Designation: D4380 – 12

Standard Test Method for Density of Bentonitic Slurries[1]

This standard is issued under the fixed designation D4380; 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 density of slurries used in slurry construction techniques, such as those used for barriers to control the horizontal movement of liquids. This test method is modified from API Recommended Practice 13B.

1.2 *Units*—The values stated in SI units are to be regarded as standard, unless other units are also specified, such as density in lbm/ft^3 or lbm/gal. No other units of measurement are included in this 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]

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 *American Petroleum Institute (API) Standard:*

API RP 13B Recommended Practice Standard Procedure for Testing Drilling Fluids (Section 1)[3]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms relating to this test method, refer to Terminology D653.

4. Summary of Test Method

4.1 The mud balance is the instrument generally used for this test method. The weight of a fixed volume of the slurry is measured by moving a rider counterweight along a graduated scale. The density of the slurry is then read directly off the graduated scale after the instrument is balanced.

5. Significance and Use

5.1 This test method is used to determine the density of bentonitic slurries in the laboratory and field. For freshly mixed slurry, this test method may be used as an indicator of mix proportions. For in-trench slurry, a certain value may be specified for maintaining trench stability.

NOTE 1—The quality of the result produced by this standard depends on the competence of the personnel performing it and the suitability of the equipment and facilities being 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 ensure reliable results. Reliable results depend on many factors; Practice D3740 provides a means of evaluating some of those factors.

6. Apparatus

6.1 *Mud Balance*—Any instrument of sufficient accuracy to permit measurement within ±0.01 g/cm^3 may be used, however, the mud balance is the instrument generally used (see Fig. 1). The mud balance consists of a mud cup attached to one end of a beam which is balanced on the other end by a fixed counterweight and a rider free to move along a graduated scale. A level bubble is mounted on the beam. Attachments for extending the range of the balance may be used.

7. Calibration

7.1 The instrument should be calibrated frequently with fresh water. Fresh water should give a reading of 1.00 g/cm^3 at 20 °C. If it does not, adjust the balancing screw or the amount of lead shot in the well at the end of the graduated arm as required.

8. Procedure

8.1 Set up the instrument base approximately level.

8.2 Fill the clean, dry cup with slurry to be tested, place the cap on the cup, and rotate the cap until firmly seated. Make sure some of the slurry is expelled through the hole in the cap to free trapped air or gas.

[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.04 on Hydrologic Properties and Hydraulic Barriers.

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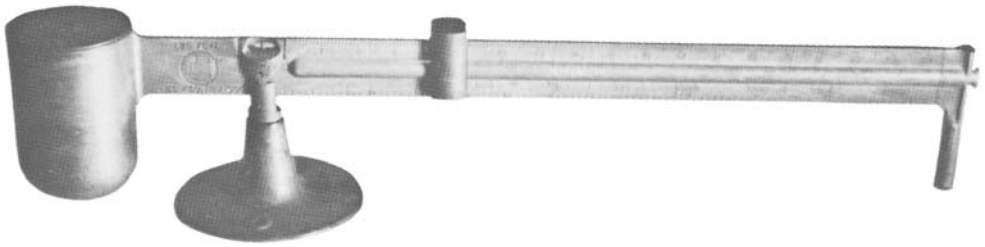
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from the American Petroleum Institute, 2101 L St., NW, Washington, DC 20037.



NOTE 1—Photo courtesy of N. L. Baroid–N. L. Industries, Inc., Houston TX.

FIG. 1 Mud Balance

8.3 Wash or wipe the excess slurry from the outside of the cup.

8.4 Place the beam on the support and balance it by moving the rider along the graduated scale. The beam is horizontal when the leveling bubble is on the center line.

8.5 Read the density at the side of the rider toward the knife edge. Make appropriate corrections when a range extender is used.

8.6 Record the density to the nearest 0.01 g/cm^3.

8.7 Clean and dry the instrument thoroughly after each use.

9. Calculation

9.1 To convert the density to other units, use the following relationships:

$$\rho \text{ in lb/ft}^3 = 62.43 \cdot \rho \text{ in g/cm}^3 \quad (1)$$

$$\rho \text{ in lb/gal} = 8.35 \cdot \rho \text{ in g/cm}^3$$

10. Report: Test Data Sheet(s)/Form(s)

10.1 Record as a minimum the following general information (data):

10.1.1 Sample/specimen identifying information, such as location, project, date and time, the source of the slurry tested, such as its station and depth, person who conducted the test, and general testing conditions.

10.2 Record as a minimum the following density data:

10.2.1 The slurry density to the nearest 0.01 g/cm^3.

11. Precision and Bias

11.1 The precision and bias of this test method have not been established. Data are being sought that will be suitable for developing a precision and bias statement.

12. Keywords

12.1 bentonite; density; slurry