



Designation: D6910/D6910M – 19

# Standard Test Method for Marsh Funnel Viscosity of Construction Slurries<sup>1</sup>

This standard is issued under the fixed designation D6910/D6910M; 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 test method provides an indirect measurement of the viscosity of construction slurries using a funnel (Marsh Funnel) and a graduated cup with specific volume marks. This test method provides an indicator of the viscosity on a routine basis. This test method has been modified from the API Recommended Practice 13B-1.

1.2 The result determined using the method is referred to as the Marsh Funnel Viscosity. The Marsh Funnel Viscosity is an index property and is not an actual measurement of viscosity.

1.3 This test can be performed in the laboratory or in the field to assess the Marsh Funnel Viscosity of a slurry for quality control purposes.

1.4 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be 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.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

<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 D18.16 on Grouting.

Current edition approved May 15, 2019. Published June 2019. Originally approved in 2004. Last previous edition approved in 2009 as D6910/D6910M – 09, which was withdrawn April 2018 and reinstated in May 2019. DOI: 10.1520/D6910\_D6910M-09.

<sup>2</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* volume information, refer to the standard's Document Summary page on the ASTM website.

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

### 2.2 API Document:

API RP 13B-1 (R2016), Recommended Practice for Field Testing Water-based Drilling Fluids, Fourth Edition (Identical to ISO 10414-1:2008)<sup>3</sup>

## 3. Terminology

3.1 *Definitions*—For common definitions of technical terms in this standard, refer to Terminology D653.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *Marsh Funnel Viscosity (MFV)*—also known as *funnel viscosity*. The time required (in seconds) for 1 qt [1 L] of a slurry to flow into a graduated cup from a funnel (known as a Marsh Funnel) with specific dimensions.

## 4. Summary of Test Method

4.1 In this method, a slurry is poured into a funnel with specific dimensions (Marsh Funnel). The slurry is then allowed to flow into a graduated cup. The time for the slurry to fill a volume of 1 qt [1 L] is measured and reported as the Marsh Funnel Viscosity. The test temperature is also reported for comparison purposes.

## 5. Significance and Use

5.1 Viscosity is a fundamental characteristic for slurries in construction applications. The Marsh Funnel Viscosity test can be used for field quality control of slurries. Relative changes in slurry viscosity can be identified using Marsh Funnel measurements and modifications can be made to mixing and handling procedures.

NOTE 1—The development of the Marsh Funnel is credited to Hallan N. Marsh of Los Angeles who published the design and use of his funnel viscometer in 1931.

5.2 This test method allows for the assessment of the apparent viscosity of construction slurries in the laboratory and in the field. The Marsh Funnel Viscosity is not a true viscosity,

<sup>3</sup> Available from American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005-4070, http://www.api.org.

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

it is an index value and can only be used to assess the relative viscosity of the slurry to water. Higher MFV values are obtained for slurries with higher viscosity and lower MFV values are obtained for slurries with lower viscosity.

5.3 In this test, it is assumed that the apparent viscosity of a slurry is directly related to the flow duration through a specially shaped funnel (the Marsh Funnel).

5.4 In slurry construction applications, the viscosity of a slurry must be maintained within a predetermined range to stabilize the surrounding soil being supported.

5.5 The Marsh Funnel Viscosity has been widely used in drilling soil and rock for water wells and oil, gas, soil stabilization, foundation drilling, and hydraulic barrier applications.

5.6 Inert suspended solids (such as fine sands, clays, and cement) and additives affect the viscosity of slurries. This test may be used to determine the relative effects of these and other such materials on the viscosity of a slurry.

NOTE 2—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 D3740 are generally considered capable of competent and objective testing, sampling/inspection/etc. Users of this standard are cautioned that compliance with Practice D3740 does not in itself assure reliable results. Reliable results depend on many factors; Practice D3740 provides a means of evaluating some of those factors.

