Designation: D4334 – 05 (Reapproved 2010)

Standard Test Method for the Determination of the Dip Tube Retention of a Mechanical Pump Dispenser[1]

This standard is issued under the fixed designation D4334; 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 force necessary to separate the dip tube from the body of a mechanical pump dispenser (spray or flow types).

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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Significance and Use

2.1 This test method may be used to establish performance specifications.

2.2 This test method may be used as a quality control assessment.

3. Apparatus

3.1 *Test Stand*—The test apparatus shall be capable of applying a smoothly increasing load to the test specimen until the dip tube is separated from the body of the mechanical pump dispenser.

NOTE 1—The condition of 3.1 is fulfilled by most motor driven tensile strength testers with a constant rate of elongation.

NOTE 2—The test stand should be equipped with a maximum force indicator.

3.2 *Clamps:*

3.2.1 *Fixture,* to secure the upper part of the mechanical pump dispenser. The fixture shall secure the dispenser in such a way that there is no slippage between it and the test specimen.

3.2.2 *Clamp,* to secure the dip tube. The clamp shall hold the dip tube in such a way that there is no slippage between the dip tube and the clamp.

3.2.3 Arrange the fixturing so that the tube is maintained in a position parallel to, and within the colinear plane of, the applied force.

3.3 *Scale,* graduated in either millimetres or inches.

4. Sampling

4.1 Select an appropriate number of dry, unused pump dispensers at random for precision and accuracy desired. Use of 10 test specimens is recommended, but a minimum of three is acceptable.

5. Conditioning

5.1 If possible, condition the test specimens at 23 ± 3°C (73 ± 5.4°F) for not less than 4 h. If the test specimens are not conditioned at the recommended temperature, this should be noted in the test report discussed in 7.1.

5.2 Test pumps should be tested no sooner than 24 h after assembly when possible. If the pumps are not conditioned at the recommended time, this should be noted in the test report discussed in 7.1.

6. Procedure

6.1 Attach fixtures and clamp to the test standard in accordance with the manufacturer's instructions and in a manner consistent with the pump's geometry.

6.2 Insert the dip tube securely into the clamp and tighten to prevent slippage.

6.3 Adjust the test stand so that there is 25 mm of exposed dip tube length.

NOTE 3—At this time, there should be a zero reading on the force gage.

6.4 Operate the test stand at 250 mm (10 in.)/min until the dip tube has separated either from the pump dispenser, broken, slipped from the jaws, or reached the limit of cross-head travel. If the recommended cross-head speed is not used, record cross-head speed (see 7.1).

6.5 Record the maximum force reading, N (lb).

6.6 Record the mode of failure for each test specimen tested.

7. Report

7.1 The report shall include the following:

7.1.1 Complete identification of the pump dispenser used including type, source, and manufacturer's code and date of manufacture, if known,

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7.1.2 Number of specimens tested,

7.1.3 Number of dip tubes that were separated from the pump dispensers,

7.1.4 Mean, minimum, maximum, and standard deviation of forces required to separate the dip tubes from pump dispensers, and

7.1.5 Mode of failure for those pump dispensers that did not separate.

8. Precision and Bias

8.1 *Precision*—The precision of Test Method D4334 is highly dependent on the particular pump dip tube size, dip tube material, and pump style tested. One laboratory has investigated one particular fine mist pump style using a capillary-style dip tube with 50 replicate tests, yielding an average of 3.62 lbf with a range of 4.2 to 3.2 lbf and a standard deviation of 0.34 lbf. Other pumps will have other averages of retention and will have more or less variability between replicate tests. Users of this test method are encouraged to reference historical files of previous tests of similar pumps for an estimate of within laboratory repeatability. Because of this strong product and pump style dependency, further investigation of repeatability and reproducibility is not practicable.

8.2 *Bias*—Test Method D4334 has no bias because an accepted reference or referee value is not available.

9. Keywords

9.1 dip tube; mechanical pump dispenser; retention