



Designation: C1937 – 24

Standard Specification for Layered, Glass Fiber Felt Pipe and Board Insulation¹

This standard is issued under the fixed designation C1937; 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 addresses layered, glass fiber felt pipe and board insulation for use on surfaces with temperatures from ambient up to 1400°F (760°C) continuous.

1.2 Glass fibers used to make this product are sometimes referred to as E-glass fibers.

1.3 Facings are not added in the manufacturing process and are not addressed by this specification.

1.4 This material is a high temperature, industrial thermal insulation that is typically covered with field-installed protective jacketing. However, jacketing materials are not addressed in this specification.

1.5 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.

1.6 *The following safety hazards caveat pertains only to the test methods described in 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

¹ This test method is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.20 on Homogeneous Inorganic Thermal Insulations.

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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.

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

C303 Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation

C335 Test Method for Steady-State Heat Transfer Properties of Pipe Insulation

C356 Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat

C390 Practice for Sampling and Acceptance of Thermal Insulation Lots

C411 Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation

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

C585 Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing

C680 Practice for Estimate of the Heat Gain or Loss and the Surface Temperatures of Insulated Flat, Cylindrical, and Spherical Systems by Use of Computer Programs

C692 Test Method for Evaluating the Influence of Thermal Insulations on External Stress Corrosion Cracking Tendency of Austenitic Stainless Steel

C795 Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel

C871 Test Methods for Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate, and Sodium Ions

C1045 Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions

C1058/C1058M Practice for Selecting Temperatures for Evaluating and Reporting Thermal Properties of Thermal Insulation

C1104/C1104M Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation

C1617 Practice for Quantitative Accelerated Laboratory Evaluation of Extraction Solutions Containing Ions Leached from Thermal Insulation on Aqueous Corrosion of Metals

C1936 Test Method for Corrosiveness of Mineral-Fiber or Cellulosic-Fiber Insulation by Comparison to Control

E84 Test Method for Surface Burning Characteristics of Building Materials

E136 Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C

3. Terminology

3.1 *Definitions*—For definitions used in this specification, refer to Terminology **C168**.

3.2 *E-glass fibers, n*—also known as electrical glass fibers, these are the standard glass composition used for most glass fibers and are made from the oxides of silicon, aluminum, calcium, magnesium, and boron.

4. Classification

4.1 This thermal insulation material is pre-formed in a factory with shapes either in standard pipe sizes and thicknesses, classified as Type I, per Practice **C585**, or boards, either flat or with a certain radius of curvature, classified as Type II, and standard thicknesses.

4.2 All Type I pipe insulation is typically formed in two halves. However, quads or hexes are permitted.

5. Materials and Manufacture

5.1 The materials covered by this specification shall all consist of glass fibers that have been mechanically bonded by a felting process into a mat. A binder, typically inorganic, is then added between the layers and over the top layer that allows the material to be formed into semi-rigid shapes after curing of that binder by applying heat to the insulation material.

5.2 Facings are not added in the manufacturing process and are not covered by this specification.

6. Ordering Information and Dimensions

6.1 The purchaser shall specify the Type, shape, and dimensions of the materials. The Type shall be either pipe or board. Dimensions for Type I pipe shall include nominal pipe size and thickness. The Type II board shall either be specified as curved, with a particular radius of curvature, or flat. Dimensions for curved board shall include inside radius, where applicable, and thickness.

6.2 Standard thicknesses for both Type I pipe and Type II board are from 1 in. (25 mm) to 4 in. (102 mm) in 0.5 in. (13 mm) increments. Greater thicknesses can be achieved with double or triple layer nesting. When a Type I pipe insulation product is to be nested, it shall be so stated on the purchase order.

6.3 Standard Type I pipe sizes are from 0.5 in. (15 mm) to 44 in. (1100 mm) NPS. Standard pipe insulation section length is 39.37 in. (1.00 m) or as otherwise specified.

6.4 Standard Type II board dimensions are 39.37 in. (1.00 m) by 39.37 in. (1.00 m) or 10.76 ft²/board (1 m²) or as otherwise specified. For curved boards, those same dimensions apply inside the curved surface. Unless otherwise specified, curved board radii of curvature shall range from 25.6 in. (650 mm) to 118 in. (3000 mm).

7. Performance, Physical, and Chemical Characteristics

7.1 The insulation shall conform to the requirements in **7.2** through **7.13**: maximum use temperature, maximum density, apparent thermal conductivity, compressive resistance, linear shrinkage, hot surface performance, sag resistance, noncombustibility, water vapor sorption, surface burning characteristics, corrosiveness to steel, and stress corrosion to austenitic stainless steel.

7.2 *Maximum Use Temperature*—Test both Type I pipe insulation and Type II board insulation according to **11.1**, in a 6 in. (152 mm) total thickness, using multiple layers as necessary. The test temperature shall be a minimum of 1400 °F (760 °C). Neither Type I pipe nor Type II board insulation shall flame, glow, smolder, or warp during hot surface exposure. Further, no evidence of melting shall be evident upon post-test inspection.

7.3 *Apparent Thermal Conductivity*—Determine in accordance with **11.2**. Thermal conductivity values shall be less than or equal to those listed in **Table 1** at the given mean temperatures.

7.3.1 Thermal conductivity tests on flat boards shall be used to represent the thermal conductivity of curved boards with a radius of curvature greater than 22 in. (559 mm).

7.4 *Density*—Determine according to **11.3**. The maximum density shall be 14.5 lb/ft³ (232 kg/m³) for Type I pipe insulation and 13.5 lb/ft³ (216 kg/m³) for Type II board insulation.

7.5 *Compressive Resistance*—Determine according to **11.4**. Compressive resistance shall be greater than 900.0 lb/ft² (43.1 kPa) @ 10% deformation with no shearing, crumbling, or cracking of the material.

7.6 *Linear Shrinkage*—Determine according to **11.5**. The test temperature shall be a minimum of 1400 °F (760 °C). Linear shrinkage shall be less than 2.0%.

7.7 *Water Vapor Sorption*—Determine according to **11.6**. Water Vapor Sorption shall be less than 2.0% by mass.

7.8 *Surface Burning Characteristics*—Determine according to **11.7**. Flame Spread Index / Smoke Developed Index shall be 0 / 0.

NOTE 1—If the material is used inside a building, it should be tested per Test Method **E84** as a system (that is, in combination with jacketing materials).

7.9 *Hot Surface Performance*—Determine according to **11.8** at a minimum test temperature of 1400 °F (760 °C). The internal temperature of both Type I pipe and Type II board insulation shall not exceed 1400°F (760°C). If the product demonstrates an internal exothermic reaction, the maximum internal temperature shall be less than or equal to 1400°F (760°C) at each internal temperature measurement location.