or equal to 1.00%, calculated as Na_2O (% Na_2O plus 0.658% K_2O), may be used with the following requirement if the cConcrete test results shall verify provides an improvement or comparable compressive strength, sulfate resistance, corrosion protective properties and other durability requirements, when as compared to concrete containing cement with an maximum alkali content less than of 0.60%. The strength and durability tests of concrete shall be performed in accordance with AASHTO T358, ASTM C39, ASTM C157, FM 3 C1012, and FM 5 516.

→ → → **921-1.2.1 Concrete/Mortar Testing:** Six mixes shall be prepared by an independent accredited laboratory, three control batches using an approved cement with a maximum alkali content of 0.60% and three comparison batches with cement with an alkali content above 0.60%, while all other constituents remain the same except for small adjustments to get the mix to yield. The alkali content of the cement used in the trial batches shall be at least the anticipated maximum alkali content of the cement that will be observed during normal production. Follow the below criteria for each mix.

→ → → → 1. Use a previously approved FDOT Class IV (5,500 psi) mix design

→ → → → 2. Size No. 57 Coarse Aggregate from an approved FDOT source

→ → → → 3. 18 to 22% Class F fly ash replacement from an approved FDOT source

Justo, Giselle
Suggest "...except as provided in this Section."

Justo, Giselle
test result provides
test results provide_

Justo, Giselle
Suggest "Six mixes shall be prepared as trial batches by an ..."

Justo, Giselle
Previous comment is made assuming here by "trial batches" you are referring to all six mixes. If this is not correct, ignore previous comment and identified which mixes (three control OR three comparison).

Justo, Giselle
Is it fair to assume that unless specified otherwise the production would be normal? Is this an industry term? Can we use "production" instead of "normal production"?

Response:

Sulfate Resistance	ASTM C1012	6 months, 12 months, 18 months
Length Change	ASTM C157	28 days

Upon completion of all 28 days and 6-month testing, the cement producer shall present the date to the State Materials Office (SMO) for acceptance. 12 month and 18-month data shall be provided to the SMO upon completion.

→ → **921-1.3 Heat of Hydration:** The cement heat of hydration for Type II (MH) and or Type IL shall be tested in accordance with ASTM C1702 and reported at three days.

921-2 Definitions Terminology.

→ The following definitions are applicable to the production and Qquality Ceontrol (QC) of cement:

→ → 1. Approved Laboratory: ~~indicates~~ Aa laboratory acceptable to the State Materials Office (SMO) that is currently inspected by the Cement and Concrete Reference Laboratory (CCRL), is actively participating in the CCRL their proficiency program, and which has all deficiencies noted at the time of inspection corrected. The laboratory must also authorize CCRL to submit their final inspection reports to the SMO.

→ → 2. Cement Producer Approved Source: ~~indicates~~ a cement supplier, including but not limited to a plant, a terminal, or a transfer facility, that has been qualified by the SMO. ~~A list of approved cement sources~~ The Cementitious Materials Production Facility Listing will be maintained by the SMO.

Justo, Giselle
Calendar or working?

Justo, Giselle
Suggest specifying if calendar or working days.
For three consecutive days?

Justo, Giselle
Suggest using SMO as it has already been used above.

Justo, Giselle
Suggest "to submit inspection reports issued by the laboratory to the SMO" or something similar.

Justo, Giselle
Suggest "A cement supplier, including..." for consistency.

Response:

→ → → 8. The specific gravity of cement reported as an average of the last twelve monthly tests, updated every six months.

