



Designation: C 441 – 02a

Standard Test Method for Effectiveness of Pozzolans or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to the Alkali-Silica Reaction¹

This standard is issued under the fixed designation C 441; 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 covers the determination of the effectiveness of pozzolans or slag in preventing the excessive expansion caused by reaction between aggregates and alkalis in portland cement mixtures. The evaluation is based on the expansion developed in mortar bars by a combination of portland cement and a pozzolan or slag, made with reactive aggregates (Pyrex glass), 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.*

2. Referenced Documents

2.1 ASTM Standards:

- C 125 Terminology Relating to Concrete and Concrete Aggregates²
- C 150 Specification for Portland Cement³
- C 227 Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)²
- C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete²
- C 989 Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars²
- C 1240 Specification for Use of Silica Fume as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar, and Grout²
- C 1437 Test Method for Flow of Hydraulic Cement Mortar³

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology C 125.

¹ This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.26 on Chemical Reactions.

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² *Annual Book of ASTM Standards*, Vol 04.02.

³ *Annual Book of ASTM Standards*, Vol 04.01.

4. Significance and Use

4.1 This test method may be used as a preliminary or screening test to evaluate the relative effectiveness of a number of different materials being considered for use to prevent excessive expansion due to alkali-silica reaction.

4.2 This test method may also be used to evaluate materials proposed for use on a particular job to prevent excessive expansion due to alkali-silica reaction, by testing in the quantity and in combination with the cement or cements to be used on the job.

4.3 This test method does not assess the suitability of pozzolans or slag for use in concrete. These materials should comply with Specification C 618, Specification C 989 or Specification C 1240.

5. Apparatus

5.1 The apparatus shall be as described in Test Method C 227.

6. Materials

6.1 *Pyrex Glass*⁴—Crushed Pyrex Glass No. 7740 cullet or solid glass rod crushed and graded according to Table 1. After the Pyrex glass has been separated into the various sieve sizes, wash with a water spray over the sieve to remove adhering dust and fine particles from the aggregate. Dry the portions retained on the various sieves and, unless used immediately, store each such portion individually in a clean container provided with a tight-fitting cover.

6.2 *High-Alkali Cement*—For the preparation of mortar bars for the preliminary or screening tests, use a blend of cement or cements that conform to Specification C 150 and contain between 0.95 and 1.05 % total alkalis as sodium oxide (Na₂O) calculated as % Na₂O + 0.658 × % potassium oxide (K₂O). If blending is needed, introduce the individual cements into the batch separately.

7. Proportioning and Consistency of Mortar

7.1 *Control Mixture*—The quantities of dry materials for the control mixture shall be 400 g of high-alkali cement and 900 g

⁴ Pyrex Brand Glass No. 7740 is available as lump cullet from the Corning Glass Works, Corning, NY.