KANSAS DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION TO THE
STANDARD SPECIFICATIONS, 1990 EDITION

NOTE: This special provision is generally written in the imperative mood. The subject, "the *Contractor*" is implied. Also implied in this language are "*shall*", "*shall be*", or similar words and phrases. The word "*will*" generally pertains to decisions or actions of the Kansas Department of Transportation.

SUBSECTION 2001

PORTLAND CEMENT AND BLENDED HYDRAULIC CEMENT

Subsection 2001. Delete the subsection and replace it with this:

2001.1 DESCRIPTION.

This specification governs the requirements for portland and blended hydraulic cement utilized in the production of concrete.

2001.2 REQUIREMENTS.

a. General. Cement types are to be designated according to the classifications of AASHTO M 85 for Portland and AASHTO M 240 for blended cement.

Utilize Type IP, I(PM) IS, I(SM), or II cement in the construction of bridge deck wearing surfaces and concrete pavement, Type III for high early strength concrete, and Type I, IP, I(PM) IS, I(SM), or II for all other construction.

A cement type and source must be prequalified before it can be utilized in Department projects.

Cements of differing types and or sources cannot be intermixed within any singular component of a structure.

A contractor must have moisture protective facilities to store the cement required for 3 active construction days. The Engineer's representative may waive this requirement if it is determined that a well-regulated supply from the cement producer can be maintained. Any cement that has been contaminated by moisture or reclaimed by any method is not acceptable.

Previously approved cement bulk stored at the source plant or terminal for over 6 months or in bulk or packaged and stored at a contractor or distributor facility for over 3 months after the initial test date is subject to re-sampling, testing, and the requirements of this **Subsection**.

Cement stored at facilities, other than those described in the foregoing, prior to the initiation of construction or delivered to such facilities during construction of Department projects is to be sampled and tested and is subject to the requirements of this **Subsection**. This requirement may be waived if certifications documenting that the cement is a prequalified type from a prequalified source are provided to the Engineer's representative.

b. Portland Cement. Portland cements Type I, Type II, and Type III furnished under this specification must comply with all applicable requirements of AASHTO M 85 except as modified by the following:

(1) Determine the fineness of these cements by the air permeability method in accordance with the procedures specified in ASTM C 204.

(2) The fineness of Type II cement is to be in the range of 280 to 400 square meter per kilogram, inclusive.

(3) The time of setting may be determined by use of the Gillmore needles method (ASTM C 266), or the Vicat needle method (ASTM C 191). Identify which method is being used on the report. The Department will test using the Gillmore method.

(4) The maximum Tricalcium Silicate (C_3S) shown in Table 1 is deleted for Type II cement.

(5) The optional chemical requirement for equivalent alkalis of Table 1A is applicable for Type II cement.

(6) If process additions are used in accordance with ASTM C 465, the percentage, composition and source of the additions must be reported in writing to the Department.

(7) Limestone addition: A maximum of 3.0% limestone by mass may be interground with the cement provided that the chemical and physical requirements are met. Only intergrind limestone that is naturally occurring, consisting of at least 70% by mass of one or more of the mineral forms of calcium carbonate. Calculate and report the limestone content in portland cement on the Mill Report as described in ASTM C 150, Annex A1.

(8) Include the CO_2 content of portland cement on the Mill Report. Determine the CO_2 in accordance with ASTM C 114. When the CO_2 content exceeds 1.0% or when any quantity of limestone is added, report the C_3S as calculated in ASTM C 150, Annex A1, using the actual CO_2 value.

c. Blended Hydraulic Cement. Blended hydraulic cements Type IP, Type I(PM), Type IS, and Type I(SM) furnished under this specification must comply with all applicable requirements of AASHTO M 240 except as modified by the following:

(1) Provide a written statement specifying the proportions and materials being blended to produce the blended hydraulic cement, and that the amount of pozzolan or blast furnace slag in the finished cement will not vary more than $\pm$ 5.0 percent by weight of the finished cement from lot to lot or within a lot.

(2) Report the amount retained on the No. 325 sieve, and the fineness by the air permeability method in accordance with the procedures specified in ASTM C 204 at the time of shipment.

(3) Mortar expansion of the finished cement must be within the limits included in Table 2 or meet the job specific mixture requirements as provided in **d. Field Mixed or Blended Cements, (1)(d).**

(4) The equivalent alkalis, as defined in Table 1A of AASHTO M 85, may not exceed 1.5 percent in any application. For prequalification, or to increase the equivalent alkalis above current production levels, submit results from ASTM C 441 testing showing mortar expansion within the limits in Table 2 of AASHTO M 240 for the maximum equivalent alkalis level intended for

production. Also submit a sample to the Engineer of Tests for verification testing. Monthly quality control test reports will be monitored to ensure the equivalent alkalis level of regular production remains below this maximum level. If production at a higher level is desired, complete requalification which establishes a new maximum limit will be required.

d. Field Mixed or Blended Cements.

