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**DIVISION 1400
CONCRETE ADMIXTURES AND CURING MATERIALS**

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1401 - AIR-ENTRAINING ADMIXTURES FOR CONCRETE

SECTION 1401

AIR-ENTRAINING ADMIXTURES FOR CONCRETE

1401.1 DESCRIPTION

This specification covers admixtures for use as air-entraining agents to be added to concrete mixtures. An air-entraining agent is defined as an admixture that is used as an ingredient of concrete, added to the batch immediately before or during mixing, for the purpose of entraining air.

1401.2 REQUIREMENTS

Provide material that complies with AASHTO M 154 for compressive and flexural strength, and resistance to freezing and thawing.

1401.3 TEST METHODS

As specified in AASHTO M 154.

1401.4 PREQUALIFICATION

All air-entraining agents must be prequalified. Submit two copies of a test report, from a recognized laboratory, to the Engineer of Tests. The test report must establish that concrete containing the agent complies with the requirements for compressive and flexural strength, and resistance to freezing and thawing as specified in AASHTO M 154. Tests for bleeding, time of set, and length change are not required. A recognized laboratory is one operated by any State Transportation Agency, the Federal Highway Administration, or other cement and concrete laboratory regularly inspected by the Cement & Concrete Reference Laboratory (CCRL) of the National Institute of Standards and Technology.

Results of tests from the AASHTO National Transportation Product Evaluation Program (NTPEP) will be accepted in lieu of the sample requested above. Include the most recent NTPEP test report along with the other documentation requested. Include evidence that the product being offered is identical to the one reported in the NTPEP report.

The test report will be reviewed for compliance with the specification. The Bureau of Materials and Research will maintain a list of air-entraining agents that have been prequalified.

1401.5 BASIS OF ACCEPTANCE

The acceptance of each shipment of material provided under this specification will be based on receipt and approval of a Type C certification as specified in **DIVISION 2600**.

1402 - CHEMICAL ADMIXTURES FOR CONCRETE

SECTION 1402

CHEMICAL ADMIXTURES FOR CONCRETE

1402.1 DESCRIPTION

This specification covers chemical admixtures to be added to concrete mixtures during mixing operations for the purposes listed below:

a. Type A – Water Reducing Admixture. An admixture that reduces the quantity of mixing water required to produce concrete of a given consistency.

b. Type B – Set Retarding Admixture. An admixture that retards the setting of concrete.

c. Type C - Accelerating Admixture. An admixture that accelerates the setting of concrete.

d. Type D – Water Reducing-Set Retarding Admixture. An admixture that reduces the quantity of mixing water required to produce concrete of a given consistency, and retards the setting of concrete.

e. Type E - Water Reducing and Accelerating Admixture. An admixture that reduces the quantity of mixing water required to produce concrete of a given consistency, and accelerates the setting of concrete.

f. Type F – Water-Reducing, High Range Admixture. An admixture that reduces the quantity of mixing water required to produce concrete of a given consistency by 12% or greater.

g. Type G – Water Reducing, High Range, and Retarding Admixture. An admixture that reduces the quantity of mixing water required to produce concrete of a given consistency by 12% or greater, and retards the setting of concrete.

h. Type I – Plasticizing Admixture. An admixture that produces flowing concrete without further addition of water.

i. Type II – Plasticizing and Set Retarding Admixture. An admixture that produces flowing concrete without further addition of water, and retards the setting of concrete.

NOTE: Flowing concrete is defined as having a slump equal to or greater than 7 ½ inches.

1402.2 REQUIREMENTS

a. Provide Type A, B, C, D, E, F and G admixtures that comply with ASTM C 494.

b. Provide Type I and II plasticizing admixtures that comply with ASTM C 1017.

1402.3 TEST METHODS

a. Test Type A, B, C, D, E, F, and G admixtures as specified in ASTM C 494, with the following exception:
(1) Provisional qualification, as stated in Table 1, Note C, will not be considered until at least 6 months of data has been established.

b. Test Type I and II plasticizing admixtures as specified in ASTM C 1017.

