Designation: D7105 – 06 (Reapproved 2013)

Standard Test Method for Determining the Adhesive and Cohesive Strength Between Materials in Roofing or Waterproofing Membranes and Systems[1]

This standard is issued under the fixed designation D7105; 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 measures the force needed to cause separation of the components of a roofing or a waterproofing membrane system normal (perpendicular) to the plane of the membrane. The separation may be adhesive at the weakest bond, or cohesive within the weakest material. If the failure is cohesive, the adhesive strength is greater than the cohesive strength.

1.2 The values stated in SI units are regarded as standard. The values given in parentheses are for information only.

1.3 *The 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]
D312 Specification for Asphalt Used in Roofing
D1079 Terminology Relating to Roofing and Waterproofing

3. Terminology

3.1 *Definitions:*
3.1.1 See D1079 for definitions of terms used in this test method.

4. Summary of Test Method

4.1 This test method subjects specimens from the laboratory prepared or field samples to a force perpendicular to the plane of the membrane. The test measures:

4.1.1 The cohesive strength of an adhesive layer when separation takes place within the adhesive layer,

4.1.2 The adhesive strength when the separation takes place at an adhered surface, or

4.1.3 The cohesive strength of the weakest material when the separation takes place within a material other than an adhesive.

5. Significance and Use

5.1 This test method is useful to define the force needed to cause separation of the roofing or waterproofing system or components perpendicular to the plane of the system, and to define the weakest plane in the system.

6. Apparatus

6.1 *Testing Machine*— a universal testing machine with automatic load and strain equipment and a constant speed cross head movement of 0.8 mm/s (2 in./min.) ±1 %.

6.2 *Mounting Clips*— the specimen mounting clips (for small specimens) are 50 mm (2 in.) square perforated galvanized steel, 0.5 mm (0.020 in.) thick, with at least a 75 mm (3 in.) long steel pin 2.7 mm (12 gauge) diameter. The pin shall be fastened to the center of the plate perpendicular to the plane of the plate.

6.3 *Mounting Blocks*— The wood or metal specimen blocks (for larger specimens) are 150 mm (6 in.) square and 13 to 32 mm (½ to 1-¼ in.) thick (depending on the force to be measured), equipped with a hook in the center of each block to permit attachment in the testing machine. If desired, round blocks with at least a 45 mm (1¾ in.) diameter and with a central hook shall not be prohibited.

6.4 *Clip or Mounting Adhesive*—Hot, steep asphalt D312 Type III has been effective for many roofing materials. For some materials, other adhesives shall not be prohibited. Consider using the adhesive recommended by the manufacturer of the materials to be tested. The adhesive shall be quick setting and shall form a strong bond between the specimen and the mounting clips or blocks.

[1] This test method is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.20 on Roofing Membrane Systems.

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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.

7. Procedure

7.1 Prepare and test at least five specimens from each sample. Trim the edges of each specimen to match the size of the clips or blocks. Adhere mounting clips or blocks to both the top and bottom of the specimen (see Fig. 1), being sure the pins or hooks are aligned. Discard all specimens that contain vertical joints or that are damaged in any way. Materials extraneous to the investigation such as roofing gravel and shards of foam shall be carefully removed prior to mounting the specimens on clips or blocks.

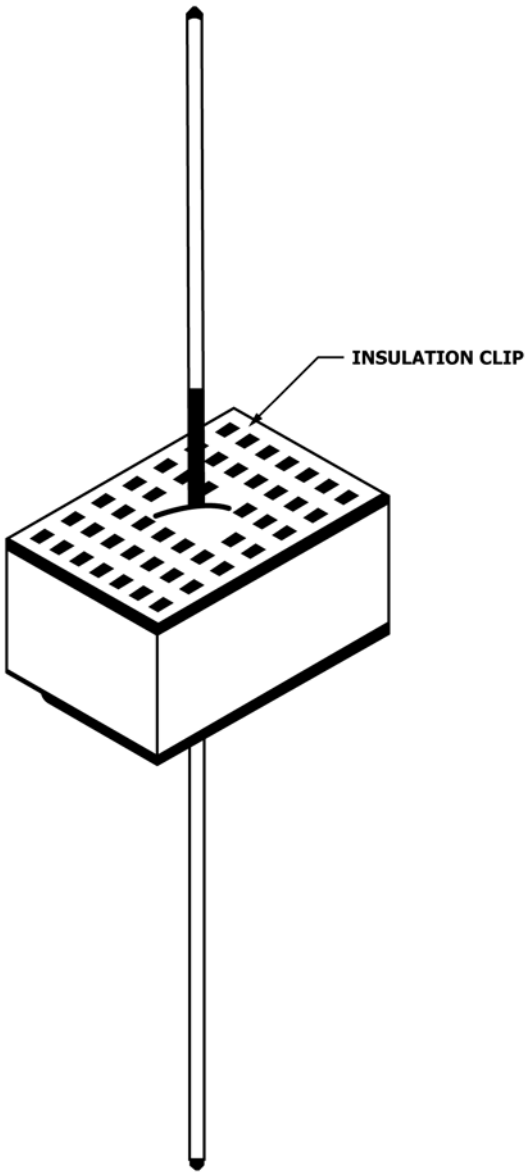

FIG. 1 Specimen

7.2 Condition each mounted specimen to the test temperature and relative humidity for at least one hour. Use 20 ± 2ºC (68 ± 4.4ºF) and 50 ± 5 % relative humidity for these tests. Additional temperatures and humidities shall not be prohibited.

7.3 Place the mounted specimen in the jaws of the testing machine, and separate jaws at 0.8 mm/s (2 in./min.) until the specimen comes apart. If the specimen debonds at the specimen-clip interface, record the failure of the clip adhesive and discard the test.

7.4 Record the specimen area, the maximum load, plane, and the type of separation (adhesive, cohesive within the membrane material or adhesive layer). Test a minimum of four samples at each test condition.

8. Report

8.1 Report the source of the sample, the original condition, and identify each layer of material in the sample.

8.2 Report the adhesive used to attach the clips or blocks, the rate of jaw separation, the temperature, and relative humidity during testing.

8.3 Report the maximum stress in kPa (lbf/in.^{2}), the plane of separation, and type of separation for each specimen. If both adhesive and cohesive separations occur in the same specimen, prepare a drawing showing the shape of each.

8.4 Report the mean, maximum load, estimated standard deviation, and number of specimens for each sample.

9. Precision and Bias

9.1 *Precision*—The precision of this test method is unknown, but preliminary tests show an estimated repeatability standard deviation of 15 % of the mean separation strength. The estimated repeatability limit is approximately 42% (2.8 × 15%) of the mean separation strength. The precision can be influenced by the nature of the sample and the quality of the centering. An interlaboratory study has been started and is expected to be complete before December 2010.

9.2 *Bias*—There is no known bias or accepted material to test the bias of this method.

10. Keywords

10.1 adhesion; cohesion; roofing; waterproofing