Florida Department of Transportation

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KEVIN J. THIBAULT, P.E.
SECRETARY

January 14, 2021

Khoa Nguyen
Director, Office of Technical Services
Federal Highway Administration
3500 Financial Plaza, Suite 400
Tallahassee, Florida 32312

Re: State Specifications Office
Section: **929**
Proposed Specification: **9290100 SUPPLEMENTARY CEMENTITIOUS MATERIALS.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

The changes are proposed by Tim Counts from the State Materials Office to update and clarify language regarding slag, calcined clay, ground glass, and metakaolin in the Standard Specification.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to daniel.strickland@dot.state.fl.us.

If you have any questions relating to this specification change, please call me at 414-4130.

Sincerely,

Signature on file

Daniel Strickland, P.E.
State Specifications Engineer

DS/dh
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

SUPPLEMENTARY CEMENTITIOUS MATERIALS
(REV 10-29-20)

ARTICLE 929-1 is expanded by the following:

929-1 General.

Supplementary cementitious materials (SCMs) shall conform to the requirements of this Section. SCMs shall be used in concrete mix designs in accordance with Section 346.

Fly ash, slag cement, and ultra-fine fly ash shall not be used in conjunction with Type IP or Type IS cements.

Repulpable bags may be accepted by the Engineer, provided a successful demonstration by the producer has indicated complete degradation of the repulpable bags during the mixing operation and before the mix is discharged.

The Engineer may require additional testing beyond the requirements of this Section prior to the acceptance of any SCM sources.

929-1.1 Definitions.

The following definitions are applicable to the production and quality control (QC) of SCMs:

1. Approved Laboratory: A laboratory that is currently inspected by the Cement and Concrete Reference Laboratory (CCRL), is actively participating in the CCRL proficiency program and has corrected all deficiencies noted at the time of inspection. The laboratory must authorize the CCRL to send a copy of the final inspection report and proficiency sample results to the State Materials Office (SMO).

2. SCM Producer: Indicates an SCM supplier, including but not limited to a plant, a terminal, or a transfer facility, that has been qualified by the SMO. The Cementitious Materials Production Facility Listing will be maintained by the SMO.

3. Test Report: A certification from the SCM producer showing that the SCM meets the requirements of this Section. The test report must include, at a minimum, the following information:

   a. The Type of SCM.
   b. The production period.
   c. Chemical and physical analysis of the SCM.
   d. The silo numbers where the SCM is stored.
   e. The specific gravity of the SCM.
   f. The approved laboratory that performed all tests.

4. Purchaser: The term “purchaser” in the ASTM requirements shall be taken as the Department.

ARTICLE 929-2 is deleted and the following substituted:

929-2 Quality Control Program.

929-2.1 General: Develop a Producer QC Program as specified in Section 105.

SCM producers shall submit a proposed QC Plan to the SMO for acceptance.

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. In addition to the QC Plan, the SCM producer must submit monthly test reports from an approved laboratory which certifies that the SCM in current production or supply conforms to the requirements of this Section.

SCM producers with an accepted QC Plan will appear on the Cementitious Materials Production Facility Listing.

QC test data that does not comply with the Specification will not be reason for rejection of the material if the SCM producer's QC Plan indicates that material will be diverted and not used for Department projects.

929-2.2 Sampling and Testing: Representatives from the Department may take verification samples at the SCM producer's plant, terminal, distribution facility or the concrete production facility. Samples shall be obtained by one of the methods described in FM 5-503. Sample sizes shall be a minimum of one gallon by volume. At the concrete production facility, cementitious samples shall be jointly obtained by the Department inspector and the concrete producer's representative.

Upon request of the Department, the SCM producer shall provide split samples of the cementitious material collected for QC testing. Split samples shall be delivered to the SMO and shall be identified as representing a designated LOT of the SCM.

Notification of failing verification sample test results will be distributed to the SCM producer and concrete producers (if applicable). Split samples of the initial sample may be provided to the SCM producer and concrete producer upon request.

SUBARTICLE 929-3.4.1 is deleted and the following substituted:

929-3.4.1 Concrete/Mortar Testing: Six concrete mixes shall be prepared by an accredited laboratory, three control batches using an approved Class F fly ash and three ~~trial~~comparison batches with petroleum coke, bark ash, or Class C fly ash, while all other constituents remain the same except for small adjustments to get the mix to yield. 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% fly ash replacement.
4. Water/cementitious materials ratio of 0.41.

The following testing shall be performed on each concrete mix, as appropriate.

