Up Your...GAME!

Building a Better Insulation Blanket through ASTM C1695-19 Standard Specification for Fabrication of Flexible and Removable Reusable Blanket Insulation for Hot Service
Overview

Brief intro about Insulation Blankets

Why we cared about getting into specification development

Existing spec examples

Suncor case study

About the ASTM standards process

Overview of C1695

How C1695 makes Insulation Blanket Fabricators better

How ASTM can make your company better
About Insulation Blankets

Heat Conservation
Personnel Protection

Process Stabilization
Freeze Protection

Noise Attenuation
Cold Service
Commercial
Tracer Wrap
Hands Up…
Recent End User Specification Development

- MEG Energy
- North West Redwater Partnership
- NOVA Chemicals
- CO-OP
- CNRL
- Enbridge
- Statoil (Equinor)
Issues Persist

- Incomplete specifications
- Antiquated materials and design
- Poor quality and damaged reputations

Solution Available

Industry-Wide Specification Development

- C1695-19 – Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service
Example #1

4.5 **All Flanges, Valves, Equipment, and Instrumentation**

All flanges, valves, equipment, and instrumentation requiring insulation shall be insulated with prefabricated insulated fabric covers that can be entirely removed for maintenance. Valve stems shall remain exposed. The removable blankets shall incorporate draw cords or other Owner approved means of securing the blankets to the item being insulated.
2.6 Insulation Blanket

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.

2.6.5. To accommodate a leak and detect its origin, insulation blankets shall have a low point stainless steel drain grommet.

2.6.6. For identification and location, a stainless steel or aluminum ID tag must be riveted to each insulation blanket. 3.2mm (1/8 in.) embossed lettering should show line number or equipment tag, size, pressure rating (where applicable) and manufacturer name.

2.6.7. Insulation blanket thicknesses for heat conservation and personnel protection shall be in accordance with Table 15.
Expectation vs Reality?
2.6 **Insulation Blanket**

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.
2.6 **Insulation Blanket**

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.
2.6 **Insulation Blanket**

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.
2.6 **Insulation Blanket**

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.
2.6 **Insulation Blanket**

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.
2.6 **Insulation Blanket**

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.
2.6 **Insulation Blanket**

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.
2.6 Insulation Blanket

2.6.1. Insulation blanket shall be in accordance with manufacturer’s standard.

2.6.2. Insulation blanket must be suitable for maximum operating temperature of piping and equipment. Insulation blanket must be chemical resistant, suitable for outdoor applications and manufactured from non-flammable materials.

2.6.3. Insulation blanket fasteners should be Metal D-ring with Velcro tab. For steam service, snaps or tie up blankets shall be used. Other fastener designs may be used subject to suitability with piping and equipment operating conditions.

2.6.4. Insulation blankets for valves shall be a two piece design with a separate body and bonnet. The Metal D-ring with Velcro tab is to be on the bonnet to fasten to main body blanket.
2.6.5. To accommodate a leak and detect its origin, insulation blankets shall have a low point stainless steel drain grommet.

2.6.6. For identification and location, a stainless steel or aluminum ID tag must be riveted to each insulation blanket. 3.2mm (1/8 in.) embossed lettering should show line number or equipment tag, size, pressure rating (where applicable) and manufacturer name.

2.6.7. Insulation blanket thicknesses for heat conservation and personnel protection shall be in accordance with Table 15.
2.6.5. To accommodate a leak and detect its origin, insulation blankets shall have a low point stainless steel drain grommet.

2.6.6. For identification and location, a stainless steel or aluminum ID tag must be riveted to each insulation blanket. 3.2mm (1/8 in.) embossed lettering should show line number or equipment tag, size, pressure rating (where applicable) and manufacturer name.

2.6.7. Insulation blanket thicknesses for heat conservation and personnel protection shall be in accordance with Table 15.
2.6.5. To accommodate a leak and detect its origin, insulation blankets shall have a **low point stainless steel drain grommet**.

2.6.6. For identification and location, a stainless steel or aluminum ID tag must be riveted to each insulation blanket. 3.2mm (1/8 in.) embossed lettering should show line number or equipment tag, size, pressure rating (where applicable) and manufacturer name.

2.6.7. **Insulation blanket thicknesses** for heat conservation and personnel protection shall be in accordance with Table 15.
What are the **Issues**?

- **Stitching Type, Spacing & Construction Method**
- **Fasteners; D-ring Quantity & Fastener Material**
- **Drawstrings Type & Placement**
- **Cloth Type & Color**
Case Study: Suncor

4.5.5 Removable and reusable insulation covers

4.5.5.1 Removable and reusable insulation covers are fabricated insulation products that can be removed for inspection and maintenance of the insulated surface. Removable and reusable insulation covers shall conform to ASTM C1695.

4.5.5.2 Removable and reusable insulation covers shall only be applied in hot service insulation for service up to 1000°F (538°C).

4.6.4 With the aid of Engineering, Operations and Maintenance, identify flanges, manways, exchanger heads, pressure relief valves (PSVs), etc. which require removable flexible insulation covers or insulation boxes. Removable flexible insulation covers and insulating boxes shall have insulation properties equal to the insulation on the line or equipment of which they are a part.
**Types of Standards**

- **Test Method**
- **Specification**
- **Classification**
- **Guide**
- **Practice**
- **Terminology**

**ASTM Standards**

- C1263 Test Method for Thermal Integrity of Flexible Water Vapor Retarders
- C168 Terminology Relating to Thermal Insulation
- C1695-19 Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service
- 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
Where do Blankets Fit in ASTM?

