



Designation: C585 – 09

Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing ¹

This standard is issued under the fixed designation C585; 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 practice is intended as a dimensional standard for preformed thermal insulation for pipes and tubing.

1.2 This practice covers insulation supplied in cylindrical sections and lists recommended single layer inner and outer diameters of insulation having nominal wall thicknesses from 1/2 to 5 in. (13 to 127 mm) to fit over standard sizes of pipe and tubing.

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

1.4 *This standard does not purport to address 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

C168 Terminology Relating to Thermal Insulation

C302 Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation

3. Terminology

3.1 *Definitions*—Definitions pertaining to insulation are defined in Terminology **C168**.

4. Significance and Use

4.1 The purpose of this practice is to ensure satisfactory fit on standard sizes, to accommodate radial expansion of pipes

and tubes which are heated after being insulated, and to minimize the number of insulation sizes and thicknesses to be manufactured and stocked.

4.2 While it is possible to manufacturer insulation to these recommended dimensions, exercise care in attempting to nest layers of different materials, or layers supplied by different manufacturers. Individual manufacturing processes will operate at slightly different tolerances. While the product will fit the pipe, it is possible that it will not readily nest as the outer layer between the different materials, or with a different manufacturer, and possibly the same manufacturer. Exercise care to determine these differences before specifying or ordering nesting sizes.

4.3 The wide range of outer diameter dimensional tolerances will prevent many pipe and tube insulations from nesting for staggered joints or double layered applications, or both unless specified when ordered from the manufacturer, distributor, or fabricator.

4.4 Dimensions in accordance with this practice do not necessarily permit application of one thickness of pipe insulation over another (Nesting or Simplified Dimensional System) to obtain total thicknesses greater than those manufactured as single layer, or for multilayer application when desired.

5. Summary of Practice

5.1 This practice provides for each pipe and tubing sizes the inner diameters with tolerances for calcium silicate, cellular foam plastics, cellular glass, mineral fiber, and perlite preformed pipe and tubing insulation identified by **Table 1** and **Table 2**.

5.2 This practice provides for each pipe and tubing sizes the outer diameters for calcium silicate, cellular foam plastics, cellular glass, mineral fiber, and perlite preformed pipe and tubing insulation identified by **Table 3**, **Table 4**, **Table 5** and **Table 6**.

5.3 This practice provides for a range of pipe and tubing sizes the outer diameter tolerances for calcium silicate and perlite preformed pipe and tubing insulation identified by **Table 3a**, **Table 4a**, **Table 5a**, and **Table 6a**.

¹ This practice is under the jurisdiction of ASTM Committee **C16** on Thermal Insulation and is the direct responsibility of Subcommittee **C16.20** on Homogeneous Inorganic Thermal Insulations.

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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.

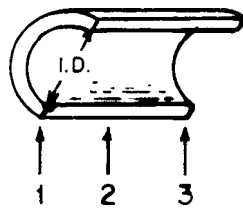


Fig. 1a Three Measurement Locations

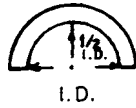


Fig. 1b Diameter and Half-Diameter Measurement Locations
FIG. 1 Inner Diameter Measurement Location

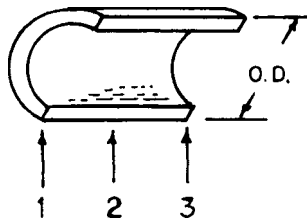


Fig. 2a Three Measurement Locations

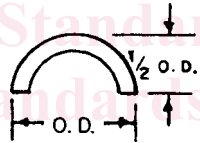


Fig. 2b Diameter and Half-Diameter Measurement Locations
FIG. 2 Outer Diameter Measurement Location

