9210100 PORTLAND CEMENT AND BLENDED CEMENT
INTERNAL/INDUSTRY REVIEW COMMENTS

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Comments: (6-22-16, Internal)
In the proposed changes to Specification 346, the Florida Test Method 5-578 or FM 5-578, is being replaced by AASHTO T 358. Should the reference to FM 5-578 in Specification 921-1.2 also be replaced with AASHTO T358? As a philosophical question, if the AASHTO method for testing concrete resistivity is preferred over the Florida Method, should the change be made throughout the Specs anytime mention is made of FM 5-578?

Response: Language was revised as follows:

→ → **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. High Alkali Cement containing a maximum of 1.00% alkali, or less, calculated as Na2O (% Na2O plus 0.658% K2O), may be used with the following. When high alkali cement is used in concrete, the test results shall verify improved or comparable strength, sulfate resistance, corrosion protective properties and other durability requirements of concrete, as compared to AASHTO M85 low alkali cement. The strength and durability tests of concrete shall be performed in accordance with AASHTO T378, ASTM C39, ASTM C157, FM 3-C1012, FM 5-516. ~~and FM 5-578.~~ ¶

→ → **921-1.3 Heat of Hydration:** The cement heat of hydration for Type II (MH) shall be ~~88~~ 73 cal/g or less at ~~7~~ 3 days when tested in accordance with ASTM ~~C186~~C1702. For Type II (MH) used in mass concrete, the cement heat of hydration shall be ~~80~~66 cal/g or less at ~~7~~ 3 days when tested in accordance with ASTM ~~C186~~C1702. ¶

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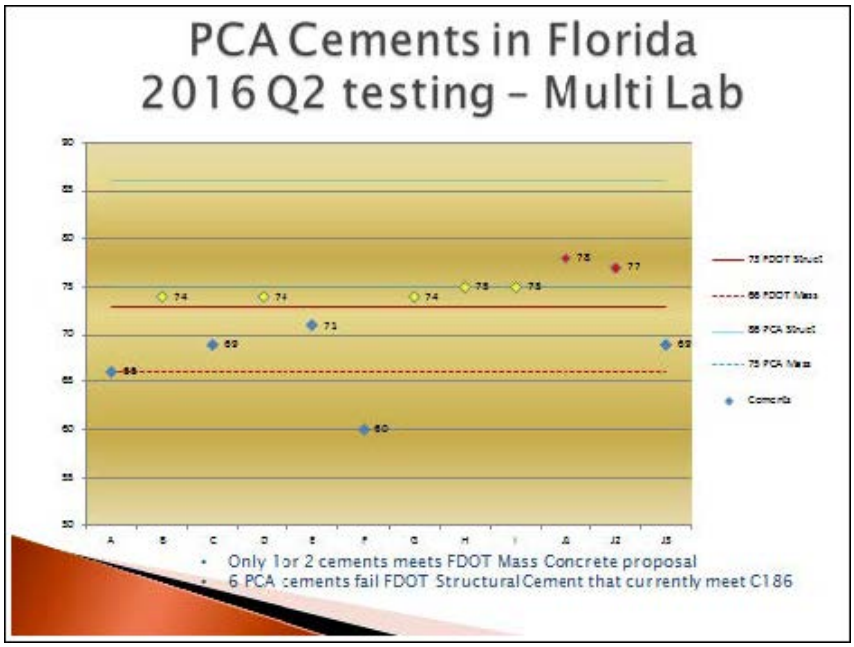
Comments: (7-20-16)

921-1.3 Heat of Hydration: The cement heat of hydration for Type II (MH) shall be ~~88~~73 cal/g or less at ~~7~~ three days when tested in accordance with ASTM C~~186~~1702. For Type II (MH) used in mass concrete, the cement heat of hydration shall be ~~80~~66 cal/g or less at ~~7~~ three days when tested in accordance with ASTM C~~186~~1702.

