



Standard Test Method for Elevated Temperature and Humidity Resistance of Vapor Retarders for Insulation¹

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1. Scope

1.1 This test method covers the determination of the aging resistance of flexible low permeance vapor retarders for thermal insulation as classified in Specification C1136. Water vapor permeance measurement and visual inspection after exposure at elevated temperature and humidity are used to assess vapor retarder response.

1.2 Typical vapor retarders applicable to this test method that are intended for indoor use include foil-scrim-kraft laminates, metallized polyester-scrim-kraft laminates, treated fabrics, treated papers, films, foils, or combinations of these materials that may comprise a vapor retarder material. This test method is not intended for assessment of the liquid-applied coatings, sealants, or mastics commonly used with insulation products.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *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

C168 Terminology Relating to Thermal Insulation

C1136 Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation

E96/E96M Test Methods for Water Vapor Transmission of Materials

¹ This test method is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.33 on Insulation Finishes and Moisture.

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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.

3. Terminology

3.1 Terminology C168 shall be considered as applying to the terms used in this specification.

4. Summary of Test Method

4.1 The vapor retarders are subjected to accelerated aging via elevated temperature and humidity at 120°F (49°C) and 95 % relative humidity for a period of 28 days, then visually inspected for corrosion (if applicable), delamination, or other degradation. Water vapor permeance in accordance with Test Methods E96/E96M is measured after humid aging.

5. Significance and Use

5.1 On sub-ambient temperature systems, humid ambient conditions cause a vapor driving force toward the insulation which, if not retarded, is detrimental to the insulation's thermal resistance. Therefore a vapor retarder should resist degradation. Degradation in this test method is induced by elevated temperature and humidity conditions.

6. Apparatus

6.1 *Environmental Chamber*, capable of maintaining $120 \pm 2^\circ\text{F}$ ($49 \pm 1^\circ\text{C}$) and $95 \pm 2\%$ relative humidity, using distilled or deionized water as the humidity source. The chamber shall be of the air-circulating variety.

6.2 *Lighted Box in a Darkened Room*—A lighted box is an enclosure having five opaque sides with one transparent glass or plastic viewing side. The box is illuminated using an incandescent lightbulb. The viewing area shall be slightly smaller than the vapor retarder specimen so that holes or degradation caused by aging are readily visible.

6.3 *Cotton Gloves*.

6.4 *Cardboard Overhead Transparency Frames or Equivalent*.

6.5 *Stainless Steel Staples*.

6.6 *Glass or Stainless Steel Rods*.

7. Test Specimens

7.1 From each sample cut four specimens that are large enough to acquire water vapor permeance test specimens after

exposure. The specimens shall be cut in a manner which best characterizes the roll width. Material exhibiting extraneous damage from mishandling in shipment or during sample preparation shall be avoided. A fifth specimen shall be cut and retained as a control. An 11¾ in. (298 mm) by 10¾ in. (273 mm) specimen size is recommended since this is the size of a typical overhead transparency frame, which is useful to support specimens in the humidity chamber. In any case, the specimen size shall be at least 6 in. by 6 in. (152 mm by 152 mm).

8. Aging Procedure

8.1 Use clean cotton gloves during handling to avoid surface contamination that may be confused with corrosion on foil or metallized laminates.

8.2 Once cut to the desired size, individually sandwich and staple the retarder specimens between two transparency frames or equivalent. The frames help to minimize curl and facilitate handling without disturbing the specimen surface area. Number the specimens 1 through 4, and retain the extra framed specimen for later comparisons.

8.3 Mount the four frames on a glass rod. This is easily accomplished by using a paper punch on one corner of the frames and sliding the frames onto the rod. Space the frames at least 1 in. (25 mm) apart.

8.4 Suspend the rod with frames in the humidity chamber. The specimens shall be oriented to allow air-flow parallel to the surface.

8.4.1 Carefully follow operation instructions of the test chamber to avoid surface condensation of the test specimens. Expose the specimens for 28 days at $120 \pm 2^\circ\text{F}$ ($49 \pm 1^\circ\text{C}$) and $95\% \pm 2$ relative humidity.

8.4.2 Alternate methods of suspending specimens may be used, provided specimen to specimen contact, or contact with potentially reactive materials, is avoided. Specimens must have adequate airspace and should never be oriented horizontally in the cabinet.

9. Evaluation

9.1 At the end of 28 days, evaluate the specimens for the following:

9.1.1 For all products, place the specimens on the lighted box and inspect for pinholes, large holes, or increased translucency from the retained control specimen. Lightly mark noteworthy areas with a felt-tip pen.

9.1.2 For foil laminates also inspect the foil surface for evidence of corrosion in the form of crystalline deposits. This inspection is easily accomplished in a darkroom by viewing the specimen using a flashlight held at an angle. Corrosion deposits have an iridescent appearance when viewed in this manner.

9.1.3 For all products, cut one water vapor permeance specimen from each aged piece. Specimens shall be cut from any noteworthy areas identified during the light box inspection. Determine the water vapor permeance in accordance with the desiccant method of Test Methods **E96/E96M**. The water vapor permeance test temperature shall be $73 \pm 2^\circ\text{F}$ ($23 \pm 1^\circ\text{C}$); relative humidity shall be $50 \pm 2\%$.

9.1.4 After the permeance specimen is cut, carefully remove the remaining portion of sample from the test frames and inspect for evidence of delamination.

10. Report

10.1 *The report shall include the following:*

10.1.1 A description of the material tested including supplies, type, lot number, and production date where possible, and

10.1.2 Any evidence of delamination if applicable, and

10.1.3 Any evidence of corrosion if applicable, and

10.1.4 Any evidence of metallization loss if applicable, and

10.1.5 Water vapor permeance after aging.

11. Precision and Bias

11.1 No statement is made concerning the precision and bias of the visual inspection portion of the accelerated aging of vapor retarders for insulation, since results merely compare performance to an unexposed control.

11.2 Refer to Test Methods **E96/E96M** for precision and bias of the water vapor permeance determination.

12. Keywords

12.1 corrosion; humid aging; insulation; vapor retarder; water vapor permeance

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