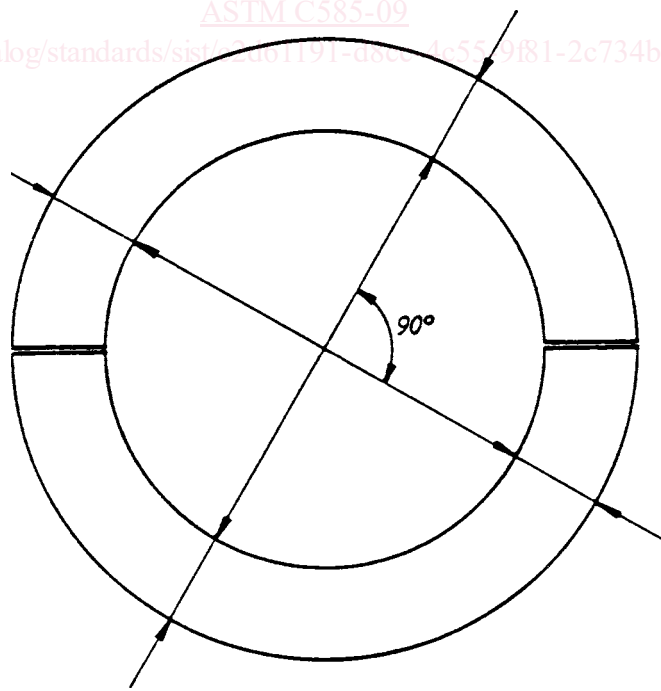


FIG. 3 Hinged Section Measurement Location

5.4 This practice provides for a range of pipe and tubing sizes the outer diameters tolerances for cellular foam plastics, cellular glass, and mineral fiber, preformed pipe and tubing insulations identified by [Table 3b](#), [Table 4b](#), [Table 5b](#) and [Table 6b](#).

5.5 This practice provides for each pipe and tubing sizes the inner and outer diameters for flexible elastomeric cellular preformed pipe and tubing insulation identified by [Table 7](#), [Table 8](#), [Table 9](#), and [Table 10](#).

5.6 This practice provides for a range of pipe and tubing sizes the inner and outer diameter tolerances for flexible elastomeric cellular preformed pipe and tubing insulation identified by [Table 7a](#), [Table 8a](#), [Table 9a](#), and [Table 10a](#).

6. Procedure

6.1 Measurement:

6.1.1 Measurement of inner and outer diameters shall be made to the nearest $\frac{1}{32}$ in. (0.8 mm) using a steel tape or rule.

6.1.1.1 *Uneven Insulation Inner & Outer Circumferential Surfaces*—Use Test Method [C302](#), Procedure C. This method must be used, to duplicate fit for application on a pipe and tubing and to determine the final outside diameter when an outer metal jacket system is snugly applied.

6.1.1.2 *Half Sections*—The diameter reported for each half-section shall be the average of six measurements taken at three locations including two near the ends and one near the center (see [Fig. 1a](#) and [Fig. 2a](#)). Three of the six readings shall be taken in the longitudinal plane of the flat, cut surface; the other three shall each be twice a half-diameter in the longitudinal plane at right angles to that of the first three (see [Fig. 1b](#) and [Fig. 2b](#)).

6.1.1.3 *Hinged Sections*—The diameter reported for each hinged section shall be the average of four measurements taken at both ends of the section (two per end) (see [Fig. 3](#)). The two measurements at each end shall be at right angles.

6.2 Recommended Inner Diameters:

6.2.1 Inner diameters and tolerances for nominal sizes of insulation for pipe are shown in [Table 1](#).

6.2.2 Inner diameters and tolerances for nominal sizes of tubing through 6 in. (150-mm) are shown in [Table 2](#).

6.3 Recommended Outer Diameters:

6.3.1 Nominal outer diameters for nominal sizes of pipe are shown in [Table 3](#) and [Table 4](#) and tubing in [Table 5](#) and [Table 6](#). Note that these values for both pipe and tubing are identical with iron pipe outer diameters as shown in Columns 2 and 3 of [Table 3](#) and [Table 4](#). [Table 3](#), [Table 4](#), [Table 5](#), and [Table 6](#) are not for nesting purposes. When a pipe or tubing insulation product is to be nested, it shall be so stated on order.

6.3.2 There are no maximum outer diameter tables provided for jacketing purposes because of the wide spread variations in the outside diameters with their plus or minus tolerances.

NOTE 1—Previous versions of C585 contained Tables for jacketing purposes only. These Tables have been removed from this practice with the inclusion of variable outside diameters caused by the addition of outer diameter (OD) tolerances. It is recommended in order to calculate the maximum circumferences for jacketing purposes, determine the pipe or tube insulation's maximum outer diameters from the manufacturer. An alternative measure for finding the jacketing stretch-out numbers is to look up the outer diameter for the pipe or tubing insulation from the Tables; add the applicable plus (+) outer diameter tolerance and twice the thickness of the jacketing to the insulation outer diameter number; multiply the added total times π (3.14159) to arrive at the maximum circumference; add the necessary longitudinal over lap dimension to the maximum circumference; and the calculated answer will be the stretch-out requirement for cutting the outer jacketing to be applied over / around the pipe or tubing insulation's OD.

