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Standard Specification for Vacuum Insulation Panels¹

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1. Scope

1.1 This specification covers the general requirements for Vacuum Insulation Panels (VIP). These panels have been used wherever high thermal resistance is desired in confined space applications, such as transportation, equipment, and appliances.

1.2 Vacuum panels typically exhibit an edge effect due to differences between core and barrier thermal properties. This specification applies to composite panels whose center-of-panel apparent thermal resistivities (sec. 3.2.4) typically range from 87 to 870 m·K/W (12.5 to 125 hr·ft²·°F/Btu·in) at 24°C (75°F) mean, and whose intended service temperature boundaries range from –70 to 480°C (–94 to 900°F).

1.3 The specification applies to panels encompassing evacuated space with: some means of preventing panel collapse due to atmospheric pressure, some means of reducing radiation heat transfer, and some means of reducing the mean free path of the remaining gas molecules.

1.4 Limitations

1.4.1 The specification is intended for evacuated planar composites; it does not apply to non-planar evacuated self-supporting structures, such as containers or bottles with evacuated walls. The complexity of describing the performance of the planar products is considered sufficiently challenging for this initial specification, although other shapes will be considered at a future time.

1.4.2 The specification describes the thermal performance considerations in the use of these insulations. Because this market is still developing, discrete classes of products have not yet been defined and standard performance values are not yet available.

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

1.6 *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 specifications and determine the applicability of regulatory limitations prior to use.* For specific safety considerations see Annex A1.

2. Referenced Documents

2.1 ASTM Standards:

- C 165 Test Method for Measuring Compressive Properties of Thermal Insulations²
- C 168 Terminology Relating to Thermal Insulating Materials²
- C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus²
- C 203 Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation²
- C 480 Test Method for Flexure Creep of Sandwich Constructions³
- C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus²
- C 740 Practice for Use of Evacuated Reflective Insulation in Cryogenic Service²
- C 1045 Practice for the Calculation of Thermal Transmission Properties from Steady-State Heat Flux Measurements²
- C 1055 Guide for Heated System Surface Conditions that Produce Contact Burn Injuries²
- C 1058 Practice for Selecting Temperatures for Reporting and Evaluating Thermal Properties of Thermal Insulations²
- C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus²
- C 1136 Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation²
- C 1363 Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus²
- D 999 Methods for Vibration Testing of Shipping Containers⁴
- D 1434 Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheetings⁵
- D 2221 Test Method for Creep Properties of Package Cushioning Materials⁴
- D 2126 Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging⁵
- D 3103 Test Method for Thermal Insulation Quality of Packages⁴

¹ This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.22 on Organic and Nonhomogeneous Inorganic Thermal Insulations.

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² *Annual Book of ASTM Standards*, Vol 04.06.

³ *Annual Book of ASTM Standards*, Vol 15.03.

⁴ *Annual Book of ASTM Standards*, Vol 15.09.

⁵ *Annual Book of ASTM Standards*, Vol 08.01.