Designation: C 1639 – 07

Standard Specification for Fabrication Of Cellular Glass Pipe And Tubing Insulation[1]

This standard is issued under the fixed designation C 1639; 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 fabrication techniques for cellular glass block into billets to fabricate pipe and tubing insulation. All materials shall be in accordance with Specification C 552.

1.2 The purpose of this specification is to optimize the thermal performance of installed cellular glass insulation systems. This is best achieved by limiting the number of joints, in particular through joints.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in the parentheses are provided for information only.

1.4 *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]

C 168 Terminology Relating to Thermal Insulation

C 450 Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging

C 552 Specification for Cellular Glass Thermal Insulation

C 585 Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)

D 312 Specification for Asphalt Used in Roofing

2.2 *ASTM Adjuncts:*[3]

ADJC0450A ASTM Recommended Dimensional Standards for Fabrication of Thermal Insulation Fitting Covers

3. Terminology

3.1 Terminology C 168 shall be considered as applying to the terms in this specification.

3.2 *Definitions of Terms Specific to This Standard:*

3.3 *billet / bun*— a single piece of insulation made up from a number of smaller blocks held together with an adhesive.

3.4 *lags*—pieces of insulation typically curved or tapered used for insulating pipes, tanks and other cylindrical equipment.

3.5 *precision cut V-grooved pipe insulation , n*—rigid insulation pieces cut into 4-sided polygons, of two parallel surfaces and two non-parallel surfaces of equal angles = 180° / *N*, such that when *N* number of these sections are assembled, they form an approximate circle and can be installed around a pipe.

3.5.1 *Discussion*—the adjective precision refers to the fact that when these *N* sections are installed onto a pipe, they fit exactly with no appreciable gaps between sections.

4. Classification

4.1 Specification C 552 defines Type I and Type II materials. The same classifications shall be used in this standard.

5. Workmanship, Finish, and Appearance

5.1 The insulation shall have no visible defects that will adversely affect its performance.

6. Standard Sizes, Dimensions, and Fabrication Configurations of Cellular Glass Pipe and Tubing Insulation

6.1 Cellular glass pipe and tubing insulation shall be fabricated in lengths as agreed to by the purchaser and the supplier. Typical lengths are 23½-in. (597mm), 24 in. (610 mm), or 36 in. (914 mm).

6.2 Cellular glass pipe and tubing insulation for NPS 4 (102 mm) and smaller pipe shall be made to a minimum thickness of 1-in. (25 mm). Pipe insulation for pipes larger than 4 in. NPS (102 mm) shall be made to a minimum 1 ½-in. (38 mm) thickness. Sizes shall conform to Practice C 585. A minimum 2 in. (51 mm) thickness should be used for pipe sizes larger than 12 in. NPS (324 mm).

6.3 Cellular glass pipe insulation must be provided in half sections for up to and including 12 in. NPS (324 mm). Half sections shall consist of hollow cylindrical sections split lengthwise in a plane that includes the cylindrical axis.

6.4 Cellular glass pipe insulation for pipe sizes 14 in. (356 mm) to 24 in. NPS (406 mm) must be fabricated in half-sections or in quarter-sections. At 26 in. NPS (660 mm) and

[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 April 1, 2007. Published May 2007.

[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.

[3] Available from ASTM International Headquarters. Order Adjunct No. ADJC0450A.

above, segmented pipe insulation shall be furnished. Segmented pipe insulation (see Fig. 1) shall be fabricated in equal widths such that no additional field cuts are required.

6.5 For operating temperatures above ambient, precision cut V-grooved pipe insulation specifically cut to fit the required diameter or segmented fabrication is an acceptable alternative.

6.6 For operating temperatures between 0°F (-18°C) and ambient, precision cut V-grooved pipe insulation, as shown on Fig. 2, is an acceptable alternative provided an acceptable vapor retarder is used.

6.7 For operating temperatures below 0° F (-18°C), V-grooved material, as shown on Fig. 2 is not acceptable.

7. Dimensional Tolerances

7.1 Fabrication tolerances for the bore diameter and wall thickness shall be as specified in Practice C 585.

7.2 Tolerance for length of pipe and tubing insulation shall be ±¼ in. (± 3.2 mm).

7.3 The following dimensional tolerances apply only to cellular glass pipe and tubing insulation applied in half sections:

7.3.1 *Fit and Closure*— When fitted to the appropriate size pipe by banding on 9 in. (230 mm) centers, the longitudinal joints on both sides of the pipe insulation shall close to within 1⁄16 in. (1.6 mm) along the entire length of the section.

