



Designation: C610 – 11

Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers molded expanded perlite block, fittings, and pipe thermal insulation intended for use on surfaces with temperatures between 80 to 1200°F (27 to 649°C).

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

- 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
- C203 Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
- 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
- C421 Test Method for Tumbling Friability of Preformed Block-Type and Preformed Pipe-Covering-Type Thermal Insulation
- C450 Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging
- 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
- C795 Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
- 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
- C1616 Test Method for Determining the Moisture Content of Organic and Inorganic Insulation Materials by Weight
- E84 Test Method for Surface Burning Characteristics of Building Materials
- E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

3. Standard Shapes, Sizes, and Dimensions

3.1 Molded expanded perlite block, fitting, and pipe thermal insulation shall be as follows:

3.1.1 *Block*—Block shall be furnished in lengths of either 36 or 39.4 in. (914 or 1000 mm), widths of 6 in. (152 mm), 12 in. (305 mm), 18 in. (457 mm), or 24 in. (610 mm), and in thickness from 1½ to 6 in. (38 to 152 mm) in increments of ½ in. (13 mm).

3.1.2 *Pipe Insulation*—Molded expanded perlite pipe insulation shall be supplied either as hollow cylindrical shapes split in half lengthwise (in a plane including the cylindrical axis) or curved segments. The pipe insulation shall be furnished in

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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.

sections or segments in lengths of either 36 or 39.4 in. (914 or 1000 mm) to fit standard sizes of pipe and tubing, and in nominal thickness from 1 to 4 in. (25 to 102 mm) in ½-in. (13-mm) increments. Inner and outer diameters of multilayer construction shall be specified. Inner and outer diameters shall be in accordance with those standard dimensions specified in Practice C585. Since outside diameter tolerances differ between individual manufacturing processes, it is acceptable to have pipe insulation furnished in two or more layers nested by the manufacturer. The purchaser shall consult the manufacturer for specific requirements.

3.1.3 *Fittings*—Molded (expanded insulation fittings shall conform to the inner and outer diameters in accordance with Practice C585. Mitered fittings shall be in accordance with Practice C450.

4. Description

4.1 *Composition*—molded expanded perlite block, fitting, and pipe thermal insulation shall be composed principally of expanded perlite and silicate binders may contain reinforcing fibers.

5. Dimensional Tolerances

5.1 *General*—The average tolerances for length, width, and thickness shall comply with the requirements shown in Table 1.

5.2 *Pipe Insulation*—The following additional tolerances apply to perlite pipe insulation supplied as half sections:

5.2.1 *Fit and Closure*—When fitted to the appropriate size pipe, the longitudinal seam of the pipe insulation shall close to within ¼ in. (1.6 mm) along the entire length of the section.

5.2.2 *Concentricity*—The inner bore of the pipe insulation shall be concentric with the outer cylindrical surface. The deviation from concentricity shall not exceed ⅛ in. (3.2 mm) or 5 % of the wall thickness, whichever is greater.

5.2.3 *Half-Section Balance*—The plane formed by the split between half sections shall include the cylindrical axis. Deviation of the split plane from the cylinder axis over the 36 or 39.4-in. (914 or 1000-mm) length shall not exceed ⅛ in. (3.2 mm).

6. Workmanship, Finish, and Appearance

6.1 Since some requirements for this material are not easily defined by a numerical value, the insulation shall not have visible defects that will adversely affect its service qualities.

7. Physical Requirements

7.1 The insulation shall conform to the physical requirements in Table 2.

TABLE 1 Dimensional Tolerances

	Block	Pipe
Length	± ⅛ in. (3.2 mm)	± ⅛ in. (3.2 mm)
Width	± ⅛ in. (3.2 mm)	...
Thickness	± ⅛ in. (3.2 mm)	± ⅛ in. (3.2 mm)
Inner Diameter	...	in accordance with Practice C585
Outer Diameter	...	in accordance with Practice C585

8. Sampling

8.1 The insulation shall be sampled in accordance with Practice C390. Specific provision for sampling shall be agreed upon between the purchaser and the supplier.

9. Qualification Requirements

9.1 The following requirements are generally employed for purpose of initial material or product qualification:

- 9.1.1 Flexural strength,
- 9.1.2 Compressive resistance,
- 9.1.3 Surface burning characteristics,
- 9.1.4 Linear shrinkage after soaking heat,
- 9.1.5 Water absorption after heat aging,
- 9.1.6 Apparent thermal conductivity,
- 9.1.7 Hot-surface performance,
- 9.1.8 Stress corrosion cracking of austenitic stainless steel, and
- 9.1.9 Weight loss by tumbling.

10. Acceptance Requirements

10.1 The following requirements are generally employed for purposes of acceptance sampling of lots or shipments of qualified products:

- 10.1.1 Density,
- 10.1.2 Dimensions,
- 10.1.3 Workmanship, and
- 10.1.4 Moisture content.

11. Test Methods

11.1 The properties enumerated in this specification shall be determined in accordance with the following test methods:

- 11.1.1 *Density*:
 - 11.1.1.1 *Block Insulation*—Test Method C303.
 - 11.1.1.2 *Pipe Insulation*—Test Method C302, Procedure A.
- 11.1.2 *Apparent Thermal Conductivity*:
 - 11.1.2.1 *Block Insulation*—Test Method C177 per Practice C1058 large temperature difference method or Test Method C518, using 1½ ± ½-in. (38 ± 13-mm) thick specimens.
 - 11.1.2.2 *Pipe Insulation*—Test Method C335, using 1½ ± ½ in. (38 ± 13-mm) thick specimens of pipe insulation as supplied for fit to a 3-in. (89 mm) nominal iron pipe.
 - 11.1.2.3 Apparent thermal conductivity versus mean temperature shall be calculated in accordance with Practice C1045. Determinations shall be made at four or more mean temperatures. Two of the test mean temperatures shall be within 50°F (28°C) of the highest and lowest mean temperature specified in Table 2. The other two determinations shall be made at mean temperatures spaced equally within the specified range. All test temperatures shall be selected in accordance with Practice C1058 and reported in the test results. The results of these tests shall be interpolated through reasonable curve fitting or numerical techniques, to establish the apparent thermal conductivity at the specified mean temperature.
- 11.1.3 *Linear Shrinkage After Heat Soaking*—Refer to Test Method C356. The test temperature shall be 1200°F (649°C).