ASTM International

159 Technical Committees

C16 - Thermal Insulation

15 Thermal Insulation Sub-Committees

C1695—19 Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service

159 Technical Committees

C16.40 – Insulation Systems Sub-Committee

42 Standards and Proposed Revisions in C16.40

Including

Including

Including
How ASTM Standards Work

Need Identified
ASTM Technical Committee
Other Interested Party

Draft
Prepared by Task Group
E-mails Conferencing
Online Document Editing

Balloting
Subcommittee Review

Balloting
Society & Main Committee Review

Approval
Publishing in ASTM Standards Collection

Reviewed
5 year cycle
Withdrawn if not revised or reissued within 8 years
C1695-19
Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service

C547-17
Standard Specification for Mineral Fiber Pipe Insulation

C533-17
Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
Evolution of ASTM & Insulation Blankets

**ASTM C1094-88**  
Standard Guide for Flexible Removable Insulation Covers
- ASTM C1094-01
- ASTM C1094-01 (withdrawn in 2006)

**Replaced by:**

**ASTM C1695-09**  
Standard Guide for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service
- ASTM C1695
- ASTM C1695-10 (2015)
- ASTM C1695-18
- ASTM C1695-18a
- ASTM C1695-19 (current version)
Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service

In this standard:

- Section 1 Scope
- Section 2 Referenced Documents
- Section 3 Terminology
- Section 4 Materials
- Section 5 Design and Fabrication
- Section 6 Construction
- Section 7 Tie-Down/Anchor Strap Construction
- Section 8 Identification Tags
- Section 9 Inspection
- Section 10 Rejection
- Section 11 Thickness Determination and Energy Savings
- Section 12 Keywords
- Footnotes
3.2.6 removable and reusable blanket insulation, n.—An insulation blanket, encased in woven fabric and/or woven wire mesh, that has attachment mechanisms designed to allow the assembly to be installed, then later removed and reinstalled, without using any new insulation or fabric materials.

4. Materials

4.1 Insulation shall be of a flexible fibrous material acceptable for the maximum temperature of the application. Acceptable materials must be one of the following:

4.1.1 High Temperature Fiber Blanket per Specification C892, any Type or Grade.

4.1.2 Needled Glass Fiber Mechanically Bonded Felt per Specification C1086.

4.1.3 Mineral Fiber Blanket, per Specification C553, of the Type suitable for the application.

4.1.4 Microporous Thermal Insulation, per Specification C1676, of the Type and Grade suitable for the application.

4.3.2 For surfaces from 501°F (261°C) to 1000°F (538°C) where leaks of process fluids are expected, such as flange pairs and valves, the inner layer and gussets shall be as specified in 4.3.1 and 4.3.1.1 above but also with Type 304 stainless steel foil that has a minimum thickness of 0.001 in. (0.025 mm). This foil shall be placed between the insulation material and the outer fabric or wire mesh.

4.4 All hardware such as D-rings, buckles, tags, quilting pins, lacing hooks and insulation anchors, etc. shall be made of Type 304 stainless steel. Where lacing hooks and lacing anchors are used, they shall be 12 or 14 Gauge.

4.5 Tie-Down Straps:

4.5.1 Outdoor Applications—These tie-down straps shall be constructed of one of the following three types of material: (1) the same material as the outer jacket, (2) a woven glass fiber fabric, or (3) a tape of suitable thickness with the same coating as the outer jacket material. If the same material as the outer

<table>
<thead>
<tr>
<th>TABLE 1 Physical and Performance Requirements for Fabrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain, heat cleaned glass fiber fabricA</td>
</tr>
<tr>
<td>Glass fiber fabric coated with Silicone, for exterior applications</td>
</tr>
<tr>
<td>Glass fiber fabric coated with Silicone, for interior applications only</td>
</tr>
<tr>
<td>Fiber fabric coated with Fluorocarbon</td>
</tr>
<tr>
<td>Weight (minimum) 17.7 (602) oz/laq. yd (g/m²) per Test Methods D3776/ D3776M</td>
</tr>
<tr>
<td>Breaking Strength 26.9 (80.7) lb/inch (kg/cm) per Test Methods D5034 or D5035</td>
</tr>
<tr>
<td>Tear Strength lb (kg) per Test Method D5587 Burst Strength psi (kg/cm²) per Test Method D3766/ D3796M</td>
</tr>
<tr>
<td>Abrasion Resistance Not Applicable 200 (14)</td>
</tr>
<tr>
<td>CS-10 Wheel, 500 g loads 500 revs, 15 % weight loss max</td>
</tr>
</tbody>
</table>

FABRICS

PHYSICAL & PERFORMANCE REQUIREMENTS

HARDWARE
C1695-19 *Highlights*

- **Lots of options – Inclusive but controlled**
  - Fabrics
  - Insulations
  - Fasteners
  - Stitching

- **Progressive**
  - Legitimate fluid barrier on liner >260°C in process fluid services

- **Commercial application**
  - “inside” vs “outside” categorization

- **Design**
  - Cones or reducing end caps

**Thickness by engineer / end user**
C1695-19 Makes Blanket Fabricators Better

- **Progressive**
  - Investment in machinery to comply with specifications

- **Quality Management**
  - Material compliance with standards

- **Solutions Provider**
  - Reference C1695 when advising engineers & end users
C1695-19 Makes **Industry Better**
Get your **Copy!**

**Non-Members**

<table>
<thead>
<tr>
<th>Format</th>
<th>Pages</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDF</td>
<td>5</td>
<td>$48.00</td>
</tr>
<tr>
<td>Hardcopy (shipping and handling)</td>
<td>5</td>
<td>$48.00</td>
</tr>
<tr>
<td>Standard + Redline PDF Bundle</td>
<td>10</td>
<td>$58.00</td>
</tr>
</tbody>
</table>
Summary

- Existing standards are lacking
- Thorough standards are needed
- ASTM can help
- C1695-19 can benefit all
Thank You!