Designation: D4073 – 06 (Reapproved 2013)

Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes[1]

This standard is issued under the fixed designation D4073; 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 tensile-tear strength of bituminous roofing membranes.

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

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D95 Test Method for Water in Petroleum Products and Bituminous Materials by Distillation

D2829 Practice for Sampling and Analysis of Existing Built-Up Roof Systems

D3617 Practice for Sampling and Analysis of Built-Up Roof Systems During Application

3. Summary of Test Method

3.1 The tensile-tear strength of a membrane in both longitudinal and transverse directions is determined by measuring the maximum load when notched specimens of specific dimensions are tested to failure at an arbitrary, fixed, tensile strain rate.

4. Significance and Use

4.1 Determining the tensile-tear strength of laboratory and field samples of roofing membranes should be useful in developing performance criteria, and as one basis for comparison of different materials and systems. The effects of temperature, moisture, and aging may be evaluated by appropriate selection of field samples or conditioning of laboratory samples, and tests may be conducted in an environmental chamber.

5. Apparatus

5.1 *Testing Machine*— Universal or standard testing machine with automatic load and strain recording equipment, capable of cross-head movement at a constant rate of 2.54 mm/min (0.100 in./min).

5.2 *Grips*—Self-aligning grips or clamps for holding the test specimen between the stationary member and the movable member or cross-head of the testing machine. Jaw faces of the grips shall be 75 mm (3.0 in.) wide by 50 mm (2.0 in.) deep, shall provide uniform clamping pressure, and shall prevent slippage of the specimen during test.

5.3 *Environmental Chamber*—An insulated chamber with heating and cooling capabilities, designed to enclose the test specimen and clamps so that the temperature may be controlled during a test.

6. Sampling

6.1 *Field Samples*— Field samples shall be taken in accordance with Practice D2829 or D3617 but of a size suitable to provide sufficient material for testing in both the machine and cross-machine directions. In cases where field applied aggregate is in place, it shall be removed with a hot scraper such as a putty knife without damaging the top felt. In cases where the insulation facer is a part of the membrane system it should be included and so reported.

6.2 *Laboratory Samples:*

6.2.1 Condition all components at 23 ± 2°C (74 ± 4°F) and 50 ± 5 % relative humidity for a minimum of 72 h prior to constructing the membrane sample.

6.2.2 Prepare sample membranes approximately 300 by 500 mm (12 by 20 in.) as required by the roof specifications being tested, exclusive of aggregate.

6.2.3 The quantity of bitumen in any layer shall be within 10 % of the quantity specified and the entire sample shall be within 5 %. (These requirements apply to laboratory prepared samples only.)

[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. Test Specimen

7.1 Cut at least three test specimens, in each orientation to be tested, of the laboratory prepared or field sampled membrane with a die or a sharp razor-knife using a metal template to produce the shape shown in Fig. 1. Machine-direction (MD) test specimens shall be oriented with the long dimension of the test specimen parallel to machine direction. Cross-machine-direction (CMD) test specimens shall be oriented with the long dimension of the test specimen parallel to cross-machine direction.

7.2 Specimens shall contain in the notch area (see Fig. 1) the minimum number of plies specified for the membrane.

8. Conditioning

8.1 Maintain specimens cut from field samples "as received," or condition them for 72 h at any desired temperature and humidity prior to testing under those conditions.

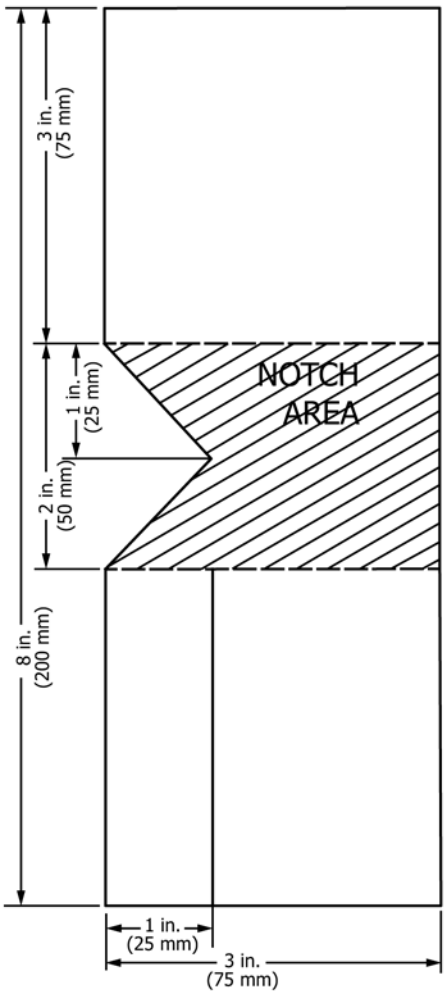

FIG. 1 Tensile Tear Specimen

8.2 Condition specimens cut from laboratory prepared samples for a minimum of 72 h at 23 ± 2°C (74 ± 4°F) and 50 ± 5 % relative humidity, or any desired temperature and humidity prior to testing under those conditions.

9. Procedure

9.1 Establish the desired conditions in the environmental chamber, if used, and set the jaws of the self-aligning grips 100 mm (4 in.) apart. Clamp the test specimen in the jaws so that the jaw faces cover a 75 mm (3 in.) wide by 50 mm (2 in.) deep area of the specimen at each end.

9.2 Start the testing machine and break the specimen in tension with a constant rate of cross-head movement of 2.54 mm/min (0.100 in./min). Record the maximum load in pounds-force (newtons) as the tensile-tear strength of the specimen.

9.3 Determine the moisture content of specimens in accordance with Test Method D95 immediately after breaking. Any moisture condensed on the surface of the specimen should be removed prior to testing moisture content.

9.4 Unless another temperature is specified, test specimens at 23 ± 2°C (74 ± 4°F).

10. Report

10.1 The report shall include the following:

10.1.1 Complete description of the membrane tested, including identification of all components if possible.

10.1.2 Source and location from which field samples were obtained, the date obtained, and the date constructed; for laboratory samples, the date constructed.

10.1.3 Conditioning and testing procedure followed, including temperature and humidity, and the date of test.

10.1.4 Tensile-tear strength of each specimen, and the average values in each direction for not less than three specimens.

10.1.5 Moisture content of specimens.

11. Precision

11.1 *Precision*—Because of the variations in felts and fabrics, repeatability and reproducibility may vary depending upon the type of felt or fabric and the number of plies in the membrane. Reproducibility may be expected to vary approximately 7 % about the mean for similar samples.

11.2 *Bias*—Since there is no accepted reference material suitable for determining the bias for this test method, bias has not been determined.

12. Keywords

12.1 bituminous roofing membranes; field and laboratory samples; tensile-tear strength