7. Keywords

7.1 pipe thermal insulation diameter; pipe thermal insulation dimension; thermal insulating materials-pipe; thermal insulating materials-tubing; thermal insulation; tubing thermal insulation diameter; tubing thermal insulation dimension

**TABLE 1 Nominal Pipe Sizes with Inner Diameters & Tolerances for
Calcium Silicate, Cellular Foam Plastics, Cellular Glass, Mineral Fiber, and Perlite Preformed Insulation**

| Pipe | | | Insulation | | | | | |
|-----------------|----------------|-------|----------------|-----|-----------|-----|-------|-----|
| Nominal Size | Outer Diameter | | Inner Diameter | | Tolerance | | | |
| | | | | | Minus | | Plus | |
| Names | in. | mm | in. | mm | in. | mm | in. | mm |
| 1/2 | 0.840 | 21.3 | 0.86 | 22 | 0 | 0 | 0.063 | 1.6 |
| 3/4 | 1.050 | 26.7 | 1.07 | 27 | 0 | 0 | 0.063 | 1.6 |
| 1 | 1.315 | 33.4 | 1.33 | 34 | 0 | 0 | 0.063 | 1.6 |
| 1 1/4 | 1.660 | 42.2 | 1.68 | 43 | 0 | 0 | 0.063 | 1.6 |
| 1 1/2 | 1.900 | 48.3 | 1.92 | 49 | 0 | 0 | 0.063 | 1.6 |
| 2 | 2.375 | 60.3 | 2.41 | 61 | 0 | 0 | 0.094 | 2.4 |
| 2 1/2 | 2.875 | 73.0 | 2.91 | 74 | 0 | 0 | 0.094 | 2.4 |
| 3 | 3.500 | 88.9 | 3.53 | 90 | 0 | 0 | 0.094 | 2.4 |
| 3 1/2 | 4.000 | 101.6 | 4.03 | 102 | 0.031 | 0.8 | 0.094 | 2.4 |
| 4 | 4.500 | 114.3 | 4.53 | 115 | 0.031 | 0.8 | 0.094 | 2.4 |
| 4 1/2 | 5.000 | 127.0 | 5.03 | 128 | 0.031 | 0.8 | 0.094 | 2.4 |
| 5 | 5.563 | 141.4 | 5.64 | 143 | 0.031 | 0.8 | 0.094 | 2.4 |
| 6 | 6.625 | 168.3 | 6.70 | 170 | 0.031 | 0.8 | 0.094 | 2.4 |
| 7 | 7.625 | 193.7 | 7.70 | 196 | 0.031 | 0.8 | 0.094 | 2.4 |
| 8 | 8.625 | 219.1 | 8.70 | 221 | 0.031 | 0.8 | 0.094 | 2.4 |
| 9 | 9.625 | 244.5 | 9.70 | 246 | 0.031 | 0.8 | 0.094 | 2.4 |
| 10 | 10.750 | 273.0 | 10.83 | 275 | 0.031 | 0.8 | 0.094 | 2.4 |
| 11 | 11.750 | 298.4 | 11.83 | 300 | 0.031 | 0.8 | 0.094 | 2.4 |
| 12 | 12.750 | 323.8 | 12.84 | 326 | 0.063 | 1.6 | 0.094 | 2.4 |
| 14 ^A | 14.000 | 355.6 | 14.09 | 358 | 0.063 | 1.6 | 0.156 | 4.0 |

^A Larger sizes through 26 in., in 1-in. (25.4-mm) increments.

**TABLE 2 Nominal Tube Sizes with Inner Diameter & Tolerances for
Calcium Silicate, Cellular Foam Plastics, Cellular Glass, Mineral Fiber, and Perlite Preformed Insulation**

