



Designation: C1410 – 17

## Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation<sup>1</sup>

This standard is issued under the fixed designation C1410; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers the type, physical properties, and dimensions of open-cell melamine foam intended for use as thermal and sound-absorbing insulation for temperatures from  $-40$  to  $+350^{\circ}\text{F}$  ( $-40$  to  $+177^{\circ}\text{C}$ ) in industrial environments.

1.2 Some uses of thermal insulation materials covered by this specification are governed by building codes that address fire performance.

1.3 The use of an appropriate vapor retarder is required on cold surface applications where water vapor condense and cause a decrease in thermal performance. Refer to Practice C755 for selection of vapor retarders. Facings shall be agreed upon between the purchaser and the manufacturer or supplier.

1.4 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.

1.5 *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.*

1.6 *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:<sup>2</sup>

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

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

C423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

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

C755 Practice for Selection of Water Vapor Retarders for Thermal Insulation

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

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

C1363 Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

D2863 Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

D3574 Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams

E84 Test Method for Surface Burning Characteristics of Building 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

E2231 Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics

<sup>1</sup> 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

**TABLE 1 Common Dimensions**

	Type I	Type II
Width, in. (mm)	12 to 50 (305 to 1270)	N/A
Length, in. (mm)	48 to 100 (1219 to 2540)	36 or 48 (914 or 1219)
Thickness, in. (mm)	¼ to 20 (6.4 to 508)	½ to 5 (12.7 to 127)

## 2.2 Boeing Standards:

Boeing Specification Support Standard 72396<sup>3</sup>

## 2.3 International Maritime Organization:

Resolution MSC.41(64) Interim Standard for Measuring Smoke and Toxic Products of Combustion Interim Standard for Measuring Smoke and Toxic Products of Combustion<sup>4</sup>

## 3. Terminology

3.1 *Definitions*—Terms used in this specification are defined in Terminology C168 and also in Terminology E176 as appropriate

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *melamine foam*—a low-density, flexible cellular, open-cell foam made from the polymerization and foaming of melamine-formaldehyde resins.

3.2.2 *flexible cellular*—a cellular organic polymeric material that will not rupture within 60 s 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 s in the form of a helix at a temperature between 65 and 85°F (18 and 29°C).

## 4. Classification

4.1 Melamine thermal insulation are furnished in the following types and grades:

### 4.1.1 Type I—Flat slab:

4.1.1.1 *Grade 1*—Regular (core foam with no facing).

4.1.1.2 *Grade 2*—Faced foam.

### 4.1.2 Type II—Pipe and tubing insulation:

4.1.2.1 *Grade 1*—Regular (core foam with no facing).

4.1.2.2 *Grade 2*—Faced foam.

### 4.1.3 Type III—Special shapes.

4.1.4 Special Facings.

## 5. Ordering Information

5.1 Purchase orders for melamine thermal insulation shall specify any or all of the following:

5.1.1 Title, number, and year of this specification.

5.1.2 Type and grade designation (see 4.1).

5.1.3 Length, width and thickness required (see Table 1).

5.1.4 Tolerance, if other than specified (see Table 2).

5.1.5 Quantity of material.

5.1.6 Special packaging or marking, when required.

5.1.7 Special requirements for inspection and for testing.

5.1.8 Thermal conductivity at mean temperature of flat stock.

5.1.9 Manufacturers name, address, and telephone number.

**TABLE 2 Insulation Tolerances**

Type	Type I	Type II
Width, in. (mm)	±¼ (6.4)	N/A
Length, in. (mm)	±¼ (6.4)	±⅛ (3.2) –0
Thickness, in. (mm)	±⅛ (3.2) or 2 % whichever is smaller	±⅛ (3.2) –0 or 2 % whichever is smaller

### 5.1.10 Jacket facing type.

## 6. Materials and Manufacture

6.1 Typically a hydrocarbon blowing agent is used to foam melamine formaldehyde resins. The result is an open-cell melamine foam. The blowing agent is drawn off in the manufacturing process and is not residual in the foam.

6.2 Facing materials incorporated into the design of pipe insulation or flat slab shall be agreed upon between the purchaser and the manufacturer or seller. Typical materials are as follows:

6.2.1 *Aluminum Foil*—Aluminum foil laminated to a supporting membrane.

6.2.2 *Aluminized Mylar*—Aluminized mylar film laminated to a supporting membrane.

6.2.3 *Polyvinylchloride*—Polyvinylchloride either plain or reinforced with polyester.

6.2.4 *Polyvinylfluoride*—Polyvinylfluoride reinforced with fiberglass and rubber.

## 7. Physical Properties

7.1 Melamine thermal insulation shall conform to the physical requirements in Table 3, which shall constitute acceptance or rejection values for this specification when tested by test methods specified in Section 14.

