Designation: C1729 – 16a

Standard Specification for Aluminum Jacketing for Insulation[1]

This standard is issued under the fixed designation C1729; 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 aluminum jacketing for thermal and acoustical insulation operating at either above or below ambient temperatures and in both indoor and outdoor locations. It does not cover insulation jacketing made from other materials such as mastics, fiber reinforced plastic, PVC, or stainless steel nor does it cover the details of thermal or acoustical insulation systems.

1.2 This specification provides physical requirements for aluminum jacketing for thermal and acoustical insulation. Guide C1423 provides guidance in selecting jacketing materials and their safe use.

1.3 This is a material specification and does not imply any performance of the installed system using the materials specified herein. For information about installation of aluminum jacketing, see (**1**).[2]

1.4 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

NOTE 1—A version of this specification in SI units is available as C1729M.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate

B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section

C168 Terminology Relating to Thermal Insulation

C450 Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging

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

C835 Test Method for Total Hemispherical Emittance of Surfaces up to 1400°C

C1371 Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

C1423 Guide for Selecting Jacketing Materials for Thermal Insulation

C1729M Specification for Aluminum Jacketing for Insulation

C1785 Test Method for Concentration of Pinhole Detections in Moisture Barriers on Metal Jacketing

D3363 Test Method for Film Hardness by Pencil Test

E84 Test Method for Surface Burning Characteristics of Building Materials

F1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

2.2 *ANSI Standard:*[4]

ANSI H35.2/H35.2(M) Dimensional Tolerances for Aluminum Mill Products

3. Terminology

3.1 *Definitions*—Definitions in Terminology C168 apply to terms used in this specification.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *box rib*—aluminum sheet formed to have alternating parallel grooves and ridges with a cross section approximating a square wave.

3.2.2 *cladding (as related to insulation jacketing)*—synonymous with jacketing.

3.2.2.1 *Discussion*—The three terms "jacketing," "lagging," and "cladding" are considered synonymous in most metal

[1] This specification is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.40 on Insulation Systems.

Current edition approved Sept. 1, 2016. Published September 2016. Originally approved in 2010. Last previous edition approved in 2016 as C1729 – 16. DOI: 10.1520/C1729-16A.

[2] The boldface numbers in parentheses refer to a list of references at the end of this standard.

[3] 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.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

jacket related applications and geographies. However, in some cases in the power industry in North America the term "lagging" has a different meaning than "jacketing" or "cladding" and refers specifically to a heavier gauge of jacketing.

3.2.3 *crevice corrosion*—localized corrosion of metal jacketing surface at, or immediately adjacent to, an area that is shielded from full exposure to the environment because of close proximity between the metal and the surface of another material.

3.2.4 *cross crimped*—synonymous with 3⁄16 in. corrugated.

3.2.5 *deep corrugated*—aluminum sheet formed to have alternating parallel grooves and ridges with a cross section approximating a sine wave.

3.2.6 *finish*—the texture of the aluminum surface.

3.2.7 *gore*—jacketing for elbows, fittings, or other non-straight portions of the piping system made from a multitude of similar overlapping pieces.

3.2.8 *lagging (as related to insulation jacketing)*—synonymous with jacketing.

3.2.8.1 *Discussion*—The three terms "jacketing", "lagging", and "cladding" are considered synonymous in most metal jacket related applications and geographies. However, in some cases in the power industry in North America the term "lagging" has a different meaning than "jacketing" or "cladding" and refers specifically to a heavier gauge of jacketing.

3.2.9 *moisture retarder (moister barrier)*—a layer of plastic film or other material applied to the inner side of metal jacketing to inhibit jacket corrosion by interfering with the formation of a galvanic cell between the dissimilar metals of the pipe and jacket or by preventing crevice corrosion.

3.2.9.1 *Discussion*—A moisture retarder is not an insulation system water vapor retarder and does not perform the same function.

3.2.10 *polykraft*—a multilayer composite film used as a moisture retarder on metal jacketing consisting of at least one layer of minimum 40 lb kraft paper and one or more layers of plastic film, usually polyethylene at a minimum thickness of 1.5 mils.