| Tube | | | Insulation | | | | | |
|--------------|----------------|-------|----------------|-----|-----------|-----|-------|-----|
| Nominal Size | Outer Diameter | | Inner Diameter | | Tolerance | | | |
| | | | | | Minus | | Plus | |
| Names | in. | mm | in. | mm | in. | mm | in. | mm |
| 3/8 | 0.500 | 12.7 | 0.52 | 13 | 0 | 0 | 0.063 | 1.6 |
| 1/2 | 0.625 | 15.9 | 0.64 | 16 | 0 | 0 | 0.063 | 1.6 |
| 3/4 | 0.875 | 22.2 | 0.89 | 23 | 0 | 0 | 0.063 | 1.6 |
| 1 | 1.125 | 28.6 | 1.14 | 29 | 0 | 0 | 0.063 | 1.6 |
| 1 1/4 | 1.375 | 34.9 | 1.39 | 35 | 0 | 0 | 0.063 | 1.6 |
| 1 1/2 | 1.625 | 41.3 | 1.64 | 42 | 0 | 0 | 0.063 | 1.6 |
| 2 | 2.125 | 54.0 | 2.16 | 55 | 0 | 0 | 0.063 | 1.6 |
| 2 1/2 | 2.625 | 66.7 | 2.66 | 68 | 0 | 0 | 0.063 | 1.6 |
| 3 | 3.125 | 79.4 | 3.16 | 80 | 0 | 0 | 0.063 | 1.6 |
| 3 1/2 | 3.625 | 92.1 | 3.66 | 93 | 0 | 0 | 0.063 | 1.6 |
| 4 | 4.125 | 104.8 | 4.16 | 106 | 0.031 | 0.8 | 0.094 | 2.4 |
| 5 | 5.125 | 130.2 | 5.16 | 131 | 0.031 | 0.8 | 0.094 | 2.4 |
| 6 | 6.125 | 155.6 | 6.20 | 157 | 0.031 | 0.8 | 0.094 | 2.4 |

TABLE 3 Outer Diameters for Nominal Pipe Sizes and Nominal Wall Thickness on Calcium Silicate, Cellular Foam Plastics, Cellular Glass, Mineral Fiber, and Perlite Preformed Insulation, inches

| Pipe Nominal Size | Insulation, Nominal Thickness | | | | | | | | | |
|-------------------------|----------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| | in. | 1 | 1½ | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 |
| Names | mm | 25 | 38 | 51 | 64 | 76 | 89 | 102 | 114 | 127 |
| | Outer Diameter, in. ^A | | | | | | | | | |
| ½ | | 2.88 | 4.00 | 5.00 | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 |
| ¾ | | 2.88 | 4.00 | 5.00 | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 |
| 1 | | 3.50 | 4.50 | 5.56 | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 |
| 1¼ | | 3.50 | 5.00 | 5.56 | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 |
| 1½ | | 4.00 | 5.00 | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 |
| 2 | | 4.50 | 5.56 | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 |
| 2½ | | 5.00 | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 | 14.00 |
| 3 | | 5.56 | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 | 14.00 |
| 3½ | | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 | 14.00 | 15.00 |
| 4 | | 6.62 | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 | 14.00 | 15.00 |
| 4½ | | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 | 14.00 | 14.00 | 15.00 |
| 5 | | 7.62 | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 | 14.00 | 15.00 | 16.00 |
| 6 | | 8.62 | 9.62 | 10.75 | 11.75 | 12.75 | 14.00 | 15.00 | 16.00 | 17.00 |
| 7 | | ... | 10.75 | 11.75 | 12.75 | 14.00 | 15.00 | 16.00 | 17.00 | 18.00 |
| 8 | | ... | 11.75 | 12.75 | 14.00 | 15.00 | 16.00 | 17.00 | 18.00 | 19.00 |
| 9 | | ... | 12.75 | 14.00 | 15.00 | 16.00 | 17.00 | 18.00 | 19.00 | 20.00 |
| 10 | | ... | 14.00 | 15.00 | 16.00 | 17.00 | 18.00 | 19.00 | 20.00 | 21.00 |
| 11 | | ... | 15.00 | 16.00 | 17.00 | 18.00 | 19.00 | 20.00 | 21.00 | 22.00 |
| 12 | | ... | 16.00 | 17.00 | 18.00 | 19.00 | 20.00 | 21.00 | 22.00 | 23.00 |
| 14 ^B | | ... | 17.00 | 18.00 | 19.00 | 20.00 | 21.00 | 22.00 | 23.00 | 24.00 |

^A These are identical with pipe outer diameters (see Table 1, Columns 2 and 3).

^B Larger sizes through 36 in., in 1-in. (25.4-mm) increments.

