



Standard Test Method for Time of Setting of Portland-Cement Pastes Containing Quick-Setting Accelerating Admixtures for Shotcrete by the Use of Gillmore Needles¹

This standard is issued under the fixed designation C 1102; 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 the time of setting of portland-cement pastes containing quick-setting accelerating admixtures for shotcrete.

1.2 The values stated in SI units are to be regarded as 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:

C 266 Test Method for Time of Setting of Hydraulic Cement Paste by Gillmore Needles²

3. Significance and Use

3.1 The performance of a quick-setting accelerating admixture for shotcrete varies with the composition of the portland cement. Since this test method involves the determination of time of setting of a particular combination of a portland cement and a quick-setting accelerating admixture, it therefore provides information on the suitability for use of that particular combination.

3.2 The time of setting of the combination established in the laboratory does not necessarily indicate the time of setting this combination will produce in actual shotcreting or at other than laboratory temperatures. Data on the time of setting of quick-setting accelerating admixtures for shotcrete have been published.^{3,4}

4. Apparatus

4.1 The apparatus described in Test Method C 266 is used to follow this test method in principle.

5. Procedure

5.1 Preparation of Cement Paste:

5.1.1 *Non-liquid Admixtures*—In a suitable rubber or plastic cup, blend with a spatula until uniform, 100 g of cement with either 3 g of the shotcrete admixture or the amount of admixture recommended by the manufacturer for use with 100 g of cement. Add distilled or deionized water, approximately 24 to 30 mL, sufficient to produce a smooth paste. Hand mix completely within 15 s.

5.1.2 *Liquid Admixtures*—Mix 3 mL of liquid shotcrete admixture, or the amount of admixture recommended by the manufacturer for use with 100 g of cement, with 24 to 30 mL of distilled or deionized water. In a suitable rubber or plastic cup, add this liquid to 100 g of cement and mix to produce a smooth paste. Hand mix completely within 15 s.

5.2 *Molding Test Specimen*—Use the cement paste, prepared in accordance with 5.1, to make a pat approximately 75 mm in diameter and 12.5 mm in thickness at the center with a flat top and tapering to a thin edge on a clean glass plate about 100 mm square. When molding the pat, flatten the cement paste first on the glass and then form the pat by drawing the trowel from the outer edge toward the center, flattening the top. Mold the specimen within 1 min after adding the mixing water to the cement to avoid mixing through the setting time.

5.3 *Time-of-Setting Determination*—The time-of-setting determination shall begin immediately after molding the pat and continue every 10 seconds. In determining the time of setting, apply the needle lightly to the surface of the pat. Consider the cement paste to have acquired its initial set when the pat will bear, without appreciable indentation, the initial Gillmore needle. Consider the cement paste to have acquired its final set when the pat will bear, without appreciable indentation, the final Gillmore needle. Measure the time of setting from the time liquid is added to the mixture.

6. Report

6.1 Report the following information:

6.1.1 The initial and final times of setting,

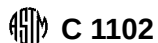
¹ This test method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.46 on Shotcrete.

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² *Annual Book of ASTM Standards*, Vol 04.01.

³ Schutz, Raymond J., "Properties of Shotcrete Admixtures," *Proceedings of an Engineering Foundation Conference, ACI SP-54*, American Concrete Institute, 1977.

⁴ Mahan, J. W., Parker, H. W., and Wuellner, W. W., "Shotcrete Practice in Underground Construction," *UILU-Eng 75-2018*, Department of Civil Engineering, University of Illinois at Urbana Champaign, August 1975.



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- 6.1.2 Brand and type of cement,
- 6.1.3 Names of the admixtures, and
- 6.1.4 Admixture dose and temperatures.

have been obtained and analyzed. The bias cannot be determined because setting time can only be determined by this test method.

7. Precision and Bias

7.1 The precision of this test method has not been determined. A statement will be included when sufficient test data

8. Keywords

8.1 gillmore needles; quick-setting accelerating admixtures; shotcrete

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