Standard Method of Test for

Length Change of Hardened Hydraulic Cement Mortar and Concrete

AASHTO Designation: T 160-17

Technical Section: 3c, Hardened Concrete

Release: Group 1 (April 2017)

ASTM Designation: C157/C157M-14

AASHTO

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1. SCOPE

1.1. This test method covers determination of the length changes that are produced by causes other than externally applied forces and temperature changes in hardened hydraulic-cement mortar and concrete specimens made in the laboratory and exposed to controlled conditions of temperature and moisture.

1.2. The values stated in either inch-pound or SI units are to be regarded separately as standard. An exception is with regard to sieve sizes and nominal size of aggregate, in which the SI values are the standard, as stated in specification ASTM E11. Within the text, the inch-pound units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other, without combining values in any way.

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. *AASHTO Standards*:

- M 201, Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
- M 210M/M 210, Use of Apparatus for the Determination of Length Change of Hardened Cement Paste, Mortar, and Concrete
- R 39, Making and Curing Concrete Test Specimens in the Laboratory
- R 60, Sampling Freshly Mixed Concrete
- T 106M/T 106, Compressive Strength of Hydraulic Cement Mortar (Using 50-mm or 2-in. Cube Specimens)
- T 119M/T 119, Slump of Hydraulic Cement Concrete
- T 162, Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency

2.2. *ASTM Standards*:

- C125, Standard Terminology Relating to Concrete and Concrete Aggregates
- C143/C143M, Standard Test Method for Slump of Hydraulic Cement Concrete

- C511, Standard Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
- C596, Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement
- E11, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
- E337, Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)

3. TERMINOLOGY

3.1. *Definitions*—The terms used in this test method are defined in the terminology of ASTM C125.

3.2. *Definition of Terms Specific to This Standard*:

3.2.1. *length change*—an increase or decrease in the length of a test specimen that has been caused to change by any factor other than externally applied forces and temperature changes.

4. SIGNIFICANCE AND USE

4.1. Measurement of length change permits assessment of the potential for volumetric expansion or contraction of mortar or concrete due to various causes other than applied force or temperature change. The method is particularly useful for comparative evaluation of this potential in different hydraulic-cement mortar or concrete mixtures.

4.2. This test method provides useful information for experimental purposes or for products that require testing under nonstandard mixing, placing, handling, or curing conditions, such as high product workability or different demolding times. Standard conditions are described in Section 5.4.1.

4.3. If conditions for mixing, curing, sampling, and storage other than those specified in this method are required, they shall be reported but are not to be considered as standard conditions of this test method. Nonstandard conditions and the reasons for departure from standard conditions shall be reported clearly and prominently with comparator values.

5. APPARATUS

5.1. *Molds and Length Comparator*—The molds for casting test specimens and the length comparator for measuring length change shall conform to the requirements of M 210M/M 210.

5.2. *Tamper*—The tamper shall be made of a nonabsorptive, nonabrasive material such as medium-hard rubber or seasoned oak wood rendered nonabsorptive by immersion for 15 min in paraffin at approximately 200°C (392°F) and shall have a cross section of 13 by 25 mm (0.50 by 1 in.) and a convenient length of about 150 mm (6 in.). The tamping face of the tamper shall be flat and at right angles to the length of the tamper.

5.3. *Tamping Rod*—The tamping rod shall be a straight steel rod 10 mm (0.375 in.) in diameter and not less than 250 mm (10 in.) in length, having at least the tamping end rounded to a hemispherical tip of the same diameter.

5.4. *Drying Room and Controls*—A drying room with suitable racks shall be provided when storing specimens in air. The racks shall be designed for free circulation of air around specimens, except for necessary supports, and shall be so situated with respect to the nearest wall or other obstruction that air circulation is not restricted in the intervening space. The supports shall be