TABLE 3a Outer Diameter Tolerances for Calcium Silicate and Perlite Preformed Pipe & Tubing Insulation, inches

| Outside Diameter (O.D.) of Insulation, inches | Outside Diameter Tolerances (O.D.), inches |
|---|--|
| 2.88 to 6.62 | ± 0.188 |
| 7.62 to 14.00 | ± 0.250 |
| 15.00 to 20.00 | ± 0.313 |
| 21.00 to 29.00 | ± 0.375 |
| 30.00 and larger | ± 0.438 |

TABLE 3b Outer Diameter Tolerances for Cellular Foam Plastics, Cellular Glass, and Mineral Fiber Preformed Pipe & Tubing Insulation, inches

| Outside Diameter (O.D.) of Insulation, inches | Outside Diameter Tolerances (O.D.), inches |
|---|--|
| 2.88 to 6.62 | ± 0.188 |
| 7.62 to 14.00 | ± 0.250 |
| 15.00 to 20.00 | ± 0.313 |
| 21.00 to 29.00 | ± 0.375 |
| 30.00 and larger | ± 0.438 |

TABLE 4 Outer Diameters for Nominal Pipe Sizes and Nominal Wall Thickness on Calcium Silicate, Cellular Foam Plastics, Cellular Glass, Mineral Fiber, and Perlite Preformed Insulation

| Pipe | Insulation, Nominal Thickness | | | | | | | | | |
|-----------------|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | in. | 1 | 1½ | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 |
| Nominal Size | mm | 25 | 38 | 51 | 64 | 76 | 89 | 102 | 114 | 127 |
| Names | Outer Diameter, mm ^A | | | | | | | | | |
| ½ | | 73 | 102 | 127 | 168 | 194 | 219 | 244 | 273 | 298 |
| ¾ | | 73 | 102 | 127 | 168 | 194 | 219 | 244 | 273 | 298 |
| 1 | | 89 | 114 | 141 | 168 | 194 | 219 | 244 | 273 | 298 |
| 1¼ | | 89 | 127 | 141 | 168 | 194 | 219 | 244 | 273 | 298 |
| 1½ | | 102 | 127 | 168 | 194 | 219 | 244 | 273 | 298 | 324 |
| 2 | | 114 | 141 | 168 | 194 | 219 | 244 | 273 | 298 | 324 |
| 2½ | | 127 | 168 | 194 | 219 | 244 | 273 | 298 | 324 | 356 |
| 3 | | 141 | 168 | 194 | 219 | 244 | 273 | 298 | 324 | 356 |
| 3½ | | 168 | 194 | 219 | 244 | 273 | 298 | 324 | 356 | 381 |
| 4 | | 168 | 194 | 219 | 244 | 273 | 298 | 324 | 356 | 381 |
| 4½ | | 194 | 219 | 244 | 273 | 298 | 324 | 356 | 381 | 406 |
| 5 | | 194 | 219 | 244 | 273 | 298 | 324 | 356 | 381 | 406 |
| 6 | | 219 | 244 | 273 | 298 | 324 | 356 | 381 | 406 | 432 |
| 7 | | ... | 273 | 298 | 324 | 356 | 381 | 406 | 432 | 457 |
| 8 | | ... | 298 | 324 | 356 | 381 | 406 | 432 | 457 | 483 |
| 9 | | ... | 324 | 356 | 381 | 406 | 432 | 457 | 483 | 508 |
| 10 | | ... | 356 | 381 | 406 | 432 | 457 | 483 | 508 | 533 |
| 11 | | ... | 381 | 406 | 432 | 457 | 483 | 508 | 533 | 559 |
| 12 | | ... | 406 | 432 | 457 | 483 | 508 | 533 | 559 | 584 |
| 14 ^B | | ... | 432 | 457 | 483 | 508 | 533 | 559 | 584 | 610 |

^A These are identical with pipe outer diameters (see Table 1, Columns 2 and 3).

^B Larger sizes through 36 in., in 1-in. (25.4-mm) increments.

TABLE 4a Outer Diameter Tolerances for Calcium Silicate and Perlite Preformed Pipe Insulation

| Outside Diameter (O.D.) of Insulation, millimeters | Outside Diameter Tolerances (O.D.) millimeters |
|--|--|
| 73 to 163 | ± 4.8 |
| 194 to 356 | ± 6.4 |
| 381 to 506 | ± 7.9 |
| 533 to 737 | ± 9.5 |
| 762 and larger | ± 11.1 |

TABLE 4b Outer Diameter Tolerances for Cellular Foam Plastics, Cellular Glass, and Mineral Fiber Preformed Pipe Insulation

| Outside Diameter (O.D.) of Insulation, millimeters | Outside Diameter Tolerances (O.D.) millimeters |
|--|--|
| 73 to 163 | ± 4.8 |
| 194 to 356 | ± 6.4 |
| 381 to 506 | ± 7.9 |
| 533 to 737 | ± 9.5 |
| 762 and larger | ± 11.1 |