



Designation: C 151 – 00

Standard Test Method for Autoclave Expansion of Portland Cement¹

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1. Scope

1.1 This test method covers determination of the autoclave expansion of portland 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:

- C 187 Test Method for Normal Consistency of Hydraulic Cement²
- 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 Concrete²
- C 511 Specification for Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes²
- C 1005 Specification for Weights and Weighing Devices for Use in the Physical Testing of Hydraulic Cements²

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 portland cement.³

4. Apparatus

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

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

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

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

4.5 *Autoclave*, consisting of a high-pressure steam vessel provided with a thermometer well. The autoclave shall be equipped with an automatic pressure control 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 shall be equipped with a safety valve. In addition, the autoclave shall be equipped with a vent valve to allow the escape of air during the early part of the heating period and to release any steam pressure remaining at the end of the cooling period. The pressure gage shall have a nominal capacity of 600 psi (4.1 MPa), a dial with a nominal diameter of 4½ in. (114 mm) and shall be graduated from 0 to 600 psi (0 to 4.1 MPa) with scale divisions not exceeding 5 psi (0.03 MPa). The error in the gage shall not exceed \pm 3 psi (\pm 0.02 MPa) at the operating pressure of 295 psi (2 MPa). The capacity of the heating unit shall be such that with maximum load (water plus specimens) the pressure of the saturated steam in the autoclave may be raised to a gage pressure of 295 psi in 45 to 75 min from the time the heat is turned on. The automatic pressure control shall be capable of maintaining the gage pressure at 295 \pm 10 psi (2 \pm 0.07 MPa) for at least 3 h. A gage pressure of 295 \pm 10 psi corresponds to a temperature of 420 \pm 3°F (216 \pm 2°C). The autoclave shall be designed to permit the gage pressure to drop from 295 psi to less than 10 psi in 1½ h after the heat supply has been shut off.

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 *Annual Book of ASTM Standards*, Vol 04.01.

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.