



Designation: C 921 – 03a

Standard Practice for Determining the Properties of Jacketing Materials for 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 practice covers jackets applied over thermal insulation on piping and equipment, including materials applied solely for physical protection, and materials applied as vapor retarders.

1.2 This practice provides material and physical requirements, or both, for jackets. Guidance in selecting the proper jacket for a given application can be found in Guide C 1423.

1.3 This practice does not cover field applied mastics or barrier coatings and their attendant reinforcements, nor does it cover jackets for buried insulation systems.

1.4 The values stated in inch-pound units are to be regarded as standard. SI units are given in parenthesis.

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:

A 167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip²

A 240 Specification for Heat-Resistant Chromium and chromim-Nickel Stainless Steel Plate, Sheet and Steel²

A 366/A366M Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality³

A 653/A653M Specification for Steel Sheet, Zinc Coated (Galvanized), or Zinc-Iron Alloy, Coated (Galvanealed) by the Hot-dip Process⁴

A 792/A792M Specification for Steel Sheet, 55% Aluminum-Zinc Alloy, Coated by the Hot-Dip Method⁴

B 209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate⁵

C 168 Terminology Relating to Thermal Insulating Materials⁶

C 390 Practice for Sampling and Acceptance of Preformed Thermal Insulation⁶

C 921 Practice for Sampling and Acceptance of Preformed Thermal Insulation⁶

C 1258 Practice for Sampling and Acceptance of Preformed Thermal Insulation⁶

C 1263 Test Method for Thermal Integrity of Flexible Water Vapor Retarders⁶

C 1338 Test Method for Determining Fungi Resistance of Insulation Materials and Facings⁶

C 1423 Guide for Selecting Jacketing Materials for Thermal Insulation⁶

C 835 Test Method for Total Hemispherical Emittance of Surfaces from 20 to 1400°C⁶

D 828 Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus⁷

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting⁸

D 1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature⁹

E 84 Test Method for Surface Burning Characteristics of Building Materials¹⁰

E 96 Test Methods for Water Vapor Transmission of Materials⁶

2.2 TAPPI Standards:

T461 Flame Resistance of Treated Paper and Paperboard¹¹

¹ This practice is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.33 on Insulation Finishes and Moisture.

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² Annual Book of ASTM Standards, Vol 01.03.

³ Annual Book of ASTM Standards, Vol 01.05.

⁴ Annual Book of ASTM Standards, Vol 01.06.

⁵ Annual Book of ASTM Standards, Vol 02.02.

⁶ Annual Book of ASTM Standards, Vol 04.06.

⁷ Annual Book of ASTM Standards, Vol 15.09.

⁸ Annual Book of ASTM Standards, Vol 08.01.

⁹ Annual Book of ASTM Standards, Vol 08.03.

¹⁰ Annual Book of ASTM Standards, Vol 04.07.

¹¹ Available from Technical Association of the Pulp and Paper Industry (TAPPI), P.O. Box 105113, Atlanta, GA 30348; 15 Technology Parkway South, Norcross, GA 30092.

T803 Puncture Test of Containerboard¹¹
3. Terminology

3.1 *Definitions*—Definitions in Terminology C 168 apply to terms used in this practice, including the word jacket, which is defined as "a form of facing applied over insulation". In common use, the terms jacket and jacketing shall be considered interchangeable.

4. Classification

4.1 *Type I*—Semi-rigid, for physical abuse resistance, physical support, and finish.

4.1.1 Grade 1: Aluminum sheet metal,

4.1.2 Grade 2: Stainless steel sheet metal,

4.1.3 Grade 3: Coated steel sheet metal, and,

4.1.4 Grade 4: Plastic sheet.

4.2 *Type II*: Flexible for vapor retardance, or physical support or finish combination thereof.

