



Standard Specification for Expansive Hydraulic Cement¹

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1. Scope

1.1 This specification covers hydraulic cements that expand during the early hardening period after setting.

2. Referenced Documents

2.1 ASTM Standards:

C 33 Specification for Concrete Aggregates²

C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)³

C 114 Test Methods for Chemical Analysis of Hydraulic Cement³

C 183 Practice for Sampling and the Amount of Testing of Hydraulic Cement³

C 185 Test Method for Air Content of Hydraulic Cement Mortar³

C 188 Test Method for Density of Hydraulic Cement³

C 465 Specification for Processing Additions for Use in the Manufacture of Hydraulic Cements³

C 688 Specification for Functional Additions for Use in Hydraulic Cements³

C 806 Test Method for Restrained Expansion of Expansive Cement Mortar³

C 807 Test Method for Time of Setting of Hydraulic Cement Mortar by Modified Vicat Needle³

3. Terminology

3.1 Definitions:

3.1.1 *expansive cement (K)*—an expansive cement containing anhydrous calcium aluminosulfate ($4\text{CaO} \cdot 3\text{Al}_2\text{O}_3 \cdot \text{SO}_3$), calcium sulfate, and uncombined calcium oxide.

3.1.2 *expansive cement (M)*—an expansive cement containing calcium aluminate cement and calcium sulfate.

3.1.3 *expansive cement (S)*—an expansive cement containing tricalcium aluminate (C_3A) and calcium sulfate.

3.1.4 *expansive hydraulic cement*—a cement composed essentially of hydraulic calcium silicates, calcium aluminates and calcium sulfates, which, upon being mixed with water, forms a

paste that increases significantly in volume during the early hardening period occurring after setting. This volume increase is due principally to the reaction of the calcium aluminates and calcium sulfates.

3.1.5 *shrinkage-compensating concrete*—a concrete made with an expansive cement in which the expansion, if restrained, induces compressive stresses that approximately offset tensile stresses induced by drying shrinkage.

4. Classification

4.1 The cement covered by this specification is suitable for use in shrinkage-compensating concrete and shall be designated as Type E-1.

NOTE 1—Three kinds of expansive cement are identified in Section 3 by the letters K, M, and S. The appropriate letter should be used as a suffix to the type designation when one of these kinds is desired. Expansive cement may also be prepared in other ways.

5. Ordering Information

5.1 When it is desired that an optional requirement apply or that the cement be of a particular kind, a specific request to this effect should be made by the purchaser.

6. Chemical Composition

6.1 Expansive cement shall conform to the requirements as to chemical composition prescribed in Table 1.

6.2 The purchaser has the option of specifying that the alkalis ($\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$) shall not exceed 0.60 % (See Table 2).

NOTE 2—This limit should be specified when the cement is to be used in concrete with aggregates that may be reactive. Reference should be made to Specification C 33 for suitable criteria of deleterious reactivity.

7. Physical Properties

7.1 Expansive cement shall conform to the physical requirements prescribed in Table 3.

8. Additions

8.1 The cement covered by this specification shall contain no additions except as follows:

8.1.1 Water, or a functional addition, or both, that has been shown to meet the requirements of Specification C 688, may be added in amounts such that the limits shown in Table 1 for loss on ignition shall not be exceeded.

¹ This specification is under the jurisdiction of ASTM Committee C-1 on Cement and is the direct responsibility of Subcommittee C01.13 on Special Cements.

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² Annual Book of ASTM Standards, Vol 04.02.

³ Annual Book of ASTM Standards, Vol 04.01.