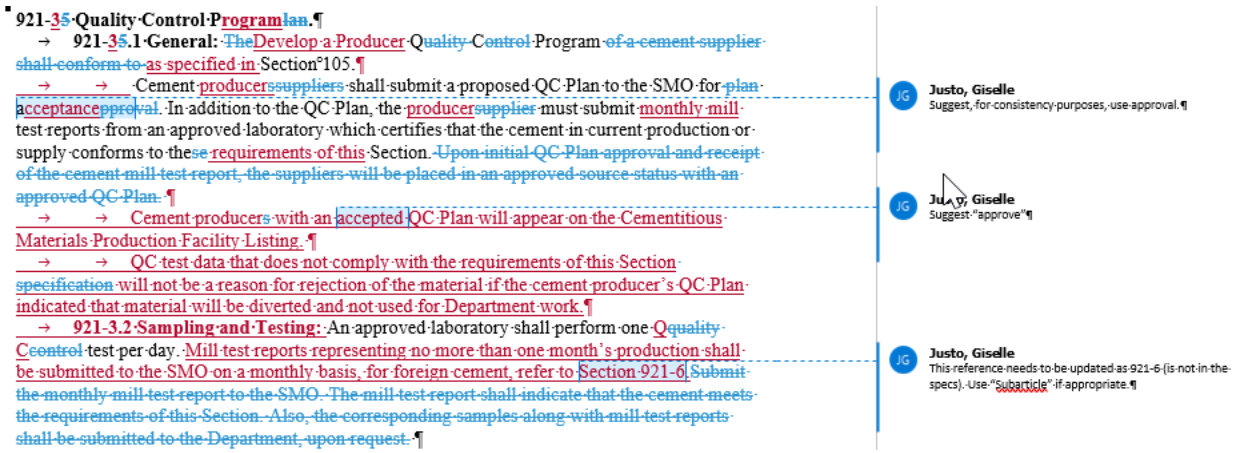
→ → → 9. The heat of hydration at three days, as applicable.

→ → → 10. The approved laboratory that performed all tests.

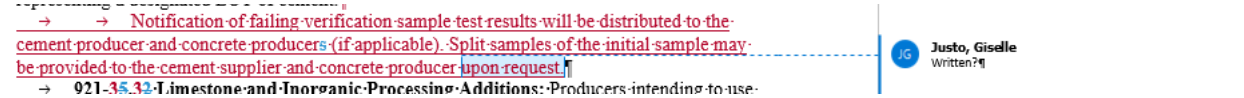
An acceptable mill test report is available found in the appendix of AASHTO M85.

Justo, Giselle
Calendar or working?
For three consecutive days?

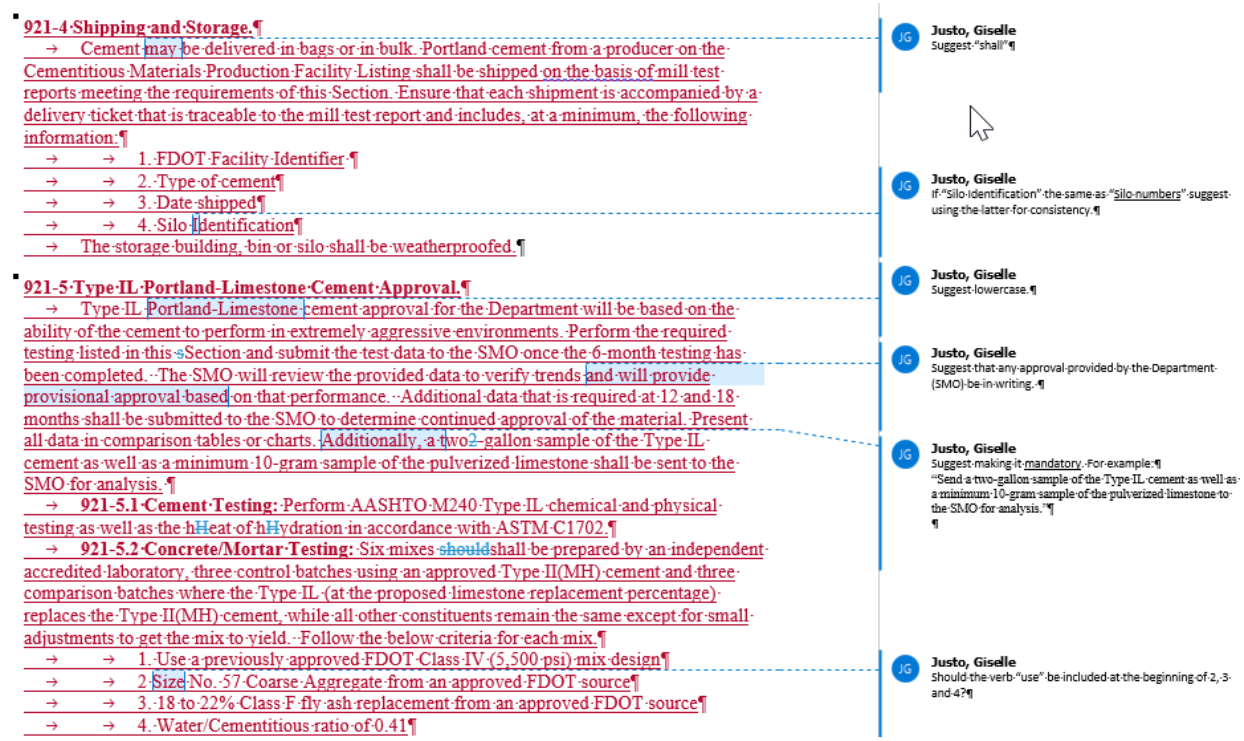
Response:



Response:



Response:



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Comments: (5-22-20, Industry)

Industry recommendation is to follow AASHTO R 80 for ASR rather than this intensive alkali certification. Since there are no ASR tests in this update and alkali >0.60, the recommendation is to simply remove the alkali certification section. Can we note that sulfate resistance ASTM C1012 is a report only for 18 months so producers and specifiers do not think that 18 months

needs to hit a certain value? Due to the test issue that D. Hooton has flagged about how severe the test solution is for it to go out to 18 months, it can be difficult for all cements and SCMs to generate a value at the 18 month mark. Additional comments:

• The main issue of higher alkali cements are due to ASR (Alkali Silica Reactivity). Florida aggregates are not known to be reactive and ASR (example ASTM C1293 or C1260) tests are not included in the qualification testing.
• To our knowledge, the additional testing for cements with alkalies greater than 0.60% is unique in the US; and unwarranted. Based on our understanding of mechanisms of concrete chemistry, everything else being equal, higher alkali cements should provide better corrosion resistance (although not corrosion-proof). In general, the later-age strength might be lower than for a lower alkali cement, it won't be problematic, and portland cements will have to meet the M 85 limits anyway.
• Except for a potential increase in ASR susceptibility, cement with alkali levels above the 0.60% are anticipated to improve corrosion resistance and reactivity of SCMs in concrete. This should generally lead to comparable or improved sulfate resistance and other durability issues. Strength of concrete is already a requirement for various classes of concrete so must be met.
• The increase in ASR susceptibility is addressed in R 80 and alkali-loading calculations are readily permitted to judge that effect by alkali reporting on cement mill test reports.
• Should FDOT use their performance criteria to evaluate new sources and benchmark against a cement that is currently on their approved list and demonstrate "comparable or better performance". The benchmark should no longer be 'any cement below 0.60% alkalies'.
• Mass concrete shouldn't restrict cements based on alkali content…this should be controlled via concrete mix design, modeling and thermal control planning.
• Comparable performance (although not previously defined) can be defined as a result within the precision and bias of the test method.
Response:

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Comments: (5-22-20, Industry)
There are 19 individual comments in this submittal, numbered below. Thank you. 1. 921-1.2 – Second paragraph. Recommend removing the "s" from the word "provides." Should read "if the concrete test results provide an improvement…". The word provides should not be pluralized. (if this section remains. Perhaps the section should be removed given the discussion regarding pozzolans and aggregates, and the updated AASHTO M85) 2. 921-1.2 – Second paragraph, last sentence. Why change the "maximum alkali language to "less than 0.60%, when the other occurrences state a "maximum of 0.60%?" Recommend stating "compared to concrete containing cement with an alkali content of 0.60% or less." (if this section remains. Perhaps the section should be removed entirely given the discussion regarding pozzolans and aggregates, and the updated AASHTO M85) Alternatively, why not just leave "…cement containing a maximum of 0.60% alkali, or less…" in all of the related occurrences? 3. 921-1.2.1 – First sentence. Recommend making "maximum alkali content of 0.60%" consistent with the phrasing of the recommended wording in the previous comment "cement with an alkali content of 0.60% or less," for consistency. (if this section remains. Perhaps the section should be removed entirely given the discussion regarding pozzolans and aggregates, and the updated AASHTO M85)

