



Designation: D7394 – 18 (Reapproved 2023)

Standard Practice for Rheological Characterization of Architectural Coatings using Three Rotational Bench Viscometers¹

This standard is issued under the fixed designation D7394; 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 practice describes a popular industry protocol for the rheological characterization of waterborne architectural coatings using three commonly used rotational bench viscometers. Each viscometer operates in a different shear rate regime for determination of coating viscosity at low shear rate, mid shear rate, and at high shear rate respectively as defined herein. General guidelines are provided for predicting some coating performance properties from the viscosity measurements made. With appropriate correlations and subsequent modification of the performance guidelines, this practice has potential for characterization of other types of aqueous and non-aqueous coatings.

1.2 The values in common viscosity units (Krebs Units, KU and Poise, P) are to be regarded as 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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:²

D562 Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer

D869 Test Method for Evaluating Degree of Settling of Paint
D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers
D1200 Test Method for Viscosity by Ford Viscosity Cup
D2196 Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer
D2805 Test Method for Hiding Power of Paints by Reflectometry
D4040 Test Method for Rheological Properties of Paste Printing and Vehicles by the Falling-Rod Viscometer
D4062 Test Method for Leveling of Paints by Draw-Down Method
D4287 Test Method for High-Shear Viscosity Using a Cone/Plate Viscometer
D4400 Test Method for Sag Resistance of Paints Using a Multinotch Applicator
D4414 Practice for Measurement of Wet Film Thickness by Notch Gages
D4958 Test Method for Comparison of the Brush Drag of Latex Paints

3. Terminology

3.1 Definitions:

3.1.1 *coating rheology, n*—the viscosity profile obtained for a fluid coating over a range of shear rates.

3.1.2 *high-shear viscosity (HSV), n*—the viscosity of a fluid coating at high shear rate (typically measured at 10,000 s⁻¹ or 12,000 s⁻¹), and for architectural coatings, it is often referred to as the “brush-drag” viscosity.

3.1.3 *leveling, n*—the ability of a wet coating to flow out to a smooth dry film after application, thereby minimizing or eliminating coating surface irregularities that occur during brushing, rolling or spraying (see also Test Method **D4062**).

3.1.4 *low-shear viscosity (LSV), n*—the viscosity of a coating fluid at low shear rate (typically in the range of 0.001 s⁻¹ to 1 s⁻¹), often referred to as the “leveling viscosity” or inversely as the “suspension viscosity.”

3.1.5 *mid-shear thickener efficiency (MSTE), n*—the weight of active thickener per unit volume of wet coating required to give the target MSV, commonly expressed as lb active thickener/100 gal wet coating (or in g/L units).

¹ This practice is under the jurisdiction of ASTM Committee **D01** on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee **D01.24** on Physical Properties of Liquid Paints & Paint Materials.

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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.