



Standard Test Method for Potential Volume Change of Cement-Aggregate Combinations¹

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1. Scope

1.1 This test method covers the determination of the potential expansion of cement-aggregate combinations by measuring the linear expansion developed by the combinations in mortar bars subjected to variations of temperature and water saturation during storage under prescribed conditions of test.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.3 The values stated in SI units are to be regarded as standard.

2. Referenced Documents

2.1 ASTM Standards:

C 109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)²

C 150 Specification for Portland Cement²

C 227 Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)³

C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency²

C 490 Practice for Use of Apparatus for the Determination of Length Change of Hardened Cement Paste, Mortar, and Concrete³

C 856 Practice for Petrographic Examination of Hardened Concrete³

E 11 Specification for Wire-Cloth Sieves for Testing Purposes⁴

3. Significance and Use

3.1 This test method has been found to produce significant expansions of cement-aggregate combinations when the cement in some cases has a very low alkali content, and in other

cases, where the aggregate is presumptively nonreactive with alkalies. It has been suggested that the test method measures interactions of phenomena possibly including microcracking effects that are in some cases physical and perhaps in other cases chemical.

3.2 No acceptance limits for expansion of cement-aggregate combinations applicable either to cement or aggregate have been developed or should be established.

3.3 This test method is intended primarily for use by those interested in research on aggregates that are found in parts of Oklahoma, Kansas, Nebraska, and Iowa.⁵

4. Apparatus

4.1 The apparatus shall conform to Test Method C 227 except as follows:

4.2 *Containers*—Containers for storing the specimens shall be of corrosion-resistant material, and the inside dimensions shall be approximately 32 by 89 by 310 mm. They shall be so constructed that when used for storing specimens, the loss of moisture is prevented by a tight-fitting cover or by sealing, or by both. The capacity of the containers shall be such that not more than 315 mL of water are required to immerse completely three mortar specimens supported 13 mm above the bottom of the container. Provision shall be made for supporting the specimens 13 mm above the bottom of the container in such manner that the weight of the specimens is not supported by the gage studs, and the specimens are kept vertical, spaced uniformly, and free from contact with the walls of the container.

NOTE 1—Removable corrosion-resistant 0.3 to 0.9-mm sheet metal spacers have been found to be satisfactory to space and support the specimens. The top spacer is a rectangular strip (28 mm in width and 86 mm in length to fit into the interior cross-sectional dimension of the container. The strip is perforated along the longitudinal center line with

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² *Annual Book of ASTM Standards*, Vol 04.01.

³ *Annual Book of ASTM Standards*, Vol 04.02.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ For additional information refer to: Conrow, A. D., "Studies of Abnormal Expansion of Portland Cement Concrete," *Proceedings*, Am. Soc. Testing Mats., ASTEA, Vol 52, 1952, p. 1205; and "Final Report on Cooperative Tests of Proposed Tentative Method of Test for Potential Volume Change of Cement-Aggregate Combinations, and Proposed Tentative Method of Test for Potential Abnormal Expansion of Cement-Aggregate Combinations," by Subcommittee II-b, ASTM Committee C-9, *Proceedings*, ASTEA, Am. Soc. Testing Mats., Vol 54, 1954; and Hadley, David W., "Field and Laboratory Study of the Reactivity of Sand—Gravel Aggregates," *Journal of the PCA Research and Development Laboratories*, Vol 10 No. 1, 1968, pp.17–13; also *Research Bulletin* 221, R and D Laboratories of the PCA, Skokie, IL, 1968.