



Designation: D 4041 – 97 (Reapproved 2003)

Standard Practice for Determining Spray Patterns of Manually Operated Pump Dispensers¹

This standard is issued under the fixed designation D 4041; 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 covers the determination of spray patterns from pump dispensers.

1.2 *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

D 996 Terminology of Packaging and Distribution Environments

3. Terminology

3.1 See Terminology D 996 for applicable definitions.

4. Significance and Use

4.1 This practice can be used to compare spray patterns of different pump dispensers and of different products.

4.2 Spray patterns from pump dispensers will vary greatly with the design of the actuator and the nature of the liquid. Liquids with differing physical properties will not necessarily yield the same spray pattern when sprayed from the same actuator. Likewise, actuators of different designs will yield spray patterns distinct from each other when the same liquid is used.

4.3 The evaluation of the spray pattern must then be made with the specific actuator and liquid involved and not on actuators or liquids assumed to be standard.

5. Apparatus

5.1 *Target Support Stand*, approximately 250 mm wide with the vertical component approximately 400 mm high. The stand

shall be attached securely at right angles to the horizontal component. The component shall be approximately 700 mm long and free of air turbulence, that will provide for stationary positioning of the paper target. An optional paper target is positioned along the length of the horizontal component to record fallout.

5.2 *Container Support Stand*, that will position the pump dispenser and container a specific distance and center them to the target. (Alternatively, the pump dispenser and container may be held firmly by hand on a flat, horizontal surface.)

5.3 *Measuring Rule*.

5.4 *Alcohol-Sensitive Paper*, cut to the desired length and width.

5.5 *Plain White Paper*, cut to the desired length and width.

5.6 *Dyes of Oil Base for Petroleum-Based Products or Water Base for Water-Based Products*—These dyes, when dissolved in the liquid, shall be in sufficient concentrate to give a strong color when sprayed onto the target paper.

NOTE 1—Dyes must be compatible and completely soluble in the test liquid. The dyed liquid shall be filtered prior to use to remove any solid particles.

6. Sampling

6.1 Select an appropriate number of dry, unused dispensers at random for the precision and bias desired.

7. Conditioning

7.1 Packages, dispensers, and liquids should be conditioned to standard laboratory temperatures prior to spray pattern evaluation.

8. Procedure

8.1 Attach the pump to the container of the test liquid.

NOTE 2—If the plain white paper is selected as the target, then the liquid product must contain a dye. If the alcohol-sensitive paper is selected as the target, then the liquid product must contain alcohol in order to stain this special paper. This method is acceptable for all products.

NOTE 3—Liquid products with water should not be tested on alcohol-sensitive paper, since the pattern will begin to change in size and shape immediately due to evaporation. With no alcohol to permanently stain the alcohol-sensitive paper, the results may be unreliable. This method is acceptable for products containing alcohol.

¹ This practice is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.33 on Mechanical Dispensers. Current edition approved Sept. 10, 1997. Published March 1998. Originally published as D 4041 – 81. Last previous edition D 4041 – 89.

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.