



Designation: C1482 – 10

Standard Specification for Polyimide Flexible Cellular Thermal and Sound Absorbing Insulation¹

This standard is issued under the fixed designation C1482; 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 specification covers the composition and physical properties of lightweight, flexible open-cell polyimide foam insulation intended for use as thermal and sound-absorbing insulation for temperatures from -328°F up to +572°F (-200°C and +300°C) in commercial and industrial environments.

1.1.1 **Annex A1** includes faced polyimide foam as specified by the U.S. Navy for marine applications.

1.1.2 This standard is designed as a material specification and not a design document. Physical property requirements vary by application and temperature. No single test is adequate for estimating either the minimum or maximum use temperature of polyimide foam under all possible conditions. Consult the manufacturer for specific recommendations and physical properties for specific applications.

1.1.3 The use of an appropriate vapor retarder is required in all applications where condensation could occur and cause a decrease in thermal performance or affect other system properties.

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 is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of the materials, products, or assemblies under actual fire conditions.

1.4 *This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

NOTE 1—The subject matter of this material specification is not covered by any other ASTM specification. There is no known ISO standard covering the subject of this standard.

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.

Current edition approved Sept. 1, 2010. Published October 2010. Originally approved in 2000. Last previous edition approved in 2009 as C1482 – 10 DOI: 10.1520/C1482-10.

2. Referenced Documents

2.1 ASTM Standards:²

- C165 Test Method for Measuring Compressive Properties of Thermal Insulations
- C168 Terminology Relating to Thermal Insulation
- C177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
- C302 Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation
- C335 Test Method for Steady-State Heat Transfer Properties of Pipe Insulation
- C390 Practice for Sampling and Acceptance of Thermal Insulation Lots
- C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- C421 Test Method for Tumbling Friability of Preformed Block-Type and Preformed Pipe-Covering-Type Thermal Insulation
- C423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- C447 Practice for Estimating the Maximum Use Temperature of Thermal Insulations
- C518 Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- C634 Terminology Relating to Building and Environmental Acoustics
- C665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
- C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions
- C1058 Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation
- C1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus
- C1304 Test Method for Assessing the Odor Emission of Thermal Insulation Materials

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.

- C1338** Test Method for Determining Fungi Resistance of Insulation Materials and Facings
- C1559** Test Method for Determining Wicking of Fibrous Glass Blanket Insulation (Aircraft Type)
- D395** Test Methods for Rubber Property—Compression Set
- D543** Practices for Evaluating the Resistance of Plastics to Chemical Reagents
- D638** Test Method for Tensile Properties of Plastics
- D2126** Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
- D3574** Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams
- D3675** Test Method for Surface Flammability of Flexible Cellular Materials Using a Radiant Heat Energy Source
- E84** Test Method for Surface Burning Characteristics of Building Materials
- E96/E96M** Test Methods for Water Vapor Transmission of Materials
- E176** Terminology of Fire Standards
- E662** Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- E795** Practices for Mounting Test Specimens During Sound Absorption Tests
- E800** Guide for Measurement of Gases Present or Generated During Fires
- E1354** Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
- E2231** Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics
- 2.2 U.S. Federal Standards:**
- FAR 25.853(a)**, Appendix F, Part 1, (a) (1) (i) Test Criteria and Procedures for Showing Compliance with Sec. 25.853, or 25.855³
- FAR 25.856(a)**, Appendix F, Part VI, Test Method to Determine the Flammability and Flame Propagation Characteristics of Thermal/Acoustic Insulation Materials
- MIL-C-20079** Cloth, Glass; Tape, Textile Glass; and Thread, Glass⁴
- MIL-A-3316** Adhesive, Fire-Resistant, Thermal Insulation⁴
- DOD-E-24607** Enamel, Interior, Nonflaming (Dry), Chlorinated Alkyd Resin, Semigloss (Metric)⁴
- 2.3 Private Sector Standards:**
- Boeing BSS 7239 Test Method for Toxic Gas Generation by Materials on Combustion⁵
- TAPPI T 803** Puncture and Stiffness Test of Container Board⁶

TM-232 Vertical Pipe-Chase Test to Determine Flame-Propagation Characteristics of Pipe Covering⁷

3. Terminology

3.1 Definitions—Terms used in this specification are defined in Terminology **C168**, Terminology **C634**, and Terminology **E176**. In the case of a conflict, Terminology **C168** shall be the dominant authority.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 flexible cellular product—a cellular organic polymeric material that will not rupture when a specimen 8 by 1 by 1 in. (200 by 25 by 25 mm) is bent around a 1 in. (25 mm) diameter mandrel at a uniform rate of one lap in 5 sec. at a temperature between 64 and 85°F (18 and 29°C), in accordance with the description of a flexible cellular product (currently Subsection 3.1.3) in Test Methods **D3574**.

3.2.2 slab—a rectangular section, piece, or sheet of foam that is cut from a bun, or block of foam.

3.2.3 polyimide foam—a flexible cellular product in which the bonds formed between monomers during polymerization are imide or amide bonds. The theoretical mole fraction of imide bonds must be greater than the theoretical mole fraction of amide bonds.

4. Classification

4.1 The flexible polyimide cellular insulations of this specification are classified into Types I through VI as listed in **Tables 1 and 2** (**Note 2**). Type I is further subdivided into two grades based on maximum allowable thermal conductivity at 75° F (24° C). The Types II and III are subdivided into classes (**Note 3**).

NOTE 2—Although all types find application in a wide variety of markets, the current primary market for each type is as follows:

Type I—marine and industrial applications.

Type II—Type II is Type I foam faced and used in specific marine applications, as specified for the U.S. Navy in **Annex A1**.

Type III—Type III is Type I foam pipe shaped and used in specific marine applications, as specified for the U.S. Navy in **Annex A1**.

Types IV and V—aerospace applications depending on density.

Type VI—applications requiring improved high temperature and fire performance.

NOTE 3—The Type II and Type III designations as well as the subdivision of Types into Classes is to maintain uniformity with existing U.S. Navy nomenclature (**Annex A1**).

5. Materials and Manufacture

5.1 Polyimide foam shall be manufactured from the appropriate monomers, and necessary compounding ingredients to conform to **3.2.3**. This is not intended to imply that foam products made using different materials are equivalent with respect to all physical properties.

6. Physical Properties

6.1 The insulation shall conform to the requirements in **Tables 1 and 2** for each type, unless specifically stated

³ Federal Aviation Regulations Part 25 (Airworthiness Standards, Transport Category Aircraft, and Section 25.853, Procedure in appendix F, Part I, (a) (1) (i) and (ii). Available from Superintendent of Documents, U.S. Government Printing Office P.O. Box 371954, Pittsburgh, PA 15250-7954.

⁴ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

⁵ Available from Boeing Commercial Airplane Group, Material Division, P.O. Box 3707, Seattle, WA 98124-2207.

⁶ Available from Technical Association of the Pulp and Paper Industry (TAPPI), 15 Technology Parkway South, Norcross, GA 30092, <http://www.tappi.org>.

⁷ Available from Armstrong World Industries, Inc., Research and Development, P.O. Box 3511, Lancaster, PA 17604.