6. Apparatus

6.1 Marsh Funnel (see Fig. 1)—The Marsh Funnel shall comply with the following:

6.1.1 Funnel Cone—A cone equipped with a screen at the top and an orifice tube at the bottom shall be used. The capacity of the cone from the bottom of the screen opening to the orifice shall be 1.6 qt [1.5 L]. Typical dimensions of the funnel cone are shown in Fig. 1. It may be manufactured from plastic, metal, or other rigid and durable material, and may be provided with external handles or stands.

6.1.2 Funnel Orifice—An orifice tube of 2-in. in length, with an inside diameter of 0.1875 in. The diameter and length of this outlet directly affects the Marsh Funnel test results and these dimensions have been the standard since the inception of this method.

6.1.3 Screen—A screen with openings of approximately 0.0625 in. (that is, 12 mesh screen). The screen is normally placed at the 1.6 qt [1.5 L] level of the funnel; approximately 0.75 in. [19 mm] below the top of the funnel. The screen is used to separate larger particles that could plug the orifice during the test.

6.2 Graduated Cup—A metal or plastic graduated cup with a 1 qt [1 L] marking.

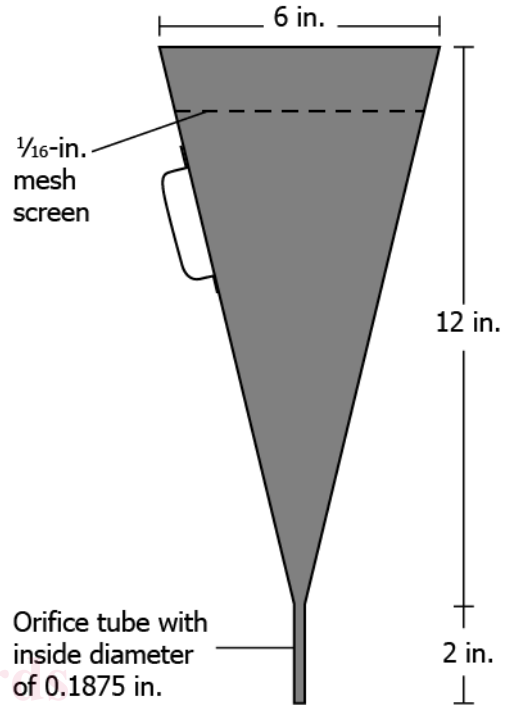
6.3 Timer—A stopwatch or equivalent timer with a resolution of 0.5 s or better.

6.4 Thermometer—A thermometer with a range of 32 to 220°F [0 to 105°C] with a resolution of 1°F [0.5°C].

6.5 Sampling and Cleaning Equipment.

6.5.1 Bottle Brush—A bottle brush shall be used to clean the Marsh Funnel.

A Typical Construction



Dimensional Equivalents	
in.	mm
0.125	3.2
0.1875	4.75
2.0	51.0
6.0	152.0
12.0	305.0

FIG. 1 Marsh Funnel

7. Hazards

7.1 Appropriate eye and hand protection is recommended for direct work with the slurries.

8. Sampling

8.1 Obtain a 2 gal [7.5 L] representative sample of the slurry to be tested using dippers, buckets, mud or slurry samplers, or equivalent equipment from a field construction operation (for example, from a hydrated mix pond) or from a laboratory slurry mix. A specimen 1.6 qt [1.5 L] in volume is required for a test.

NOTE 3—When allowed to sit undisturbed, slurries containing clay as a viscosifier have a tendency to form a gel. If the viscosity is measured without breaking this gel, the measured viscosity will be erroneously high. Marsh Funnel Viscosity measurements are more repeatable if the slurry is mixed thoroughly immediately prior to testing. This can be accomplished, for example, by taking a sample directly from a flowline in a grouting operation and expediently making the Marsh Funnel Viscosity measurement. If a measurement must be made on a stagnant sample, the sample shall be vigorously agitated before making the Marsh Funnel Viscosity measurement.

9. Calibration Checks

9.1 Periodically check the Marsh Funnel and the graduated cup for damage or wear. The Marsh Funnel shall be cleaned