

## 2001 - PORTLAND CEMENT AND BLENDED HYDRAULIC CEMENT

### SECTION 2001

#### PORTLAND CEMENT AND BLENDED HYDRAULIC CEMENT

##### 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 I, IP(x), IS(x), IT(Ax)(By), II(MH), or III cement as allowed in **SECTION 401**. The “x” and “y” in the previous sentence equals the targeted percentage of pozzolan or slag cement in the product expressed as a whole number by mass of final blended product. Likewise, “A” and “B” are either “S” for slag cement or “P” for pozzolan with “A” being the larger material by mass and “B” the smaller.

A cement type and source must be prequalified before it can be utilized in KDOT 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, before the initiation of construction or delivered to such facilities during construction of KDOT projects is to be sampled and tested and is subject to the requirements of this Section. 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.** Provide Type I, Type II(MH), and Type III portland cement that comply with all applicable requirements (including the optional chemical and physical requirements, annexes, and appendices) of AASHTO M 85, except as modified by the following:

(1) The time of setting may be determined by use of the Gillmore needles method (AASHTO T 154), or the Vicat needle method (AASHTO T 131). Identify which method is being used on the report. KDOT will test using the Gillmore method.

(2) Optimized SO<sub>3</sub> – Provide supporting expansion data whenever SO<sub>3</sub> results exceed the requirements stated in AASHTO M 85, Table 1.

(3) If processing additions are used, report the percentage, composition, and the source of the additions in writing to KDOT.

(4) Heat of hydration requirements as stated in AASHTO M 85, Table 4 will not be enforced.

**c. Blended Hydraulic Cement.** Supply blended hydraulic cements Type IP(x), Type IS(x), and Type IT(Ax)(By) that comply with 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 slag cement in the finished cement will not vary more than ± 5.0% 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 of AASHTO M240 or the job specific mixture requirements in **subsection 2001.2d.(1)(d)**.

(4) The equivalent alkalis, as defined in Table 2 of AASHTO M 85, may not exceed 1.5% 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

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equivalent alkalis level intended for production. Submit a sample to the Engineer of Tests for verification testing. Monthly quality control test reports will be monitored to verify 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 Blended Cements.

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

- (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 slag cement will not vary more than  $\pm 1.0\%$  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 slag cement from approved or prequalified sources.
- (d) Test and provide project mix design results complying with **SECTION 401**.
- (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 2001.2d.(1)**.

(3) Refer to **SECTION 401** for more specific information regarding the substitution of any pozzolan or slag cement for portland cement as a field 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 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) 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.
- (b) A 2-gallon sample of each cement type produced by the source and permitted through this Section that is representative of the product intended for use on KDOT projects.
- (c) Certified quality control test results of cement, by type, that was produced by the source during the 6 months immediately before the prequalification request. Provide the high, low and average values or statistical analysis for each month.
- (d) Documentation of the source nominal cement production levels, by quantity of each type produced, for the 6 months preceding the prequalification request.
- (e) Documentation of routine Cement and Concrete Reference Laboratory (CCRL) inspection of the source laboratory performing the cement quality control testing. Include the results of the most recent evaluation.
- (f) The names of the individuals responsible for the quality control for cement production at the source.

(2) Submit monthly quality control reports for all prequalified cement Types within 2 weeks after completion of testing. Include supporting expansion data whenever  $SO_3$  results exceed the requirements stated in AASHTO M 85, Table 1. Also include a summary of the amount, composition, and source of all processing additions used for each type of cement manufactured during the month. If none were used, report that fact also.

(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.

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

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

(2) Submit monthly quality control reports for all prequalified cement types within 2 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 CCRL 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. Provide a copy of the bill of lading which includes the following certification statement and the signature of a responsible source representative to the Field Engineer responsible for the project.

**Certification Statement**

**The material herein has been sampled and tested as prescribed by KDOT and complies with the applicable specification requirements for Type \_\_ cement in accordance with the requirements of AASHTO \_\_\_\_\_.**

**Date \_\_\_\_\_ Signed \_\_\_\_\_**

If a processing addition is used in the manufacture of the cement, include the following as a part of the certification statement:

**A processing addition, consisting of \_\_% of \_\_\_\_\_ and complying with the requirements of AASHTO M 85, has been used in the manufacture of this cement.**

**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 provide 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 KDOT 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.