1402.4 PREQUALIFICATION

a. Each brand and type of admixture covered by this specification must be prequalified. Submit a written request to be evaluated for prequalification to the Chief of Materials and Research. Provide the following for each brand and type of material to be evaluated:

1402 - CHEMICAL ADMIXTURES FOR CONCRETE

- (1) Name and address of the manufacturer.
 - (2) Brand name of the material.
 - (3) Type of material as defined in **subsection 1402.1**.
 - (4) The chloride content of the admixture and whether or not chloride was added during its manufacture.
 - (5) Recommended dosage for each of the following concrete temperature ranges: 68° to 77°F, 77° to 86°F, and above 86°F.
 - (6) Recommended manner and time of adding the admixture to the concrete batch.
 - (7) Two copies of a certified test report prepared by a laboratory regularly inspected by the Cement and Concrete Reference Laboratory (CCRL) of the National Institute of Standards and Technology, showing test results complying with the applicable requirements of ASTM C 494 or ASTM C 1017. Also, include evidence that the laboratory is regularly inspected by CCRL. Test results are to be no more than 36 months out of date.
 - (8) An infra-red spectrum of the admixture which was used in the laboratory tests.
- b.** Forward a one-liter sample from production of each type of admixture being offered for prequalification to the Engineer of Tests.
- c.** The information, test reports and test results obtained at the Materials and Research Center on samples submitted, will be reviewed by the Chief of Materials and Research. The manufacturer will be advised of the results.
- d.** Results of tests from the AASHTO National Transportation Product Evaluation Program (NTPEP) will be accepted in lieu of the sample requested above. Include the most recent NTPEP test report along with the other documentation requested. Include evidence that the product being offered is identical to the one reported in the NTPEP report.
- e.** The Bureau of Materials and Research will maintain a list of prequalified chemical admixtures for concrete. Products that have been prequalified by the above procedures will remain prequalified, as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the admixture functions appropriately. Changes in the formulation, manufacturing process, or failure of the admixture to function appropriately will require a new prequalification.

1402.5 BASIS OF ACCEPTANCE

- a.** Prequalification as set forth under **subsection 1402.4**.
- b.** Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

1403 - SILICA FUME

SECTION 1403

SILICA FUME

1403.1 DESCRIPTION

This specification covers silica fume, or microsilica, which is suitable for use as an admixture for portland cement concrete. Silica fume is a by-product resulting from the reduction of high purity quartz with coal in electric arc furnaces in the manufacture of silicon and ferrosilicon alloys.

1403.2 REQUIREMENTS

Provide material which complies with ASTM C 1240.

1403.3 TEST METHODS

As specified in ASTM C 1240.

1403.4 PREQUALIFICATION

a. Sources of silica fume must be prequalified. Submit certified analyses of the quality control tests completed during the 6-month period immediately before the prequalification request. Certified analyses are defined as the range of test results of the properties specified above on representative materials tested by a laboratory which is regularly inspected and certified by the Cement and Concrete Reference Laboratory (CCRL). Include mill certifications for the raw material.

b. Forward the certified analysis to the Chief of Materials and Research. If the material satisfies all requirements, the source will be placed on a prequalified list.

c. Verification samples will be taken by each District, at the rate of one per year, for each silica fume producer supplying material to that District's projects.

d. Semi-annual results of the producers quality control testing, as defined above, are required to be forwarded to the Bureau of Materials and Research to maintain status on the prequalified list. Sources will remain on the prequalified list, so long as verification samples and semi-annual test results complies with all requirements, and indicate acceptable quality control.

1403.5 BASIS OF ACCEPTANCE

a. Prequalification as required by **subsection 1403.4** of this specification.

b. Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

1404 - PRECURE/FINISHING AID

SECTION 1404

PRECURE/FINISHING AID

1404.1 DESCRIPTION

This specification covers evaporation retarding material for use in finishing concrete flatwork, and serves as a finishing aid. This material is not a substitute for regular curing compound, which must be applied after the concrete is finished.

1404.2 REQUIREMENTS

- a. Provide a pigmented water based material, as described in ACI 345R, capable of producing a monomolecular film over freshly placed concrete, which serves to retard evaporation from the surface.
- b. The material may have no deleterious effects on concrete.
- c. Prepare and use the material in accordance with the manufacturer's instructions. Provide a copy of those instructions to the Field Engineer prior to commencing operations.

1404.3 TEST METHODS

None specified.

1404.4 PREQUALIFICATION

Pre-cure/ finishing aid materials must be prequalified. For approval of proposed products, submit complete technical data and material safety data sheets to the Bureau of Materials and Research. The manufacturer will be notified of the acceptance or denial of the product. The Bureau of Materials and Research will maintain a list of prequalified pre-cure/finishing aid material for concrete. Products prequalified by the above procedures will remain prequalified, as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the admixture functions appropriately.

1404.5 BASIS OF ACCEPTANCE

- a. Prequalification as required by **subsection 1404.4** of this specification.
- b. Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

1405 - LIQUID MEMBRANE FORMING COMPOUNDS

SECTION 1405

LIQUID MEMBRANE FORMING COMPOUNDS

1405.1 DESCRIPTION

This specification covers liquid membrane forming compounds (also referred to as concrete curing compounds) suitable for spraying on horizontal and vertical concrete surfaces to retard the loss of water during the early hardening period and subsequent curing period.