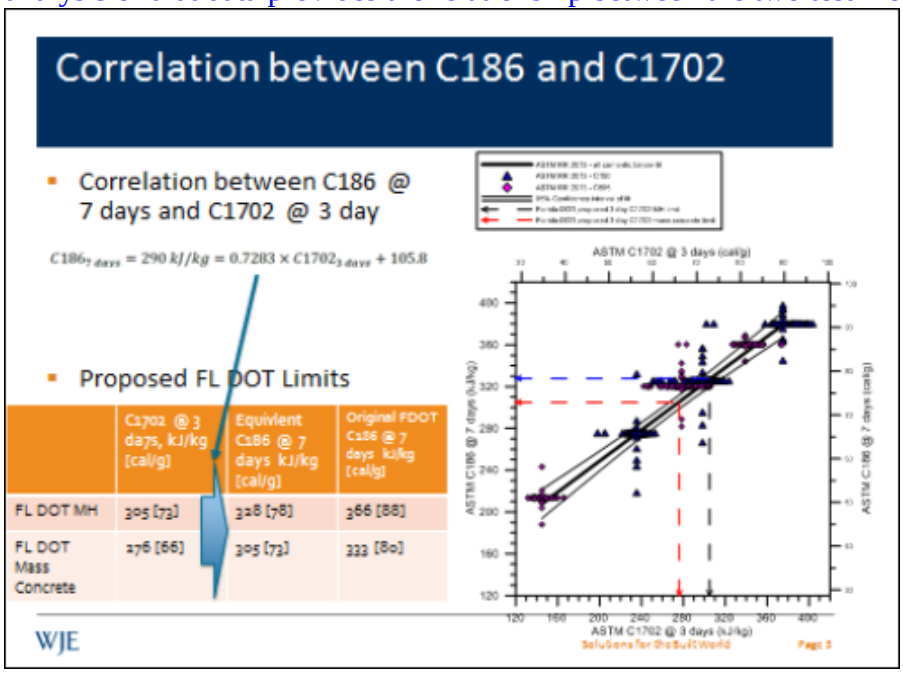
Industry Proposals: According to the FDOT no concrete failures due to temperature rise have been documented due to cements currently supplied to Florida projects. Concrete temperature rise is governed by the overall concrete mix design, and reporting of cement heat of hydration supports the calculation of the concrete temperature rise for the end user. Industry proposal is to require heat of hydration values be reported for cements to allow concrete temperature rise to be estimated, but to place no limits on those values in 921-1.3.We also recommend that the newer Type IL cements be treated the same way for heat of hydration as the Type I/II MH in FDOT specs.

921-1.3 Heat of Hydration: The cement heat of hydration for Type II (MH) shall be ~~88~~ reported at ~~7~~ three days when tested in accordance with ASTM ~~C186~~ 1702. For Type II (MH) used in mass concrete, the cement heat of hydration shall be reported at ~~7~~ three days when tested in accordance with ASTM ~~C186~~ 1702.

A primary concern with the initial FDOT 921-1.3 proposal is that 58% of cements supplied to Florida would not meet the proposed heat of hydration limit (73 cal/g) for cements used in structural concrete applications and 83% of cements would not meet the proposed limit for heat of hydration (66 cal/g) for cements used in mass concrete applications, as noted in the figure below:



The ASTM C01.26 subcommittee chairman has prepared a graph presenting data from round robin testing showing the relationship between 7-day C186 vs 3-day C1702 values. Regression analysis of that data provides the relationship between the two test methods in the table above.



Response:

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Comments: (7-21-16)
The proposed limits are too low and would mean multiple cements used in Florida that are currently qualified for mass concrete would no longer be qualified for mass concrete. A survey by the Portland Cement Association (PCA) PS&T committee showed that 83% of cements currently used in Florida would not meet mass concrete requirements under the proposed specification limits, even though the majority of these cements are used successfully in FDOT mass concrete today. There is variability in the test methods and in the correlation between C186 and C1702. Therefore, it cannot be assumed that a best-fit equation between the two test methods will correspond to field performance. Concrete suppliers and contractors have myriad options to control the temperature of concrete during curing. These include use of SCMs, admixtures, chilled water, ice, liquid nitrogen, and placing and curing techniques. (See ACI 305 for a more comprehensive list.) Therefore, the concrete thermal control engineering should consider all options to select the best combination of strategies for controlling concrete temperature. This can be accomplished by having cement producers report the ASTM C1702 heat of hydration at 3 days, without limits on a maximum value, and allowing the thermal control engineer and concrete mix designer to select the cement, in combination with other materials and strategies, that most effectively and economically control concrete temperature.

Response:

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