3.2.11 *polyfilm—in relation to metal jacketing*, a three-layer film used as a moisture retarder on metal jacketing consisting of one layer of ethylene/methacrylic acid copolymer and two layers of other polymers, usually polyethylene.

3.2.12 *PVdF based paint system*—a pigmented paint used on the outer surface of metal jacketing to provide corrosion resistance and higher emittance than bare metal consisting of a fairly thin primer paint layer covered by a thicker topcoat paint layer where the latter is a polyvinylidene fluoride (PVdF) type paint.

3.2.13 *PVF film*—a polymer film consisting of polyvinyl fluoride used on the outer surface of metal jacketing to provide corrosion resistance and higher emittance than bare metal.

3.2.14 *safety edge*—an edge of metal jacketing that has been de-burred or rounded by a rolling operation.

3.2.15 *safety hem*—a rounded edge of metal jacketing created by folding the edge of sheet jacketing completely back upon itself using a roll former or a brake.

3.2.15.1 *Discussion*—The fold is typically made toward the underside of the jacketing so that the original edge is hidden and the external appearance of the jacketing is preserved.

3.2.16 *splice roll*—metal jacketing sold in roll form where the package contains two separate pieces of metal jacketing rolled approximately end to end.

3.2.16.1 *Discussion*—A splice roll occurs when the metal coil being used to form the roll jacketing reaches its end before the required roll length is obtained.

3.2.17 *split roll*—synonymous with splice roll.

4. Significance and Use

4.1 This specification is used to specify material by physical property requirements that address the prerequisites in Sections 6 to 10. The designer of an insulation system, after determining the system requirements, shall use this specification to specify the appropriate aluminum jacketing.

5. Classification

5.1 Classification of aluminum jacketing is based on three factors:

5.1.1 *Outer surface treatment and emittance (ε):*

5.1.1.1 Type I = Bare surface, $\varepsilon \geq 0.1$,

5.1.1.2 Type II = Painted with pigmented paint, $\varepsilon \geq 0.8$,

5.1.1.3 Type III = Painted with unpigmented paint, $\varepsilon \geq 0.5$,

5.1.1.4 Type IV = Plastic film coated surface, $\varepsilon \geq 0.85$, and

5.1.1.5 Type V = Painted with a PVdF based paint system, $\varepsilon \geq 0.8$.

5.1.1.6 PVF film is one kind of plastic film used in Type IV.

5.1.1.7 Paint systems for Types II and III must be factory applied and baked on.

5.1.1.8 Plastic film for Type IV must be factory applied and heat laminated to the surface.

5.1.2 *Alloy and Temper per Specification B209:*

5.1.2.1 Grade 1 = Alloy 3105 or 3003, half hard temper (H14 or H24)

5.1.2.2 Grade 2 = Alloy 3105 or 3003, quarter hard temper (H12 - lock forming quality),

5.1.2.3 Grade 3 = Alloy 1100, dead soft temper,

5.1.2.4 Grade 4 = Alloy 3004,

5.1.2.5 Grade 5 = Alloy Alclad 3004 (alloy 3004 clad both sides with alloy 7072 for improved corrosion resistance), and

5.1.2.6 Grade 6 = Alloy 5052.

5.1.3 *Moisture Retarder:*

5.1.3.1 Class A = polyfilm, 3 mil thick,

5.1.3.2 Class C = polykraft per section 3.2.10,

5.1.3.3 Class D = painted, and

5.1.3.4 Class E = no moisture retarder.

NOTE 2—Class B was removed in 2011 because it was not used or produced. The remaining Classes were not renumbered to avoid conflicts with engineering specifications that reference the remaining Classes.

6. Materials and Manufacture

6.1 Aluminum jacketing materials are composed of a single material or a lamination of several components. The materials are supplied in the form of rolls or sheets or preformed to fit the

surface to which they are to be applied. The materials are applied in the field or as a factory-applied composite with the insulation.

6.2 The primary material shall be aluminum and shall have a finish that is smooth, 3⁄16 in. corrugated, or stucco embossed. The dimensions of corrugations (pitch and depth) must be agreed to by manufacturer and purchaser to achieve interchangeability, constant rigidity, and appearance.