1405.2 REQUIREMENTS

a. Provide liquid membrane forming compound that complies with AASHTO M 148 for Type 1-D, clear or translucent with fugitive dye, or Type 2, white pigmented compound.

b. Type 2 white pigmented compound will be further classified into Type 2 (Wax Based) and Type 2 (Other). This is to allow specifying of wax based compound for certain applications where a bond breaker is desired. Either formulation base may be supplied except when wax based is specified.

c. Do not allow water-emulsion based material to freeze. Material that has been subjected to freezing temperatures will be rejected.

1405.3 TEST METHODS

Test materials in accordance with AASHTO M 148. Fingerprinting and screening of verification samples by infrared spectroscopy is done according to ASTM E 1252.

Water emulsion based material is not subject to the long term settling test by the freeze thaw cycling method.

Wax-based material for Cement Treated Base (CTB) with the following exceptions:

Moisture Loss, kg/sq m (max.)	0.60
Reflectance (min.).....	50%

1405.4 PREQUALIFICATION

Submit a 1-quart sample of material and a copy of the manufacturer's test results on samples of the same lot of material to the Engineer of Tests. Include a copy of the Material Safety Data Sheet (MSDS). For Type 2 white pigmented compounds, include a statement regarding whether the formulation is wax based or other, unless it is specifically addressed in the MSDS.

Samples will be tested for compliance with this specification. The manufacturer will be notified of the test results on the samples submitted.

Results of tests from the AASHTO National Transportation Product Evaluation Program (NTPEP) will be accepted in lieu of the sample requested above. Include the most recent NTPEP test report along with the other documentation requested. Include evidence that the product being offered is identical to the one reported in the NTPEP report.

Manufacturers whose products comply with this specification will be placed on a prequalified list. Manufacturers will remain on the list as long as the results of verification samples and performance in the field are satisfactory. Any changes in formulation will require re-submittal for prequalification testing.

Verification samples will be taken by each District at the rate of 2 per product, per manufacturer, per year, of the manufacturers supplying to that District. Samples will be forwarded to the Materials and Research Center for verification testing.

1405.5 BASIS OF ACCEPTANCE

Prequalification as required by **subsection 1405.4** above.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

1406 - BURLAP

SECTION 1406

BURLAP

1406.1 DESCRIPTION

This specification covers new and used burlap for use in curing concrete.

1406.2 REQUIREMENTS

a. General. Provide material which complies with AASHTO M 182, Class 3 (10 oz/yd) with the following additions:

- (1) Manila hemp may also be used to make burlap.
- (2) Burlap fabricated from bags may not be used.
- (3) Burlap may not contain any water soluble ingredient which will retard the setting time of portland cement concrete.

b. Used Burlap. Used burlap must comply with the requirements stated above, and can only have been used previously for curing concrete. "Like new" cleanliness is not expected, but contamination with any substance foreign to the concrete curing process (e.g. grease or oil) will be cause for rejection.

1406.3 TEST METHODS

As specified in AASHTO M 182.

1406.4 PREQUALIFICATION

None Required

1406.5 BASIS OF ACCEPTANCE

a. New burlap will be accepted on the basis receipt and approval of a Type D certification as specified in **DIVISION 2600** and a visual inspection for compliance with AASHTO M 182.

b. Used burlap will be accepted on the basis of a Contractor certification regarding the source and previous use of the material, and a visual inspection for compliance with AASHTO M 182.

1407 - SHEET MATERIALS FOR CURING CONCRETE

SECTION 1407

SHEET MATERIALS FOR CURING CONCRETE

1407.1 DESCRIPTION

This specification covers materials in sheet form used for covering the surfaces of hydraulic cement concrete to inhibit moisture loss during the curing period. In the case of white reflective materials, it also reduces temperature rise in concrete exposed to radiation from the sun. Materials included are clear and white opaque polyethylene film, and white-burlap polyethylene sheet.

1407.2 REQUIREMENTS

a. General. Provide material that complies with AASHTO M 171.

b. Used Sheet Material. Used sheet material must comply with the requirements stated above, and can only have been used previously for curing concrete. "Like new" cleanliness is not expected, but contamination with any substance foreign to the concrete curing process (e.g. grease or oil) will be cause for rejection.

1407.3 TEST METHODS

As specified in AASHTO M 171.

1407.4 PREQUALIFICATION

None Required.

1407.5 BASIS OF ACCEPTANCE

a. New sheet materials will be accepted on the basis receipt and approval of a Type D certification as specified in **DIVISION 2600**, and a visual inspection for compliance with AASHTO M 171.

b. Used sheet materials will be accepted on the basis of a Contractor certification regarding the source and previous use of the material, and a visual inspection for compliance with AASHTO M 171.