Designation: C1136 – 16

Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation[1]

This standard is issued under the fixed designation C1136; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers vapor retarders for thermal insulation, specifically, flexible materials with permeance of 0.10 perm or lower and surface burning characteristics of 25 flame spread/50 smoke or lower. These materials are intended for use at surface temperatures of −20 to 150°F (−29 to 66°C). It does not cover mastics or barrier coatings applied in liquid form, nor materials intended for use as weather barriers.

1.2 This is a material specification and does not imply that an installed system using these materials will provide the physical properties specified in Section 6.

1.3 This specification provides physical requirements for vapor retarders. Practice C755 provides assistance in solving problems related to moisture vapor transmission through thermal insulation materials.

1.4 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.

1.5 The following precautionary caveat pertains to the test methods portion only, Section 10, of this specification: *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

C755 Practice for Selection of Water Vapor Retarders for Thermal Insulation

D774/D774M Test Method for Bursting Strength of Paper (Withdrawn 2010)[3]

C1258 Test Method for Elevated Temperature and Humidity Resistance of Vapor Retarders for Insulation

C1263 Test Method for Thermal Integrity of Flexible Water Vapor Retarders

C1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings

D828 Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus (Withdrawn 2009)[3]

D882 Test Method for Tensile Properties of Thin Plastic Sheeting

D1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature

D3285 Test Method for Water Absorptiveness of Nonbibulous Paper and Paperboard (Cobb Test) (Withdrawn 2010)[3]

E84 Test Method for Surface Burning Characteristics of Building Materials

E96/E96M Test Methods for Water Vapor Transmission of Materials

2.2 *TAPPI Standards:*

T461 Flame Resistance of Treated Paper and Paperboard

3. Terminology

3.1 *Definitions*—Definitions in Terminology C168 apply to terms used in this specification.

4. Classification

4.1 Classification of vapor retarders, with the exception of Type IX, is based on physical properties.

4.1.1 Type IX, in addition to physical property requirements, has specific structural requirements.

4.2 Physical property requirements are listed in Table 1.

[1] This specification 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] The last approved version of this historical standard is referenced on www.astm.org.

TABLE 1 Physical Property Requirements[A]

Physical Properties	Type I	Type II	Type III	Type IV	Type VII	Type VIII	Type IX	Type X
Permeance, max Perms ($ng \cdot Pa^{-1} \cdot s^{-1} \cdot m^{-2}$)	0.02 (1.15)	0.02 (1.15)	0.10 (5.75)	0.10 (5.75)	0.01 (0.58)	0.02 (1.15)	0.00 (0.00)	0.02 (1.15)
Burst Strength, min psi (kPa)	55 (380)	35 (240)	55 (380)	35 (240)	70 (483)	60 (414)	80 (552)	75 (518)
Tensile, Machine Direction lb/in. width, min (N/mm width, min)	45 (7.9)	30 (5.3)	45 (7.9)	30 (5.3)	11 (1.9)	8 (1.4)	25 (4.4)	60 (10.5)
Tensile, Cross Direction lb/in. width, min (N/mm width, min)	30 (5.3)	20 (3.5)	30 (5.3)	20 (3.5)	10 (1.7)	7 (1.2)	25 (4.4)	50 (8.8)
Dimensional Change, max percent	0.50	0.50	0.50	0.50	1	1	0.5	0.5

[A]Types V and VI were deleted in 2010 because these materials are no longer produced and were replaced with Types VII and VIII.

5. Materials and Manufacture

5.1 Vapor retarders, with the exception of Type IX, are constructed of various films, metallic foils, fabrics, papers and reinforcements, alone or in combination as a lamination.

5.2 Metallic foils, the most commonly used being aluminum of a minimum gauge, are the only materials expected to provide the impermeable component in a vapor retarder required for Type IX.

5.2.1 Type IX vapor retarders must contain at a minimum the following components in the structure:

5.2.2 One layer of metallic foil with a minimum thickness of 0.00095 in. (24.1μ) or

5.2.3 Multiple layers of metallic foil with a cumulative minimum thickness of 0.0012 in. (30.5μ)

5.2.4 A fully laminated, continuous protective substrate on at least one side of the foil layers

5.3 Types VII-X vapor retarders contain water resistant outer surfaces.

6. Physical Properties

6.1 Maximum permeance for a specific type vapor retarder shall be as shown in Table 1 when tested in accordance with 10.1. Values for permeance requirements are rounded to two decimals.

6.2 All vapor retarders shall demonstrate a flame spread of 25 or less and smoke developed of 50 or less when testing the finish side (the side opposite that contacting the insulation) in accordance with 10.2.

6.3 Minimum tensile strength for a specific type vapor retarder shall be as shown in Table 1 when tested in accordance with 10.3.

6.4 Maximum dimensional change for a specific type vapor retarder shall be as shown in Table 1, when tested in accordance with 10.4.

6.5 All type vapor retarders shall not sustain growth of fungi when tested in accordance with 10.5.

6.6 All type vapor retarders shall not crack or delaminate at temperatures from −20 to 150°F (−29 to 66°C) when tested in accordance with 10.6.

6.7 Minimum burst strength for a specific type vapor retarder shall be as shown in Table 1 when tested in accordance with 10.7.

6.8 Vapor retarders containing paper or paper products shall not demonstrate an increase in char length of more than 20 % when tested in accordance with 10.8.

6.9 All type vapor retarders shall not corrode or delaminate, nor demonstrate, after exposure, a permeance greater than the maximum allowable for the type being tested, when tested in accordance with 10.9.

6.10 Types VII-X vapor retarders shall not absorb more than 0.02 g of water (2.0 g/m^2) when tested for water resistance in accordance with 10.10.

7. Dimensions, Mass, and Permissible Variations

7.1 Dimensions for roll or sheeted materials shall be as specified by the purchaser.

7.2 Tolerance for roll materials shall be ±⅛ in. (±3 mm) on width and +5, −0 % on length.

7.3 Tolerance for sheeted materials shall be ±⅛ in. (±3 mm) on length and width.

8. Workmanship, Finish, and Appearance

8.1 There shall be no defects in materials or workmanship that will affect the required performance of the vapor retarder.

8.2 There shall be no defects that adversely affect the appearance of the vapor retarder.

8.3 There shall be no defects that would affect ability of user to process material.

9. Significance and Use

9.1 Entrapment of water in thermal insulation caused by condensation of water vapor that has penetrated into the insulation is detrimental to the thermal resistance of the insulation. For this reason, in certain installations where temperature and moisture conditions have the potential to create a vapor driving force toward the insulation, a deterrent to the passage of such vapor into the installed insulation needs to be provided. This is the primary function of the vapor retarder.

9.2 In addition to the function stated in 9.1, a vapor retarder has the potential to provide physical protection and added strength to the insulation system.

9.3 This specification is used to specify material by physical property requirements that address the above prerequisites. The