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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Practice for Selection of Vapor Retarders for Thermal Insulation¹

This standard is issued under the fixed designation C 755; 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 practice outlines factors to be considered, describes design principles and procedures for 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 temperature range from -40 to $+80^{\circ}\text{F}$ (-40 to $+27^{\circ}\text{C}$) within the structure. Emphasis is placed on the control of moisture penetration by choice of the most suitable components of the system.

1.2 *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

2. Referenced Documents

2.1 ASTM Standards:

D 828 Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus³

E 84 Test Method for Surface Burning Characteristics of Building Materials⁴

E 96 Test Methods for Water Vapor Transmission of Materials⁵

F 372 Test Method for Water Vapor Rate Transmission of Flexible Barrier Materials Using an Infrared Detection Technique³

2.2 TAPPI Standard:

T803, Puncture Test of Containerboard⁶

3. Terminology

3.1 Definitions:

3.1.1 *dew-point temperature (D_p)*, n —the temperature at

which a specific atmosphere is saturated with water vapor. (Cooling below the dew point will cause release of water vapor in the form of condensation. In problem analysis for vapor barrier selection it is the dew-point temperature, not the relative humidity, that is pertinent. Dew-point temperature is directly related to saturation water vapor pressure and may be obtained from tables.)

3.1.2 *thermal insulation system, n* —thermal insulation for resistance to heat flow combined with means for attachment to the surface to be insulated, and with facings, vapor retarders, joint sealants, or protective coatings as installed.

3.1.3 *vapor retarders, n* —those materials or systems which adequately retard the transmission of water vapor under specified conditions. (For practical purposes it is assumed that the permeance of an adequate retarder will not exceed 1 perm, although at present this value may be adequate only for residential construction. For certain other types of construction the permeance must be very low.)

3.1.4 *water vapor diffusion, n* —the process by which water vapor spreads or moves through permeable materials caused by a difference in water vapor pressure.

3.1.5 *water vapor permeability (permeability), n* —the water vapor transmission of a homogeneous material under unit vapor pressure difference between two specific surfaces, per unit thickness. An acceptable unit of permeability is the perm-inch: grain-in./h·ft²·in. Hg (the metric perm-cm = 1 g/24 h·m²·mm Hg).

3.1.6 *water vapor permeance (permeance), n* —the water vapor transmission of a material under unit vapor pressure difference between two specific surfaces. An acceptable unit of permeance is the perm: grain/h·ft² in. Hg (1 metric perm = 1 g/24 h·m² mm Hg).

3.1.7 *water vapor transmission (WVT), n* —the steady-state time rate of water vapor diffusion or flow through unit area of a material, normal to specific parallel surfaces under specific conditions of temperature and humidity at each surface. An acceptable unit of WVT is grain/h·ft² (1 g/24 h·m²).

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

¹ This practice is under the jurisdiction of ASTM Committee C-16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.33 on Thermal Insulation Finishes and Vapor Transmission.

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² Discontinued; see 1983 *Annual Book of ASTM Standards*, Vol 15.09.

³ *Annual Book of ASTM Standards*, Vol 15.09.

⁴ *Annual Book of ASTM Standards*, Vol 04.07.

⁵ *Annual Book of ASTM Standards*, Vol 04.06.

⁶ Available from TAPPI, P.O. Box 105113, Atlanta, GA 30348.