(1) Cements for use in concrete that are mixed or blended in the field by substituting any pozzolan or blast furnace slag for portland cement whether in the mixer or otherwise, must comply with the following requirements:

(a) Provide a written statement specifying the proportions and materials being blended to produce the total cementitious content, and that the amount of pozzolan or blast furnace slag will not vary more than $\pm$ 1.0 percent by weight of the total cement from batch to batch.

(b) Use portland cement or blended hydraulic cement from sources prequalified under this specification.

(c) Use pozzolan or blast furnace slag from approved or prequalified sources.

(d) Test and provide project mix design results meeting those established in 90M/P-156 (latest revision)

(e) Concrete made with these mixtures is subject to strength and other requirements detailed in other parts of the specifications.

(2) Silica fume, which is specified elsewhere, is excluded from the requirements in **subsection 2001.2 d.** (1).

(3) Refer to **Section 401** for more specific information regarding substituting any pozzolan or blast furnace slag for portland cement as a field mixed or blended cement.

2001.3 TEST METHODS.

Conduct all tests required by the applicable AASHTO, ASTM or other specifications of **subsection 2001.2** according to the procedures specified in that standard. Field sample cement in accordance with the procedures of the Construction Manual, Part V, KT-29. Obtain all other cement samples in accordance with the requirements and procedures of ASTM C 183.

2001.4 PREQUALIFICATION.

a. Becoming Prequalified.

(1) Submit the following to the Engineer of Tests:

- A copy of the quality control plan for the source. The plan should include information on what cement types are produced, where and how sampling is done, frequency, and what standards (AASHTO, ASTM, etc.) are applied.
- A 1 gallon sample of each cement type produced by the source and permitted through this **Subsection** that is representative of the product intended for use on Department projects.

- Certified quality control test results of cement, by type, that was produced by the source during the 6 months immediately prior to the prequalification request. Provide the high, low and average values or statistical analysis for each month.
- Documentation of the source nominal cement production levels, by quantity of each type produced, for the 6 months preceding the prequalification request.
- Documentation of routine Cement and Concrete Reference Laboratory (CCRL-NIST) inspection of the source laboratory performing the cement quality control testing. Include the results of the most recent evaluation.
- The name of the individuals responsible for the quality control for cement production at the source.

(2) The Engineer of Tests will test the submitted sample and review the information submitted by the source for compliance with the requirements of this **Subsection**. The Bureau Chief, Materials and Research, will notify the source of the results by written documentation. Cement producing sources and terminals established and maintained by them that comply with all requirements will be placed on a list of prequalified cement sources, including cement types, maintained by the Bureau of Materials and Research.

(3) Prequalification of a cement source, by type, will be based on cement produced when the source is utilizing specific materials, equipment and processes. Any change in materials, materials sources, equipment or processes voids the source prequalification, and a new prequalification will be required.

b. Maintaining Prequalified Status. After a cement source has acquired prequalified status, the source will be permitted to furnish cement, by prequalified type, for use on KDOT projects provided the following conditions are complied with.

(1) The quality-monitoring program complies the minimum sampling and testing frequencies established in ASTM C 183. This frequency may be altered somewhat with the approval of the Bureau Chief, Materials and Research.

(2) Submit monthly quality control reports for all prequalified cement types within two weeks after completion of the testing. Include a summary of the amount, composition and source of all process additions used under ASTM C 465 for each type of cement manufactured during the month. If none were used, report that fact also.

(3) Utilize an approved laboratory to conduct quality control tests. The laboratory will be considered approved if it is properly equipped, has the capabilities to perform the tests required through this **Subsection** and is routinely inspected through the Cement and Concrete Reference Laboratory (CCRL-NIST) program. Continued approval of the control laboratory and the source, by cement type, will depend on satisfactory comparison of its test results with the results obtained by the Materials and Research Center on random verification samples of cement produced by the source.

(4) The source has not changed materials, material sources, equipment, or processes since prequalification.

2001.5 BASIS OF ACCEPTANCE.

a. Prequalification as specified in **subsection 2001.4**.

b. A proper certification must accompany each shipment of cement. Furnish a copy of the bill of lading which includes the following certification statement and the signature of a responsible source representative to the Engineer's representative responsible for the project.

Certification Statement

The material herein has been sampled and tested as prescribed by the Kansas Department of Transportation and complies with the applicable specification requirements for Type __ cement in accordance with the requirements of AASHTO__.

Date_____ Signed_____

If a process addition (ASTM C 465) is used in the manufacture of the cement, include the following as a part of the certification statement:

A process addition consisting of __% of _____ has been used in the manufacture of this cement as prescribed in ASTM C 465.

c. Identify the bills of lading with a project number, and denote the cement source, the type, and the quantity in the shipment. Retain this copy at the project or contractor or distributor facility for the Engineer's representative's records.

d. In the case of more than one project being supplied by a contractor or distributor facility, the facility must furnish the Engineer's representative either a copy of the bill of lading, or a signed listing of the bills of lading representing the cement, by type and source, incorporated into each project.

Note: Verification samples will be obtained by Department personnel at the project site. Test results that do not comply with the specifications of this **Subsection** may be considered sufficient cause to rescind approval to furnish cement, by type, on a certification basis.

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