Table 929-1 Concrete Testing Requirements		
Test Description	Standard Test Method	Test Age
Surface Resistivity	AASHTO T 358	28 days
Compressive Strength	ASTM C39	28 days
Chloride Diffusion	ASTM C1556 or NT Build 443	6 months, 12 months (1)
Length Change	ASTM C157	28 days(2)
(1) Upon completion of all 28 day and 6 month testing, the SCM producer may present the data to the SMO for acceptance. The12 month data shall be provided to the SMO upon completion. (2) Follow the Air Storage procedure.		

Sulfate Resistance testing shall be performed on a mortar mix in accordance with ASTM C1012 and results reported after 6 and 12 months of testing.

SUBARTICLE 929-4.1 is deleted and the following substituted:

929-4.1 General: Slag cement and reference cement used for determination of slag activity tests shall meet the requirements of ASTM C989. Sampling and testing procedures shall follow the requirements of ASTM C989. ~~Only slag cement Grade 100 and 120 will be permitted.~~

SUBARTICLE 929-5.2.1 is deleted and the following substituted:

929-5.2.1 Concrete/Mortar Testing: Six concrete mixes shall be prepared by an accredited laboratory, three control batches using an approved Class F fly ash and three comparison batches with the calcined clay, while all other constituents remain the same except for small adjustments to get the mix to yield. 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. Control batches: Replace 18 to 22% ~~fly ash replacement~~of the portland cement with C~~c~~lass F fly ash ~~replacement~~.
4. ~~Water/cementitious materials ratio of 0.41~~ ~~for the control~~Comparison batches: ~~, r~~Replace~~d~~ a portion of portland cement with ~~the necessary amount~~a quantity of calcined clay sufficient to produce properties comparable to those for the control batches ~~for comparison batches~~.
5. Water/cementitious materials ratio of 0.41

Testing shall be performed in accordance with Table 929-1.

Sulfate Resistance testing shall be performed on a mortar mix in accordance with ASTM C1012 and results reported after 6, 12, and 18 months of testing.

929-6.2.1 Concrete/Mortar Testing: Six concrete mixes shall be prepared by an accredited laboratory, three control batches using an approved Class F fly ash and three comparison batches with the ground glass, while all other constituents remain the same except for small adjustments to get the mix to yield. 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. Control batches: Replace 18 to 22% of the portland cement with Cclass F fly ash ~~replacement~~.
4. ~~Water/cementitious materials ratio of 0.41.~~ Comparison batches: Replace a portion of portland cement with a quantity of ground glass sufficient to produce properties comparable to those for the control batches.
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Testing shall be performed in accordance with Table 929-1.

Sulfate Resistance testing shall be performed on a mortar mix in accordance with ASTM C1012 and results reported after 6, 12, and 18 months of testing.

SUBARTICLE 929-7.2.2 is deleted and the following substituted:

929-7.2.2 Acceptance Testing of Metakaolin: Acceptance of metakaolin from sources operating under an accepted QC Plan shall be based on the monthly test reports meeting the chemical and physical requirements of ASTM C618 Class N, as modified herein, and this Section.

~~Metakaolin may be used in concrete if the test results provide an improvement or comparable compressive strength, sulfate resistance, corrosion protective properties, and other durability requirements of concrete, when compared to ASTM C618 Class F fly ash concrete.~~

SUBARTICLE 929-7.2.3 is deleted.

~~**929-7.2.3 Concrete/Mortar Testing:** Six concrete mixes shall be prepared by an accredited laboratory, three control batches using an approved Class F fly ash and three comparison batches with the metakaolin, while all other constituents remain the same except for small adjustments to get the mix to yield. 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% fly ash replacement.~~
~~4. Water/cementitious materials ratio of 0.41.~~

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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. Control batches: Replace 18 to 22% of the portland cement with Class F fly ash.
4. Comparison batches: Replace a portion of portland cement with a quantity of calcined clay sufficient to produce properties comparable to those for the control batches.
5. Water/cementitious materials ratio of 0.41

Testing shall be performed in accordance with Table 929-1.

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929-6.2.1 Concrete/Mortar Testing: Six concrete mixes shall be prepared by an accredited laboratory, three control batches using an approved Class F fly ash and three comparison batches with the ground glass, while all other constituents remain the same except for small adjustments to get the mix to yield. 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. Control batches: Replace 18 to 22% of the portland cement with Class F fly ash.
4. Comparison batches: Replace a portion of portland cement with a quantity of ground glass sufficient to produce properties comparable to those for the control batches.
5. Water/cementitious materials ratio of 0.41.

Testing shall be performed in accordance with Table 929-1.

Sulfate Resistance testing shall be performed on a mortar mix in accordance with ASTM C1012 and results reported after 6, 12, and 18 months of testing.

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SUBARTICLE 929-7.2.3 is deleted.