6.3 When agreed upon by purchaser and seller, aluminum sheets used as pipe insulation jacketing (see 8.2) shall have a safety edge or a 3⁄8 to 1⁄2 in. safety hem along one entire width edge of the sheet. Aluminum jacketing with a safety edge or safety hem must still meet the length dimensions specified in 8.2.1. A safety hem shall not be specified when the finish is 3⁄16 in. corrugated.

6.4 In most cases, the inner surface of aluminum jacketing material is coated or covered with a moisture resistant film to retard possible galvanic or chemical corrosion, or both, of the jacketing.

6.5 Polyfilm (Class A) and polykraft (Class C) must be factory applied and heat laminated to the interior surface of the metal jacketing.

6.6 For highly corrosive ambient conditions or to increase emittance, the purchaser shall specify that the outer surface of the aluminum be coated with a pigmented paint (Type II), unpigmented paint (Type III), a plastic film (Type IV), or with a PVdF based paint system (Type V).

6.7 Pigmented paint (Type II), unpigmented paint (Type III), and PVdF based paint systems (Type V) must be factory applied and baked on to the outer surface.

6.8 Unless agreed to otherwise by purchaser and seller of the metal jacketing, the primer layer for Type V outer surface treatment must have a minimum dry thickness of 0.2 mils and the PVdF topcoat must have a minimum dry thickness of 0.7 mils.

NOTE 3—It is important to be aware that the minimum 0.7 mil thickness requirement in Table 1 applies to the topcoat of the Type V PVdF based paint system and not to the total outer surface paint thickness.

6.9 Plastic film (Type IV), including PVF film, must be factory applied to the metal jacketing outer surface using heat lamination with a thermally activated adhesive.

6.10 Plastic film (Type IV), including PVF film, must be a minimum of 1.5 mils thick.

6.11 The aluminum used in this jacketing, with the exception of box rib, shall be manufactured from Specification , alloys 3003, 3105, or 1100 with tempers of H14 or H24 (half hard), H12 (quarter hard), or dead soft – Grades 1, 2, or 3 per 5.1.2.

6.12 Aluminum jacketing shall be specified by the thickness of the aluminum layer which shall be in the range from 0.016 to 0.050 in.

NOTE 4—The thickness values mentioned in 6.11, 6.13, and 6.12 are nominal thickness. The tolerances shown in Table 2 apply to these listed nominal values.

6.13 The measured thickness of metal jacketing will be influenced by any forming or rolling such as that described in 10.5. All requirements for and discussion of jacketing thickness and thickness tolerance in this document including Table 3 and Table 2 apply to the base metal before any forming or rolling and do not include any coatings or films that are applied to the surface such as the moisture barriers described in 5.1.3.

TABLE 1 Physical Properties

Type	I				II and V				III				IV			
Grade	All				All				All				All			
Class	A	C	D	E	A	C	D	E	A	C	D	E	A	C	D	E
Emittance	0.1	0.1	0.1	0.1	0.8	0.8	0.8	0.8	0.5	0.5	0.5	0.5	0.85	0.85	0.85	0.85
Surface Burning (flame/ smoke max)	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50	25/50
Moisture retarder pinhole dectections (per 50 ft^2)	≤5	≤5	≤5	n.a.	≤5	≤5	≤5	n.a.	≤5	≤5	≤5	n.a.	≤5	≤5	≤5	n.a.
Moisture retarder WVTR (g/100 in2/ day)	≤0.1	≤1.1	n.a.	n.a.	≤0.1	≤1.1	n.a.	n.a.	≤0.1	≤1.1	n.a.	n.a.	≤0.1	≤1.1	n.a.	n.a.
Outer Paint Thickness (mils)	n.a.	n.a.	n.a.	n.a.	0.7-0.8	0.7-0.8	0.7-0.8	0.7-0.8	0.3-0.4	0.3-0.4	0.3-0.4	0.3-0.4	n.a.	n.a.	n.a.	n.a.
Outer Paint Pencil Hardness (min)	n.a.	n.a.	n.a	n.a.	H	H	H	H	H	H	H	H	n.a	n.a	n.a.	n.a.