4.2.1 Grade 1: Laminated multi-layer,

4.2.1.1 Class A: Below ambient application; extremely low permeance,

4.2.1.2 Class B: Below ambient application; very low permeance,

4.2.1.3 Class C: Below ambient application; low permeance, and

4.2.1.4 Class D: Above ambient application; no vapor retarder needed,

4.2.2 Grade 2: Plastic film.

4.2.2.1 Class A: Below ambient application; extremely low permeance,

4.2.2.2 Class B: Below ambient application; very low permeance,

4.2.2.3 Class C: Below ambient application; low permeance, and

4.2.2.4 Class D: Above ambient application; no vapor retarder needed.

4.3 Grade 3: Fabric

4.3.1 No grades; support only, vapor retarder properties not applicable.

5. Significance and Use

5.1 Jackets provide one or more of three basic functions when applied over thermal insulation:

5.1.1 Physical protection, in the form of abuse resistance and added structural integrity or support for the insulating medium.

5.1.2 Resistance to moisture vapor intrusion into the insulating medium in those applications where ambient and operating temperatures create a vapor driving force toward the cold (insulated) surface.

5.1.3 Exposed finish for the insulation

5.2 Type I semi-rigid jackets, in the form of metallic or heavy gauge plastic sheet, are used over insulation on piping or equipment to provide high abuse resistance. In this case, the material is also referred to as a protective jacket.

5.3 The vapor retarding Type II flexible jacket (Grades 1 and 2, Classes A, B and C) is used by itself in below ambient service applications not requiring high abuse resistance. In

those cases where high abuse resistance is required, it is applied to the insulation prior to installation of a protective jacket.

5.4 The non vapor-retarding Type II flexible jacket (Grades 1 and 2, class D) is used by itself in above ambient service applications not requiring high abuse resistance. It may also be used for support of the insulation prior to installation of a protective jacket in above ambient applications requiring high abuse resistance.

5.5 Since semi-rigid protective jackets do not perform a vapor retarder function, and flexible jackets do not provide high abuse resistance, the various materials categorized herein are commonly used in combination, but not interchangeably.

5.6 Vapor-retarding properties are not necessary for systems operating above ambient.

5.7 In applications where there is a need to reduce surface emittance, non-metallic jacket, or painted, or film covered metal jacket may be specified.

5.8 For direct outdoor exposure, certain Type I jackets may be used. UV resistance is an important consideration with the Grade 4 materials. Consult with the manufacturer for recommendations on suitability for these applications.

6. Materials and Manufacture

6.1 Jackets shall be composed of a single material or a lamination of several component. The material shall be in the form of rolls or sheets or performed to fit the surface to which they are to be applied. The materials may be applied in the field or may be a factory-applied composite with the insulation.

6.2 *Type I - Semi-rigid Protective*: :

6.2.1 Semi-rigid jackets consist of metal jackets (Grades 1, 2, and 3) and heavy gauge plastic jackets (Grade 4).

6.2.2 Metal jackets are those whose primary material (usually the component of greatest thickness) is metal, such as aluminum alloy, stainless steel, or aluminum - zinc alloy coated steel sheet. Depending upon the metal, it may be available in a smooth mill finish, corrugated, embossed, painted or covered with a laminated, protective film. The inner surface (that side in contact with the insulation) is usually coated or covered with corrosion inhibiting film.

6.2.3 Aluminum Alloy jackets are commonly manufactured to Specification B 209, Type 3003, 3004, 3104, 3105, 5005, 5052, or 1100. Aluminum temper ranges from half hard through full hard. Thicknesses generally available are 0.010 to 0.063 in. (0.25 to 1.60 mm) nominal.

6.2.4 Stainless steel jackets are manufactured to Specification A 240, Type 301, 302, 304, or 316 stainless. Thicknesses generally available are from 0.010 to 0.032 inches (0.25 to 0.81 mm) nominal.

6.2.5 Coated steel jackets are manufactured to requirements in Specifications A 366/A 366M, A 653/A 653M, or A 792/A 792M as appropriate. Thickness generally available is 0.016 inches (0.41 mm) nominal. Other thicknesses shall be available as agreed upon between purchaser and seller.

6.2.6 Heavy gauge plastic Type I, Grade 4 jackets are manufactured in plastic films or sheet with materials such as Polyvinylchloride (PVC) and Polyvinylidenechloride (PVdC) and are available in various thicknesses.

6.3 *Type II - Flexible*: