



Designation: C1698 – 19

Standard Test Method for Autogenous Strain of Cement Paste and Mortar¹

This standard is issued under the fixed designation C1698; 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 measures the bulk strain of a sealed cement paste or mortar specimen, including those containing admixtures, various supplementary cementitious materials (SCM), and other fine materials, at constant temperature and not subjected to external forces, from the time of final setting until a specified age. This strain is known as *autogenous strain*. Autogenous strain is most significant in concrete with low water-cementitious materials ratio (w/cm) (See [Note 1](#)).

NOTE 1—A low water-cementitious materials ratio (w/cm) can be considered to be a water to cement ratio of 0.40 or lower for this test.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 The text of this standard references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this standard.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use. (Warning—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.²)*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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

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² Section on Safety Precautions, Manual of Aggregate and Concrete Testing, *Annual Book of ASTM Standards*, Vol. 04.02.

2. Referenced Documents

2.1 ASTM Standards:³

C125 Terminology Relating to Concrete and Concrete Aggregates

C157/C157M Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete

C191 Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle

C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory

C219 Terminology Relating to Hydraulic Cement

C305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency

C403/C403M Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance

C1005 Specification for Reference Masses and Devices for Determining Mass and Volume for Use in the Physical Testing of Hydraulic Cements

2.2 API Specification⁴

RP 10B-2/ISO 10426-2 Recommended Practice for Testing Well Cements

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method, refer to Terminologies C125 and C219.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *autogenous strain, n*—the bulk strain of a sealed specimen of a cementitious mixture, not subjected to external forces and under constant temperature, measured from the time of final setting until a specified age; negative strain corresponds to shrinkage and positive strain corresponds to expansion.

4. Summary of Test Method

4.1 A specimen of freshly mixed paste or mortar is prepared using a corrugated mold that offers little resistance to length change of the specimen. The mold is sealed to prevent moisture

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ Available from American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005-4070, <http://www.api.org>.

*A Summary of Changes section appears at the end of this standard