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

7.3.3 *Half-Section Balance*—the plane formed by the slit between half sections shall include the cylindrical axis. Deviation of the split plane from the cylindrical axis over a 24-in. (610-mm) length shall not exceed ⅛ in. (3.2 mm).

8. Fabrication Standards

8.1 Cellular glass pipe and tubing insulation shall be fabricated from the minimum number of insulation blocks. Sectional pipe insulation shall contain not more than four ″through″ joints per full section of insulation, excluding the half section mating plane (Fig. 3). Precision cut v-groove fabrication is an exception.

8.2 Fabrication adhesive shall be hot asphalt, Specification D 312, Type II for operating temperatures below 250°F (121°C). For operating temperatures above ambient, fabrication adhesive shall include but not be limited to Type II hot asphalt, elastomeric asphalt, or gypsum-based cement of the type and grade specified by the insulation manufacturer. Adhesives shall be suitable for specified design conditions.

8.2.1 Fabricating adhesive shall be applied such that there is 100% coverage of adhesive on the mating surfaces.

8.2.2 There shall be no visible voids in the adhered joint nor shall any adhered joint exceed 1⁄16 in. (1.6 mm) in width.

8.3 Billet and miter construction shall conform to the following:

8.3.1 Insulation blocks or sections shall be hand rubbed if necessary to fit prior to bonding.

8.3.2 Bond joints shall be made with a full depth of approved adhesive. (See 3.3.)

8.4 *Bond Joints for Segmented Fabrication*—Bond joints are defined as an adhesive joint in insulation for construction purposes:

8.4.1 Are “Non-through” - start at the outside circumference and run continuously in a straight line to the opposite side terminating at the outside circumference, or;

8.4.2 Are ‘through” start at the outside circumference and runs continuously in a straight line to the opposite side and terminates at the inside circumference (See Fig. 3 and Fig. 4)

8.4.3 Bond joints shall be no greater than 1⁄16 in. (1.6mm) thick.

8.4.4 Fabricated sections of insulation shall be a minimum of ½ in. (12.7mm) thick. (See Fig. 3 and Fig. 4)

8.4.5 Bond joints on the inside and outside diameter of fabricated pieces shall be smooth and consistent with the shape of the fabricated pieces. Care shall be taken that adhesive is not recessed or extended from the dimension of the fabricated more than 1⁄32 in. (0.8mm).

8.4.6 Bond joints which meet other bond joints must meet at 90º angels, must be a minimum of 1 in. (25.4mm) in length and shall not cross. (Fig. 4)

8.4.7 There shall be a maximum of two bond joints per half section or sidewall segment. (See Fig. 3 and Fig. 4).

8.4.8 For pipe insulation that is designed for pipe sizes 6 in. (152 mm) and under, there shall not be more than one fabrication joint per half section.

8.4.9 Pipe insulation that is designed for pipe sizes greater than 6 in. (152 mm) and less than 18 in. (457mm) shall not have more than three fabrication joints per half section.

8.4.10 Pipe insulation that is designed for pipe sizes 18 in. (457mm) and above shall not have more than four fabrication joints per half section.

