



Designation: C1738 – 11

Standard Practice for High-Shear Mixing of Hydraulic Cement Pastes¹

This standard is issued under the fixed designation C1738; 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 practice covers the high-shear mixing of hydraulic cement pastes.

1.2 The values stated in SI units or inch-pound units are to be regarded as the standard. Within the text, the inch-pound units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

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:*²

C219 Terminology Relating to Hydraulic Cement

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

C511 Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes

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

2.2 *Non-ASTM Standard:*³

ANSI/API Recommended Practice 10B-2 (formerly 10B)—Recommended Practice for Testing Well Cements||

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology **C219**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *mixing, high-shear, v*—of pastes, the process of blending dry and liquid materials in a container using blades rotating axially at speeds at or above 420 rad/s [4000 rpm].

4. Summary of Practice

4.1 The practice describes the mixing of hydraulic cement paste in a high-shear mixer with a cooling jacket or other method to control the temperature of the paste. This procedure is derived from the ANSI/API standard and the following reports:

(1) R. Helmuth, L.M. Hills, D.A. Whiting, S. Bhattacharja, Abnormal Concrete Performance in the Presence of Admixtures, RP333, Portland Cement Association, Skokie, Illinois, USA, 1995, 92 pages and

(2) C. F. Ferraris, Measurement of the rheological properties of cement paste: a New Approach, Int. RILEM Conf.—The role of Admixtures in High Performance Concrete, ed. by J.G. Cabrera and R. Rivera-Villareal, Monterrey (Mexico), March 1999. pp. 333-342, or

(3) C. Ferraris, K. Obla, R. Hill, The influence of mineral admixtures on the rheology of cement paste and concrete, Cement and Concrete Research Vol. 31/2, pp. 245-255 (2001).

5. Significance and Use

5.1 This practice is useful in laboratory research on rheology of hydraulic cement systems as it has been shown to provide a paste with rheological properties similar to those obtained in a concrete from which the aggregate had been removed.⁴ Mixing of paste using **C305** is not satisfactory as the paste is not thoroughly mixed, due to the absence of sand. In this practice the shear imparted to the cement paste is significantly higher than in **C305** and therefore it is known as high-shear mixing.

6. Apparatus

6.1 *Mixer*—Composed of an electrical motor, a mixing container and a tachometer with the motor speed controlled automatically (rheostat adjustment of speed will not be acceptable). The blades are attached to the bottom of the container

¹ This practice is under the jurisdiction of ASTM Committee C01 on Cement and is the direct responsibility of Subcommittee C01.22 on Workability.

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² 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.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

⁴ R. Helmuth, L.M. Hills, D.A. Whiting, S. Bhattacharja, Abnormal Concrete Performance in the Presence of Admixtures, RP333, Portland Cement Association, Skokie, Illinois, USA, 1995, 92 pages.