NOTE 1—Data in Table 3 is for unfaced products; facings affect the properties listed.

NOTE 2—Melamine foams are hydrophilic and will absorb water or moisture. Any system exposed to water, moisture, high humidity or that is used on cold installations must be protected by a vapor retarder or moisture retarder system.

7.2 The sound-absorption results for unfaced melamine foam shall conform to the performance requirements in Table 4 of this specification.

7.3 Do not use values stated in Tables 3 and 4 as design values. It is the buyer's responsibility to specify design requirements and obtain supporting documentation from the material supplier.

## 8. Inspection Requirements

8.1 The physical requirements for density and thermal conductivity at 75°F mean temperature (unless otherwise agreed upon between the purchaser and the supplier) as listed in Table 3 are defined as inspection requirements (refer to Practice C390).

8.2 All dimensional requirements, as described in Tables 1 and 2, are defined as inspection requirements.

8.3 All workmanship and appearance requirements, as described in Section 11, are defined as inspection requirements.

<sup>3</sup> The Boeing Company, Boeing Technology Services, Seattle, WA, <http://www.boeing.com>.

<sup>4</sup> International Maritime Organization, 4 Albert Embankment, London, United Kingdom, <http://www.imo.org>.

**TABLE 3 Physical Properties**

Property	Requirement
Oxygen index, minimum % oxygen	33
Specific optical smoke density, max, Dm:	
Flaming mode	86
Non-flaming mode	40
Surface burning characteristics, max:	
Flame spread index/smoke developed index, max, at 1 in. thickness	25/50
Density, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )	0.44 ± 0.19 (7.0 ± 3.0)
Tensile strength, min, lb/in. <sup>2</sup> (kPa)	14 (96.52)
Percent elongation, max	35
Indentation force deflection, N (lbf)	
Compression at 25 %	225 (50.6)
Compression at 65 %	550 (123.6)
Thermal conductivity, max, Btu in./h ft <sup>2</sup> °F (W/mK)	
at -40°F mean	0.19 (0.027)
at 75°F mean	0.27 (0.039)
at 300°F mean	0.52 (0.074)
Water vapor sorption by weight, max, % (by volume, max, %)	20 (0.12)
High-temperature linear shrinkage at 350°F, max, %	5
Smoke toxicity, max ppm	
Carbon monoxide	3500
Hydrogen Chloride	500
Hydrogen fluoride	50
Nitrous Oxide	100
Sulfur Dioxide	100
Hydrogen cyanide	150

## 9. Qualification Requirements

9.1 All physical requirements listed in **Tables 3 and 4** that are not considered inspection requirements are defined as qualification requirements (refer to Practice **C390**).

9.2 For the purpose of initial material qualification, compliance with qualification requirements for each type of insulation shall be in accordance with Practice **C390**.

9.3 Other properties, such as odor or corrosion, agreed upon between the purchaser and the manufacturer or supplier shall be considered to comply with this specification.

## 10. Dimensions and Permissible Variations

10.1 *Type I, Flat Sheet*—Sheets shall be rectangular sections and shall be true to form and dimensions, the corners square and the sides and edges parallel. Typical sizes are shown in **Table 1**. Other sizes as agreed upon between the purchaser and the manufacturer or supplier shall be considered to comply with this specification.

10.2 *Type II, Pipe and Tubing Insulation*—Pipe insulation shall be fabricated in sizes to conform to Practice **C585** or as agreed upon between the manufacturer and the user.

10.3 *Type III, Special Shapes*—Dimensions of special shapes shall be as decided upon between the manufacturer and the user.

10.4 *Dimensional Tolerances*—The insulation shall not differ from the manufacturer's standard dimensions by more than the tolerances listed in **Table 2**.

## 11. Workmanship and Appearance

11.1 Since several requirements for this material are not easily defined by a numerical value but affect the workmanship of the finished job, the insulation shall be free of defects that

adversely affect the service quality. For example, blowholes and tears when occurring to an excessive degree beyond what is agreed upon by the manufacturer and purchaser shall be judged to adversely affect the service quality of the material.

## 12. Sampling

12.1 Unless otherwise specified in the purchase order or contract, sampling shall be in accordance with Practice **C390**.

## 13. Test Methods

13.1 *Apparent Thermal Conductivity*—Determine the thermal conductivity versus temperature relationship for the material using Test Methods **C177**, **C335**, **C518** or **C1363** as appropriate for the sample in conjunction with Practice **C1045** for data analysis. For most specimens, Test Methods **C177** and **C518**, are preferred. Test Method **C177** Shall be used as the referee in case of disputes.

13.2 *Sound Absorption Coefficients*—Test in accordance with Test Method **C423** using Type “A” mounting in accordance with Practice **E795**. The insulation shall have sound absorption coefficient and NRC not less than that indicated in **Table 4**. This specification addresses the foam alone; coatings and facings affect the properties listed.

