



Designation: C 451 – 99

Standard Test Method for Early Stiffening of Hydraulic Cement (Paste Method)¹

This standard is issued under the fixed designation C 451; 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 early stiffening in hydraulic-cement paste.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information 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.* See Note 1 for a specific warning statement.

NOTE 1—**Warning:** Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure. The use of gloves, protective clothing, and eye protection is recommended. Wash contact area with copious amounts of water after contact. Wash eyes for a minimum of 15 min. Avoid exposure of the body to clothing saturated with the liquid phase of the unhardened material. Remove contaminated clothing immediately after exposure.

2. Referenced Documents

2.1 ASTM Standards:

- C 150 Specification for Portland Cement²
- C 183 Practice for Sampling and the Amount of Testing of Hydraulic Cement²
- C 187 Test Method for Normal Consistency of Hydraulic Cement²
- C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency²
- C 490 Practice for Use of Apparatus for the Determination of Length Change of Hardened Cement Paste, Mortar, and Concrete²
- C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials³
- C 1005 Specification for Reference Masses and Devices for Determining Mass for Use in the Physical Testing of Hydraulic Cements²

¹ This test method is under the jurisdiction of ASTM Committee C-1 on Cement and is the direct responsibility of Subcommittee C01.30 on Time of Set.

Current edition approved Jan. 10, 1999. Published May 1999. Originally published as C 451 – 60 T. Last previous edition C 451 – 95.

² Annual Book of ASTM Standards, Vol 04.01.

³ Annual Book of ASTM Standards, Vol 04.02.

D 1193 Specification for Reagent Water⁴

3. Terminology

3.1 Definitions:

3.1.1 *early stiffening, n*—the early development of stiffness in the working characteristics of a portland-cement paste, mortar, or concrete. Varieties include false set and flash set.

3.1.2 *false set, n*—the early development of stiffness in the working characteristics of a portland-cement paste, mortar, or concrete without the evolution of much heat, which stiffness can be dispelled and plasticity regained by further mixing without addition of water; also known as “grab set,” “premature stiffening,” “hesitation set,” and “rubber set.”

3.1.3 *flash set, n*—the early development of stiffness in the working characteristics of a portland-cement paste, mortar, or concrete, usually with the evolution of considerable heat, which stiffness cannot be dispelled nor can the plasticity be regained by further mixing without addition of water; also known as “quick set.”

4. Summary of Test Method

4.1 A paste is prepared with the cement to be tested, using sufficient water to give a required initial penetration as measured by the Vicat apparatus at a stipulated time after completion of mixing. A second penetration, termed the final penetration, is measured at a later stipulated time. The ratio of final penetration to initial penetration is calculated as a percentage.

5. Significance and Use

5.1 The purpose of this test method is to determine the degree to which a cement paste develops early stiffening or to establish whether or not a cement complies with a specification limit on early stiffening.

5.2 When used for establishing compliance with a specification limit, the specification requirement is customarily stated in terms of the minimum allowable final penetration, in percent, calculated in accordance with Section 11. When used for estimating the relative tendency of a cement to manifest early stiffening, additional information of value may be obtained if the remix procedure described in Section 10 is employed. Under some conditions, a judgment may be made

⁴ Annual Book of ASTM Standards, Vol 11.01.