Alternatively, why not just leave "…cement containing a maximum of 0.60% alkali, or less…" in all of the related occurrences? 4. 921-2, 3. - Mill Test Report - Recommend changing the word "supplier" to "producer" for consistency. The definitions section states that the word producer includes suppliers. 5. 921-3.2 – 4th paragraph, 2nd sentence. Recommend changing the word "supplier" to "producer" for consistency. The definitions section states that the word producer includes suppliers. 6. Recommend adding periods after listed items in 921-1.2.1, 921-4 and 921-5.2, for consistency with the list in 921-2 3. Mill Test Report. 7. 921-5.2 – Recommend adding a space between Type II and (MH) for the two occurrences, for consistency with 921-1.1 and 921-1.3 8. Table 921-1 - Chloride Diffusion – recommend removing the 35-day test age, as it provided little value. (if this section remains. If the alkali content section is removed, a concrete/mortar testing will likely need to remain, for the Type IL approval process) 9. Table 921-1 - Length Change – recommend changing "28d" to "28 days" for consistency with other test ages in the table. 10. 921-1.2.1 - Paragraph after table – recommend pluralizing "6-month" for consistency with the test ages in the table. 11. 921-1.2.1 - Paragraph after table – "…the cement producer shall present the date…" should be changed to "…the cement producer shall present the data…" 12. 921-1.2.1 - Paragraph after table – recommend pluralizing "12 month and 18-month data" for consistency with the test age phrasing in the table. Also, there is a dash between "18 and month" that does not appear in the test ages in the table. Recommend either removing the dash, or adding a dash to all for consistency. 13. 921-3.1 – 2nd paragraph. Recommend adding the following after the first sentence "Complete the Cementitious Materials Producer QC Plan Checklist (Appendix B02) and submit it along with the QC Plan, in a separate file. The checklist can be found on the SMO website: https://www.fdot.gov/materials/quality/programs/qualitycontrol/checklists/index.shtm 14. 921-3.1 – 3rd paragraph. Recommend pluralizing "Cement producerS with an accepted QC Plan…" 15. 921-3.1 – 3rd paragraph. Recommend pluralizing "…does not comply with the specificationS…" 16. 921-3.2 – 4th paragraph, second sentence. What is the intent of "split samples of the initial sample may be provided to the cement supplier upon request?" Does this mean that if there is any leftover material from the split samples in SMO's possession (which were initially provided from the supplier to SMO as a split sample), that any remaining material may be provided back to the supplier or concrete producer? What if there is no material left at that point in SMO's possession? 17. 921-5 - An occurrence of "6-month testing" contains a dash, whereas occurrences of "12 and 18 months" do not contain the dash. Please make consistent throughout the document. 18. 921-5 – First paragraph, last sentence, states "Send a two-gallon sample of the Type IL cement as well as a minimum 10-gram sample of the pulverized limestone shall be sent to the SMO for analysis." Recommend stating "A two-gallon sample of the Type IL cement as well as a minimum 10-gram sample of the pulverized limestone shall be sent to the SMO for analysis." 19. 921-6 1. – Recommend stating "The proposed QC Plan and the QC Plan Checklist (Appendix B02) referenced in 921-3.1 shall be sent to the SMO…"
Response:

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Comments: (6-5-20, Industry)
Text: 1) For 921-1.2, higher alkali content is known to reduce slightly longer-term compressive strength. This is successfully managed by the concrete producers through mix design changes.

