



Designation: C 151 – 05

Standard Test Method for Autoclave Expansion of Hydraulic Cement¹

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1. Scope

1.1 This test method covers determination of the autoclave expansion of hydraulic cement by means of a test on a neat cement specimen.

1.2 The values stated in inch-pound units are to be regarded as the standard.

1.3 *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.* For specific precaution statements, see the section on Safety Precautions.

2. Referenced Documents

2.1 *ASTM Standards:*²

C 187 Test Method for Normal Consistency of Hydraulic Cement

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

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

C 511 Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes

C 856 Practice for Petrographic Examination of Hardened Concrete

C 1005 Specification for Reference Masses and Devices for Determining Mass and Volume for Use in the Physical Testing of Hydraulic Cements

C 1157 Performance Specification for Hydraulic Cement

¹ This test method is under the jurisdiction of ASTM Committee C01 on Cement and is the direct responsibility of Subcommittee C01.31 on Volume Change.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Significance and Use

3.1 The autoclave expansion test provides an index of potential delayed expansion caused by the hydration of CaO, or MgO, or both, when present in hydraulic cement.³

4. Interferences

4.1 Pozzolans containing fine-grained quartz have been reported to cause excessive expansion under autoclave test conditions due to alkali-silica reaction that will not occur under normal service conditions.⁴ When excessive expansion of paste containing pozzolans occurs, it is recommended that the specimens be examined (See Practice **C 856**) for evidence of alkali-silica reaction (**Note 1**).

NOTE 1—If the excessive expansion has resulted from alkali-silica reaction under autoclave conditions, the pozzolan can be evaluated for alkali reactivity using the procedure described in Performance Specification **C 1157**.

5. Apparatus

5.1 *Weighing Devices and Weights*, for determining the mass of materials conforming to the requirements of Specification **C 1005**.

5.2 *Glass Graduates*, 200 or 250-mL capacity, and conforming to the requirements of Practice **C 490**.

5.3 *Molds*, 1 by 1-in. (25.4 by 25.4-mm) cross section, conforming to the requirements of Practice **C 490**.

5.4 *Flat Trowel*, having a straight-edged steel blade 4 to 6 in. (100 to 150 mm) in length.

5.5 *Autoclave*, consisting of a high-pressure steam vessel provided with a thermometer well. The autoclave shall be equipped with automatic controls and a rupture disk with a bursting pressure of 350 psi (2.4 MPa) \pm 5%. In locations where the use of a rupture disk is not permitted, the autoclave

³ Gonnerman, H. F., Lerch, W. and Whiteside, T. M., "Investigations of the Hydration Expansion Characteristics of Portland Cements," *Portland Cement Association Research Department Bulletin 45*, 1953, pp. 1-168.

⁴ Wang, H., "Autoclave Soundness Test Mischaracterizes Cement-Fly Ash Blends by Introducing Alkali-Quartz Reaction," *Cement, Concrete, and Aggregates*, Vol. 24, No. 2, 2002, pp. 68-72.