



Standard Test Method for Determining Age at Cracking and Induced Tensile Stress Characteristics of Mortar and Concrete under Restrained Shrinkage¹

This standard is issued under the fixed designation C1581/C1581M; 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 laboratory determination of the age at cracking and induced tensile stress characteristics of mortar or concrete specimens under restrained shrinkage. The procedure can be used to determine the effects of variations in the proportions and material properties of mortar or concrete on cracking due to both drying shrinkage and deformations caused by autogenous shrinkage and heat of hydration.

1.2 This test method is not intended for expansive materials.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the 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 and health practices and to 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)*

2. Referenced Documents

2.1 *ASTM Standards:*³

C33/C33M Specification for Concrete Aggregates

C125 Terminology Relating to Concrete and Concrete Aggregates

C138/C138M Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

C143/C143M Test Method for Slump of Hydraulic-Cement Concrete

C150/C150M Specification for Portland Cement

C171 Specification for Sheet Materials for Curing Concrete

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

C387/C387M Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar

C595/C595M Specification for Blended Hydraulic Cements

C1157/C1157M Performance Specification for Hydraulic Cement

C1437 Test Method for Flow of Hydraulic Cement Mortar

F441/F441M Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

2.2 *ASME Standards:*⁴

B 46.1 Surface Texture (Surface Roughness, Waviness and Lay)

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology C125.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *age at cracking, n* —the age of each test specimen, measured from the time of casting, when a sudden decrease in strain occurs.

3.2.2 *net strain, n* —the value corresponding to the difference between the strain in the steel ring at each recorded time and the initial strain.

4. Summary of Test Method

4.1 A sample of freshly mixed mortar or concrete is compacted in a circular mold around an instrumented steel ring. The compressive strain developed in the steel ring caused by shrinkage of the mortar or concrete specimen is measured from

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.

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 Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.