13.3 *Oxygen Index*—Test in accordance with Test Method **D2863**.

13.4 *Density*—Test in accordance with Test Methods **D3574**, Test Method A.

13.5 *Tensile Strength*—Test in accordance with Test Methods **D3574**, Test Method E.

13.6 *Compressibility*—Test in accordance with Test Methods **D3574**, Test Method C.

13.7 *Elongation*—Test in accordance with Test Methods **D3574**, Test Method E.

### 13.8 Surface Burning Characteristics:

13.8.1 *For Grade 1 Materials*—Test 1-in. thick core foam sample in accordance with Test Method **E84** and Practice **E2231** mounting procedure.

13.8.2 For thickness other than 1-in. the manufacturer or the supplier shall test in the actual thickness used for surface burning characteristics and other fire properties. The thickness and the results shall be reported.

13.8.3 *For Grade 2 Materials*—Test 1-in. thick core foam and specified facer sample in accordance with Test Method **E84** and Practice **E2231** mounting procedure. See **13.8.2**.

### 13.9 Specific Optical Smoke Density:

13.9.1 *For Grade 1 Materials*—Test 1-in. thick sample in accordance with Test Method **E662**. See **13.8.2**.

13.9.2 *For Grade 2 Materials*—Test 1-in. thick core foam and specified facer sample in accordance with Test Method **E662**. See **13.8.2**.

13.10 *High-Temperature Shrinkage*—Test in accordance with Test Method **C356** at 350°F. Use the provisions for linear shrinkage-length only with a specimen size of 300 × 75mm (12 × 3in.)

**TABLE 4 Unfaced Sound-Absorption Coefficients (min) Using Test Method C423 Type “A” Mounting Practice E795**

Frequency, Hz	125	250	500	1000	2000	4000	NRC <sup>A</sup>
Minimum coefficient at 2-in. (50-mm) thickness	0.14	0.44	0.94	0.98	0.97	1.03	0.85
Minimum coefficient at 1-in. (25-mm) thickness	0.08	0.19	0.53	0.74	0.82	0.89	0.55
Minimum coefficient at ½-in. (12-mm) thickness	0.03	0.08	0.27	0.48	0.62	0.71	0.35

<sup>A</sup> NRC=Noise Reduction Coefficient

13.11 *Indentation Force Deflection*—Test in accordance with Test Methods D3574, Test Method B.

13.12 *Water Vapor Sorption*—Test in accordance with Test Method C1104/C1104M.

13.13 *Smoke Toxicity*—Test for gases listed in Table 3 in accordance with the following methods: Boeing Specification Support Standard 7239; with toxic gasses evaluated in accordance with IMO Resolution MCS.41(64).

13.13.1 *For Grade 1 Materials*—Test 1-in. thick core foam specimen. See 13.8.2.

13.13.2 *For Grade 2 Materials*—Test 1-in. thick core foam and specified facer specimen. See 13.8.2.

## 14. Inspection

14.1 Unless otherwise specified in the purchase order or contract, Practice C390 shall be used for the basis of inspection requirements and qualification requirements.

## 15. Rejection and Rehearing

15.1 Material that fails to conform to the requirements of this specification are subject to rejection. Rejection shall be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the tests, the producer or the supplier shall have the right to request a rehearing.

15.2 At the agreement of the buyer and the seller, the seller shall have the right to reinspect a rejected shipment and resubmit same after removal of the non-conforming portion.

## 16. Certification

16.1 Unless otherwise specified in the purchase order or contract, Practice C390 shall be the basis for the certification.

When specified in the purchase order or contract, a report of the test results shall be furnished.

## 17. Packaging and Package Marking

17.1 *Packaging*—Unless otherwise agreed upon and specified between the purchaser and the manufacturer or supplier, the insulation shall be packaged by the manufacturer’s standard commercial practice.

17.2 *Marking*—Unless otherwise specified, each container shall be plainly marked with this specification number, type and grade (see 4.1), and the following:

17.2.1 *Sheet (Type I)*—The name of the manufacturer, address, telephone number, size, and quantity of the material in the container.

17.2.2 *Pipe and Tubing Insulation (Type II)*—The name of the manufacturer, address, telephone number, pipe size, quantity, and nominal thickness of the material in the container.

17.2.3 *Special Shapes (Type III)*—The name of the manufacturer, address, telephone number, shape, and quantity of the material in the container.

17.2.4 *Facing Materials*—The type of facing material and adhesive.

## 18. Keywords

18.1 acoustical insulation; formaldehyde and aldehyde; melamine; melamine formaldehyde; pipe insulation; thermal conductivity; thermal insulation

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