



Designation: ~~D6024-02~~ Designation: D 6024 - 07

## Standard Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application<sup>1</sup>

This standard is issued under the fixed designation D 6024; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This ~~specification~~ test method explains the determination of the ability of Controlled Low Strength Material (CLSM) to withstand loading by repeatedly dropping a metal weight onto the in-place material.

~~1.2 All~~ 1.2 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D 6026.

~~1.2.1 The~~ 1.2.1 The method used to specify how data are collected, calculated, or recorded in this test method is not directly related to the accuracy to which the data can be applied in design or other uses, or both. How one applies the results obtained using this standard is beyond its scope.

1.3 The values stated in SI units are to be regarded as the standard. The inch-pound equivalents are shown for information only.

1.4 CLSM is also known as flowable fill, controlled density fill, soil-cement slurry, soil-cement grout, unshrinkable fill, “K-Krete,” and other similar names.

~~1.5 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.~~

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### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>3</sup>

C 125 Terminology Relating to Concrete and Concrete Aggregates

D 653 Terminology Relating to Soil, Rock, and Contained Fluids ~~-07~~

D 3740 Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as ~~used~~ Used in the Engineering Design and Construction

D 4832 Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders

D 6023 Test Method for Unit Weight, Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low Strength Material (CLSM)

D 6026 Practice for Using Significant Digits in Geotechnical Data

D 6103 Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)<sup>-3</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms in this test method, refer to Terminology C 125 and D 653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *Controlled Low Strength Material (CLSM), n*—a mixture of soil or aggregates, cementitious material, fly ash, water and sometimes chemical admixtures, that hardens into a material with a higher strength than the soil, but less than 8400 kPa (1200 psi).

3.2.1.1 *Discussion*—Used as a replacement for compacted backfill, CLSM can be placed as a slurry, a mortar, or a compacted

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.15 on Stabilization ~~with~~ With Admixtures.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 04.02.

<sup>2</sup> Section on Safety Precautions, *Manual of Aggregate and Concrete Testing*, Annual Book of ASTM Standards, Vol. 04.02.

<sup>3</sup> 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*, Vol 04.08, volume information, refer to the standard's Document Summary page on the ASTM website.

\*A Summary of Changes section appears at the end of this standard.

material and typically has strengths of 350 to 700 kPa (50 to 100 psi) for most applications.

**4. Summary of Test Method**

4.1 A standard cylindrical weight is dropped five times from a specific height onto the surface of in-place CLSM. The diameter of the resulting indentation is measured and compared to established criteria. The indentation is inspected for any free water brought to the surface from the impact.

**5. Significance and Use**

5.1 This test method is used primarily as a field test to determine the readiness of the CLSM to accept loads prior to adding a temporary or permanent wearing surface.

5.2 This test method is not meant to predict the load bearing strength of a CLSM mixture.

5.3 This test is one of a series of quality control tests that can be performed on CLSM during construction to monitor compliance with specification requirements. The other tests that can be used during construction control are Test Methods D 4832, D 6023, and D 6103.

NOTE 1—The quality of the result produced by this standard is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D 3740 are generally considered capable of competent and objective testing/sampling/inspection/and the like. Users of this standard are cautioned that compliance with Practice D 3740 does not in itself assure reliable results. Reliable results depend on many factors; Practice D 3740 provides a means of evaluating some of those factors.

**6. Apparatus**

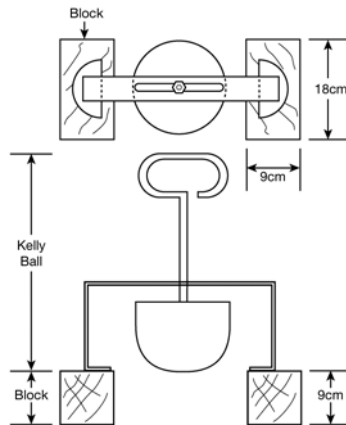
6.1 *Ball-drop Apparatus*—a cylinder with a hemispherically shaped bottom and handle with a mass of 14±0.05 kg (30±0.1 lb), and a stirrup or frame to guide the handle (—a Ball Penetration Apparatus (Kelly Ball) that consists of a cylinder with a ball-shaped bottom and handle, together weighing 14–15 kg (30–33 lbs). The cylindrical weight may be machined from metal stock or cast or spun with a smooth finish. A stirrup or frame guides the handle (Fig. 1).

6.1.1 *Weight*—The cylindrical weight (ball) shall be approximately 15 cm (6 in.) in diameter and 12 cm (4½ in.) in height, with the top surface at right angles to the axis and the bottom in the form of a hemisphere of 75 mm (3 in.) 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.

6.1.2 *Handle*—The handle shall be a metal rod, 13 mm (½ in.) in diameter. The handle may be T-shaped or a closed rectangle at the top to permit grasping by the hand.

6.1.3 *Stirrup*—The stirrup shall be at least 38 mm (1½ in.) in width. The stirrup frame is attached securely to blocks elevating it 9 cm (3½ in.).

6.1.4 *Blocks*—pieces of wood, or ultra high molecular weight plastic (UHMW) that are 9 cm (3½ in.) high are used to elevate the stirrups to the proper height. The stirrups must be centered on the blocks to avoid tipping, and attached securely to the stirrups



Metric Equivalents			
in.	mm	in.	mm
1/8	3.2	4 5/8	117
1/2	13	5 1/2	140
5/8	16	5 5/8	143
1	25	9	228
1 1/2	38	12	305
3	76		

FIG. 1 Ball-drop Apparatus