The focus of the testing proposed here should be durability. 2) Is an independent accredited laboratory defined and how is it different from an Independent Approved Laboratory? 3) Regarding the statement in 921-1.2.1 that the alkali content of the cement in the trial batches shall be at least the anticipated maximum alkali content, there should be some tolerance because of normal variation in the alkali content and the precision of the alkali content measurement. It may not be practical to obtain a sample from production of the exact maximum alkali content. For example, the provision could require the alkali tested shall be within 0.10% of the declared maximum approved for the source. 4) In 921-1.2.1 and 921-5.2, the testing requires fly ash. Can slag be used in fly ash is not available? Also, the w/cm of 0.41 could be adjusted to maintain strength and slump. FDOT approved mixes may be designed below the maximum w/cm to ensure compliance with specifications and account for temperature and transit time. 5) In Table 921-1, the length change is measured at 28 days. Clarify if this is 28d moist curing plus 28d drying? We suggest using 7-day moist curing, which is more typical of field conditions. Also clarify whether the mortar to evaluate sulfate resistance is the mix design required in ASTM C1012 or a mix with fly ash and a w/cm of 0.41. 6) In 921-2.3.5, the base cement phase composition is not required by ASTM C595 or AASHTO M240 for blended cements. There are no limits on the base cement phase composition and the cement is evaluated based on performance. This is likely to create confusion by users of the cement. 7) In 921-5.2, the testing is done at the proposed limestone percentage. Once a cement is approved with a certain limestone target (actual can be +/-2.5% range per AASHTO M240), it should be acceptable for the manufacturer to produce a cement with lower but not higher limestone content target. If the cement has been tested at low limestone (Type II) and high limestone (Type IL), then any limestone in between should be acceptable. 8) For 921-6 foreign cement acceptance, concrete producers should be permitted to start doing concrete mix substitution testing after acceptance of the QCP and initial sample, but before the verification sample. The verification sample could take several weeks for FDOT to obtain and test, plus another several weeks for the concrete test results. At that point, the cement could be in the terminal for 2 months without the ability to use it on FDOT projects. If there had been a different cement source previously in the silo, this would most likely be unavailable by the time the concrete producers get the mixes with the new cement approved, creating disruptions to ongoing FDOT projects. In the past, some district engineers have permitted the concrete testing before the verification sample, but others have not; therefore, it would be helpful to have this stated clearly in the specification. For the verification sample, the timing of the testing should be clarified since it may delay existing FDOT projects, especially if 28-day results are needed. In addition, the typical practice for imported cement is a third-party surveyor takes composite samples upon loading. A split of this sample could be sent FDOT to expedite the process since loading may happen up to 30 days before the cement arrives in Florida. The same should apply to acceptance of foreign fly ash and slag.
Response:

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Comments: (6-9-20, Industry)
TCOP staff have reviewed the above subject and offer comments for 9300100 and 9210000. (K.C.Jose) 1. 9300100: Subsection 930-7.1 refers to spec 457. (Page 5/6 - 930-7 Special Fillers. 930-7.1 General: This material is intended to be used as filler material and for rapid repairs to pile jacket structures and other locations specified in the Plans. Meet the requirements of Section

457 for preparing the surfaces, placing, sampling, testing and curing the concrete. Mix the material in accordance with the manufacturer's recommendations) FDOT current specs do not have a section for 457. 2. 9210000: Subsection 921-5.2 contents on page 5/7 is a repetition of subsection 921-1.2.1 on page 2/7. The Central office may review this. 3. No comments on SP0070202, 1050404MM8.4, 1050404MM8.6, and 9950201 Thanks for the opportunity to review. Sincerely, K. C. JOSE, P.E. Construction Senior Project Manager D4 - Treasure Coast Operations 3601 Oleander Ave., Ft. Pierce, FL 34982 Office: 772-429-4936; Cell: 772-519-2348. Kandarappallil.Jose@dot.state.fl.us

Response:

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Comments: (6-9-20, Industry)
2. 9210000: Subsection 921-5.2 contents on page 5/7 is a repetition of subsection 921-1.2.1 on page 2/7. The Central office may review this. K. C. JOSE, P.E. Construction Senior Project Manager D4 - Treasure Coast Operations 3601 Oleander Ave., Ft. Pierce, FL 34982 Office: 772-429-4936; Cell: 772-519-2348.
Response:

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