NOTICE: This standard has either been superseded and replaced by a new version or withdrawn.

Please contact ASTM International (www.astm.org) for the latest information.

INTERNATIONAL

Designation: C 878 - 95a

Standard Test Method for Restrained Expansion of Shrinkage-Compensating Concrete¹

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 (ϵ) 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 Aggregates²
- C 157 Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete²
- C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory²
- C 219 Terminology Relating to Hydraulic Cement³
- C 403 Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance²
- C 490 Practice for Use of Apparatus for the Determination of Length Change of Hardened Cement Paste, Mortar, and Concrete³
- C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials²
- C 806 Test Method for Restrained Expansion of Expansive Cement Mortar³
- C 845 Specification for Expansive Hydraulic Concrete³ 2.2 ACI Standards:⁴
- 116-R-90 Cement and Concrete Terminology

¹ This method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.68 on Volume Change of Concrete and Aggregates.

Current edition approved April 15 and July 15, 1995. Published September 1995. Originally published as C 878 – 78. Last previous edition C 878 – 87.

- ² Annual Book of ASTM Standards, Vol 04.02.
- ³ Annual Book of ASTM Standards, Vol 04.01.
- ⁴ Available from American Concrete Institute, P.O. Box 19150, Detroit, MI 48219.

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

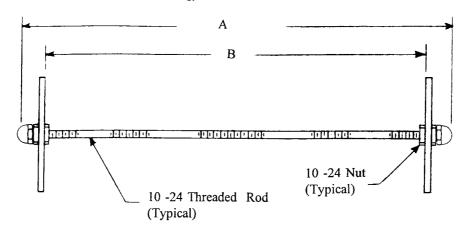
- 4.1 Since the potential for expansion, under conditions of controlled restraint, of concrete made with shrinkage-compensating cement cannot always be satisfactorily predicted from tests of mortars made in accordance with Test Method C 806C 806, a need has been recognized for a test method in which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

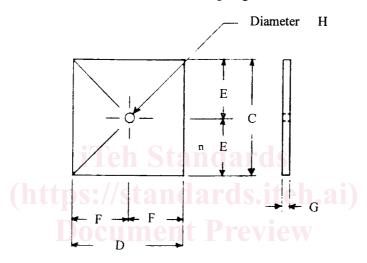
- 5.1 *Molds*, for casting test specimens, when used in conjunction with the restraining cage described in 4.2, shall provide for forming prisms 3 in. (76 mm) square with a gage length of 10 in. (254 mm). The molds shall otherwise conform to the requirements of Practice C 490C 490, except that the stud 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



Assembled Restraining Cage



https://standards.iteh.ai/catalog/sta	A	Dimensions		
	Measurement	6229c637-60 <mark>nf</mark> -4b27	-93e2-c3mm6dflda	
	Α	11%16 ± 1/16	294 ± 1.6	
	В	10	254 (gage length)	
	С	3	76	
	D	$2^{31}/_{32} \pm 1/_{32}$	75 ± 1	
	E	1½	38	
	F	1 ³¹ / ₆₄	37.7	
	G	3/8	10	
	Н	3/16	5	

Note 1-All material is mild steel, except for stainless steel cap nuts.

FIG. 1 Restraining Cage

C 490C 490 shall be used. If the terminals of the comparator are fitted with collars, they shall be such that the cap nuts on the ends of the threaded rod of the specimen do not rest on the collar during the measuring (see Figs. 2 and 3).

- 5.4 Tamping Rod—The tamping rod shall be a straight steel rod, 3/8 in. or 10 mm in diameter, and no less than 10 in. or 250 mm in length, having at least the tamping end rounded to a hemispherical tip of the same diameter.
- 5.5 *Vibrators*, conforming to the requirements for external vibrators prescribed in Practice C 192C 192.

6. Test Specimens

6.1 The test specimen shall be a prism: 3 in. (76 mm) square with a gage length of 10 in. (254 mm) and an overall length (including the length of the rod and cap nuts) of approximately $11\frac{1}{2}$ in. (292 mm). At least three specimens shall be prepared for each test.

Note 2—Caution: Aggregate sizes greater than 1 in. may adversely affect the test results.