



Standard Practice for Selection of Water Vapor Retarders for Thermal Insulation¹

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1. Scope

1.1 This practice outlines factors to be considered, describes design principles and procedures for water vapor retarder selection, and defines water vapor transmission values appropriate for established criteria. It is intended for the guidance of design engineers in preparing vapor retarder application specifications for control of water vapor flow through thermal insulation. It covers commercial and residential building construction and industrial applications in the service temperature range from -40 to $+150^{\circ}\text{F}$ (-40 to $+66^{\circ}\text{C}$). Emphasis is placed on the control of moisture penetration by choice of the most suitable components of the system.

1.2 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.

1.3 *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

C168 Terminology Relating to Thermal Insulation

C647 Guide to Properties and Tests of Mastics and Coating Finishes for Thermal Insulation

C921 Practice for Determining the Properties of Jacketing Materials for 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 practice 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 For definitions of terms used in this practice, refer to Terminology C168.

4. Significance and Use

4.1 Experience has shown that uncontrolled water entry into thermal insulation is the most serious factor causing impaired performance. Water entry into an insulation system may be through diffusion of water vapor, air leakage carrying water vapor, and leakage of surface water. Application specifications for insulation systems that operate below ambient dew-point temperatures should include an adequate vapor retarder system. This may be separate and distinct from the insulation system or may be an integral part of it. For selection of adequate retarder systems to control vapor diffusion, it is necessary to establish acceptable practices and standards.

4.2 *Vapor Retarder Function*—Water entry into an insulation system may be through diffusion of water vapor, air leakage carrying water vapor, and leakage of surface water. The primary function of a vapor retarder is to control movement of diffusing water vapor into or through a permeable insulation system. The vapor retarder system alone is seldom intended to prevent either entry of surface water or air leakage, but it may be considered as a second line of defense.

4.3 *Vapor Retarder Performance*—Design choice of retarders will be affected by thickness of retarder materials, substrate to which applied, the number of joints, available length and width of sheet materials, useful life of the system, and inspection procedures. Each of these factors will have an effect on the retarder system performance and each must be considered and evaluated by the designer.

4.3.1 Although this practice properly places major emphasis on selecting the best vapor retarders, it must be recognized that faulty installation techniques can impair vapor retarder performance. The effectiveness of installation or application techniques in obtaining design water vapor transmission (WVT) performance must be considered in the selection of retarder materials.

4.3.2 As an example of the evaluation required, it may be impractical to specify a lower “as installed” value, because difficulties of field application often will preclude “as installed” attainment of the inherent WVT values of the vapor retarder materials used. The designer could approach this requirement