Designation: D4016 – 08

StandardTest Method for Viscosity of Chemical Grouts by Brookfield Viscometer (Laboratory Method)[1]

This standard is issued under the fixed designation D4016; 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 viscosity of catalysed chemical grouts with the Brookfield viscometer (laboratory method), over the range from 1.0 to 1000 cP (0.001 to 1 Pa·s).

1.2 *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.*

1.3 *This test method offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

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

D6026 Practice for Using Significant Digits in Geotechnical Data

E1 Specification for ASTM Liquid-in-Glass Thermometers

3. Terminology

3.1 For common definitions of terms used in this standard, refer to Terminology D653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *coefficient of viscosity*—the ratio between the applied shear stress and the rate of shear. This coefficient is a measure of the resistance to flow of the liquid. It is commonly called the viscosity of the liquid. The cgs unit of viscosity is 1 g/cm·s (1 dyn/s cm ^{2}) and is called a poise (P). Viscosities of thin liquids are normally given in hundredths of a poise or centipoises (cP). The SI unit of viscosity is 1 Pa·s (1 N·s/m^{2}) and is equal to 10 P, or 1000 cP.

3.2.2 *Newtonian liquid*—a liquid in which the shear stress is proportional to the rate of shearing strain. This constant ratio is the viscosity. Non-Newtonian behavior can be determined with the Brookfield instrument by taking measurements at different spindle speeds.

4. Summary of Test Method

4.1 A rotating spindle is immersed in a container of catalysed chemical grout. An index to the viscosity is read directly on the instrument scale.

5. Significance and Use

5.1 This test is intended for materials that will penetrate soil voids and rock fissures. Viscosity alone is not necessarily an exact index of grout penetrability.

NOTE 1—The quality of the result produced by this test method 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 of Practice D3740 does not in itself assure reliable results. Reliable results depend on mnay factors; of Practice D3740 provides a means of evaluating some of those factors.

6. Apparatus

6.1 *Brookfield Viscometer*—Any model whose lower limit of effective measurement is less than the value of the sample. Models LVF and LVT should be used for measurements above 20 cP (20 mPa·s), and for measurements from 1 to 20 cP (1 to

[1] 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 Admixtures.

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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.

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