



Designation: C 878 – 95a

## Standard Test Method for Restrained Expansion of Shrinkage-Compensating Concrete<sup>1</sup>

This standard is issued under the fixed designation C 878; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers the determination of expansion of concrete made with shrinkage-compensating cement.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values in parentheses are for information purposes only.

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 125 Terminology Relating to Concrete and Concrete Aggregates<sup>2</sup>

C 157 Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete<sup>2</sup>

C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory<sup>2</sup>

C 219 Terminology Relating to Hydraulic Cement<sup>3</sup>

C 403 Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance<sup>2</sup>

C 490 Practice for Use of Apparatus for the Determination of Length Change of Hardened Cement Paste, Mortar, and Concrete<sup>3</sup>

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials<sup>2</sup>

C 806 Test Method for Restrained Expansion of Expansive Cement Mortar<sup>3</sup>

C 845 Specification for Expansive Hydraulic Concrete<sup>3</sup>

#### 2.2 ACI Standards:<sup>4</sup>

116-R-90 Cement and Concrete Terminology

223-83 Standard Practice for the Use of Shrinkage-Compensating Concrete

### 3. Terminology

3.1 Terms used in this test method are defined in Terminology C 219C 219, Terminology C 125C 125, and ACI 116-R-90.

### 4. Significance and Use

4.1 Since the potential for expansion, under conditions of controlled restraint, of concrete made with shrinkage-compensating cement cannot always be satisfactorily predicted from tests of mortars made in accordance with Test Method C 806C 806, a need has been recognized for a test method in which concrete specimens are tested.

4.2 This test method can also be adapted readily to studies of expansion involving degrees of restraint, comparisons of cements, effects of cement contents, mixture proportions, schedules, or environmental treatments that differ from the standard procedures prescribed by this test method.

### 5. Apparatus

5.1 *Molds*, for casting test specimens, when used in conjunction with the restraining cage described in 4.2, shall provide for forming prisms 3 in. (76 mm) square with a gage length of 10 in. (254 mm). The molds shall otherwise conform to the requirements of Practice C 490C 490, except that the stud holder, gage studs, and spacer screws described in that specification will not be used.

5.2 *Restraining Cage*, consisting of a threaded 10–24 low-carbon steel rod (plain or zinc-coated) with steel end plates held in place by hex nuts as shown in Fig. 1. The hex nuts outside the cage shall be of stainless steel. Stainless steel cap nuts shall be put on each end of the rod. When tested in tension, within the elastic range, the rod shall have a strain of  $0.0012 \pm 0.0001/630$  lbf (2802 kN) of load (Note 1).

NOTE 1—It is intended that all rods used meet the indicated requirement for strain. When a large number of rods are obtained as a single lot, judgment should be exercised as to whether or not all must be tested.

5.3 *Length Comparator*, conforming to and to be used in accordance with the requirements of Practice C 490C 490. A reference bar complying with the description given in Practice

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<sup>2</sup> Annual Book of ASTM Standards, Vol 04.02.

<sup>3</sup> Annual Book of ASTM Standards, Vol 04.01.

<sup>4</sup> Available from American Concrete Institute, P.O. Box 19150, Detroit, MI 48219.