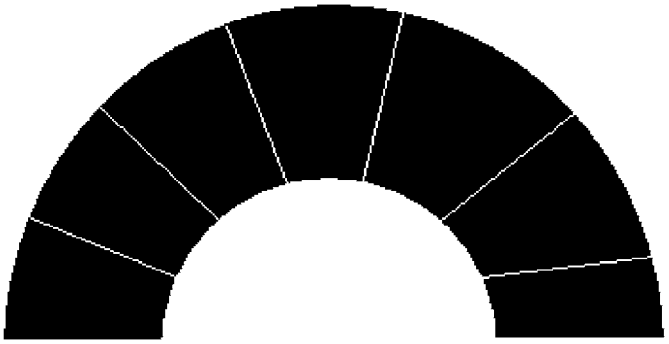

FIG. 1 Circular Cut Segmented Pipe Insulation

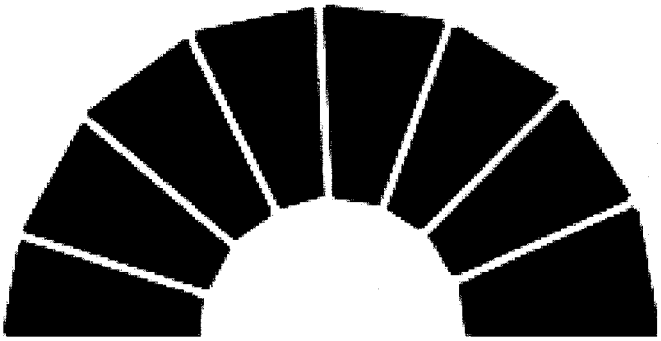

FIG. 2 Precision Cut V-Grooved Segmented Pipe Insulation

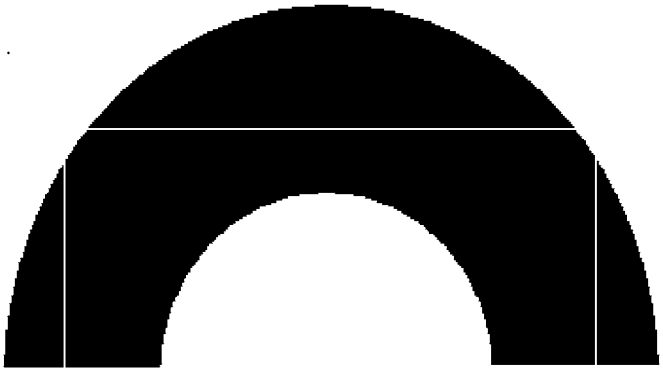

FIG. 3 Non-through Joints

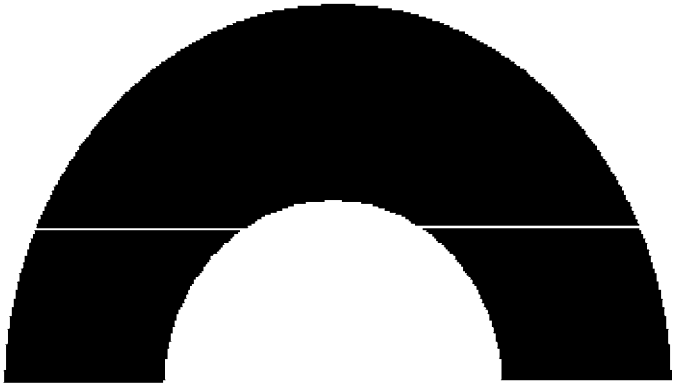

FIG. 4 Through Joints

8.4.11 Insulation curved sidewall segments shall have no more than two bond joints per sidewall segment. These bond joints shall conform to the requirements previously stated in sections 8.4.1-8.4.6 of this standard.

8.4.12 Beveled lags shall not be used for below ambient applications. If beveled lags are specified for above ambient applications, they shall have no more than one fabrication joint per lag.

8.5 *Segmented Pipe Insulation Considerations*:

8.5.1 All segmented pipe insulation shall be edge trimmed at the fabrication site.

8.5.2 Either a grinder or a saw shall be used to edge trim segmented pipe insulation.

8.5.3 If segmented pipe insulation is edge trimmed using a saw blade, edges shall be rubbed to remove uneven patterns caused by flexing blade where needed.

8.6 *Fitting Insulation Considerations*:

8.6.1 Fittings for all sizes shall be either factory ground or factory mitered.

8.6.2 Fittings shall be fabricated to meet the dimensional standards of ADJC0450A Adjunct[3].

8.6.3 Acceptable adhesive for fittings shall be as specified in 8.2.

9. Packaging and Marking

9.1 *Packaging*—Unless otherwise agreed and specified between the purchaser and the manufacturer or supplier, the cellular glass insulation shall be packaged in the manufacturer/fabricator's standard commercial containers.

9.2 *Marking*—Unless otherwise specified, each container shall be plainly marked as follows:

9.2.1 *Pipe and Tubing Insulation*—The name of the manufacturer/fabricator, pipe size, grade, quantity, nominal thickness, and jacket, if any, of the material in the container.

9.2.2 *Special Shapes*—The name of the manufacturer/fabricator, shape, grade, and quantity of the material in the container.

10. Keywords

10.1 cellular glass; fabrication; pipe insulation; tubing insulation