



Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate¹

This standard is issued under the fixed designation C 452; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method, which is applicable only to portland cements, covers the determination of the expansion of mortar bars made from a mixture of portland cement and gypsum in such proportions that the mixture has a sulfur trioxide (SO_3) content of 7.0 mass %.

1.2 The values stated in SI (Practice E 380) 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.*

2. Referenced Documents

2.1 ASTM Standards:

- C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50-mm (2-in.) Cube Specimens)²
- C 150 Specification for Portland Cement²
- C 230 Specification for Flow Table for Use in Tests of Hydraulic Cement²
- C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency²
- C 471 Test Methods for Chemical Analysis of Gypsum and Gypsum Products²
- 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 778 Specification for Standard Sand²
- C 1005 Specification for Weights and Weighing Devices for Use in the Physical Testing of Hydraulic Cements²
- D 1193 Specification for Reagent Water³
- E 380 Practice for Use of the International System of Units

¹ This test method is under the jurisdiction of ASTM Committee C-1 on Cement and is the direct responsibility of Subcommittee C01.29 on Sulfate Resistance. Current edition approved June 15, 1995. Published August 1995. Originally published as C 452 – 60. Last previous edition C 452 – 89.

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

³ *Annual Book of ASTM Standards*, Vol 11.01.

(SI) (The Modernized Metric System)⁴

3. Significance and Use

3.1 This test method is used primarily by those interested in research on methods for determining the potential sulfate resistance of portland cement. This test method is also used to establish that a sulfate-resisting portland cement meets the performance requirements of Specification C 150.

4. Apparatus

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

4.2 *Flow Table*, conforming to the requirements of Specification C 230.

4.3 *Mixer, Bowl, and Paddle*, conforming to the requirements of Practice C 305.

4.4 *Trowel and Tamper*, conforming to the requirements of Test Method C 109.

4.5 *Glass Graduates, Molds, and Length Comparator*, conforming to the requirements of Practice C 490.

5. Temperature and Humidity

5.1 *Molding Room, Dry Materials, and Mixing Water*—The temperature of the molding room, dry materials, and mixing water shall be maintained between 20 and 27.5°C (68 and 81.5°F) and the relative humidity of the molding room shall not be less than 50 %.

5.2 *Moist Cabinet or Room*, conforming to the requirements of Specification C 511.

6. Materials

6.1 The sand used for making the test mortar shall conform to Specification C 778.

6.2 The gypsum⁵ used for addition to the portland cement shall be high grade natural gypsum with 100 % passing the 150- μm (No. 100) sieve, at least 94 % passing the 75- μm (No. 200) sieve, and at least 90 % passing the 45- μm (No. 325) sieve. Calculate the percentage of cement and gypsum required to provide a mixture containing 7.0 mass % SO_3 as follows:

$$\text{Cement, \%} = [(g - 7.0)/(g - c)] \times 100 \quad (1)$$

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

⁵ Terra Alba No. 1, available from the U.S. Gypsum Co., Southard, OK plant, meets these requirements.