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Standard Test Method for Ball Penetration in Freshly Mixed Hydraulic Cement Concrete¹

This standard is issued under the fixed designation C 360; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This test method has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This test method covers determination of the depth of penetration of a metal weight into freshly mixed hydraulic cement concrete.

1.2 The values stated in inch-pound units are to be regarded as the standard.

1.3 *This standard does not purport to address all of the safety problems, 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 143 Test Method for Slump of Hydraulic Cement Concrete²

C 172 Practice for Sampling Freshly Mixed Concrete²

2.2 Other Document:

Manual of Aggregate and Concrete Testing²

3. Summary of Test Method

3.1 The consistency of concrete is measured by determining the penetration of a 30 ± 0.1 -lb (14 ± 0.05 -kg) cylinder with a hemispherically shaped bottom into fresh concrete. Penetration readings may be correlated with results of Test Method C 143 for a given concrete mix.

4. Significance and Use

4.1 This test method is used primarily to determine the penetration of a metal ball into freshly mixed concrete as a means of determining the workability of concrete. After sufficient correlation data with results from the standard slump test is obtained, the results of the penetration reading may be used to determine compliance with slump requirements.

NOTE—Additional guidance and information can be found in Section 29, Ball Penetration in Fresh Portland Cement Concrete, of the ASTM Manual of Aggregate and Concrete Testing.

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 C09.60 on Fresh Concrete Testing.

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² *Annual Book of ASTM Standards*, Vol 04.02.

5. Apparatus

5.1 The ball-penetration apparatus shall consist of a cylinder with a hemispherically shaped bottom and handle weighing 30 ± 0.1 lb (14 ± 0.05 kg), and a stirrup or frame to guide the handle and serve as a reference for measuring the depth of penetration (Fig. 1).

5.1.1 *Weight*—The cylindrical weight shall be approximately 6 in. (152 mm) in diameter and $4\frac{3}{8}$ in. (117 mm) in height, with the top surface at right angles to the axis and the bottom in the form of a hemisphere of 3-in. (76-mm) radius. The cylindrical weight may be machined from metal stock or cast or spun provided the dimensions and weight with the handle meet requirements, and the finish is smooth.

5.1.2 *Handle*—The handle shall be a metal rod, $\frac{1}{2}$ in. (13 mm) in diameter and graduated in increments of $\frac{1}{4}$ in. (6.4 mm), with each inch numbered from the zero point at the stirrup. The handle may be T-shaped or a closed rectangle at the top to permit grasping by the hand.

5.1.3 *Stirrup*—The stirrup shall be at least $1\frac{1}{2}$ in. (38 mm) in width and each foot shall have a minimum bearing area of 9 in.² (57 cm²). The clear distance between feet shall be at least 9 in. (228 mm). The top edge of the stirrup shall coincide with the zero mark on the graduated handle when the apparatus is rested upon a plane solid surface.

6. Sample

6.1 The concrete may be tested either as placed in the forms prior to any manipulation, or in a suitable container such as a can, pan, hopper, or wheelbarrow in accordance with the sampling procedure of Practice C 172. In any case the minimum depth of the concrete shall be at least three times the maximum size aggregate, but in no case less than 8 in. (203 mm). The minimum horizontal distance from the center line of the handle to the nearest edge of the level surface on which the test is to be made shall be 9 in. (228 mm).

7. Procedure

7.1 Bring the surface of the concrete to a smooth and level condition by the use of a small wood float or screed, working the surface as little as possible to avoid formation of mortar layers. During the test, the adjoining concrete should not be subjected to vibration, jarring, or agitation. Set the base of the apparatus on the levelled concrete surface, with the handle in a vertical position and free to slide through the frame. Lower the weight to the surface of the concrete and