



~~Designation: C585-09~~ Designation: C585 – 10

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.

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.

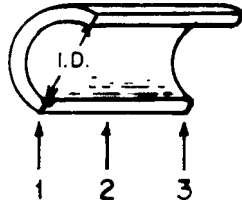


Fig. 1a Three Measurement Locations



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

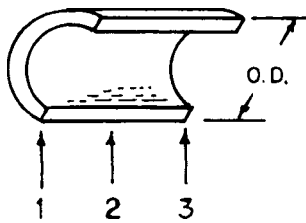


Fig. 2a Three Measurement Locations

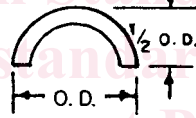


Fig. 2b Diameter and Half-Diameter Measurement Locations
FIG. 2 Outer Diameter Measurement Location

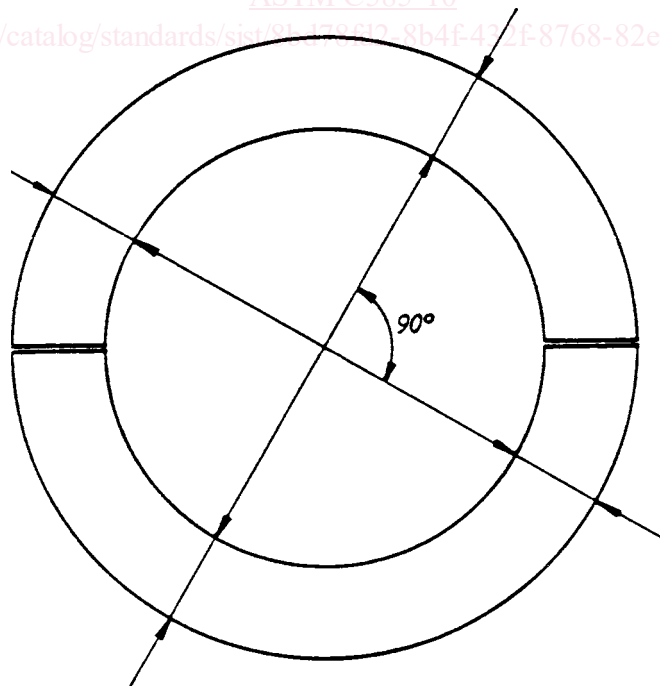


FIG. 3 Hinged Section Measurement Location

5.3 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.

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 and polyolefin 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 and polyolefin 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 7, Table 7a Table 9 and Table 9a.~~

~~6.2.2 Inner diameters and tolerances for nominal sizes of tubing are shown in Table 2, Table 8, Table 8a Table 10 and Table 10a.~~

6.3 Recommended Outer Diameters :

~~6.3.1 Nominal outer~~ 6.3.1 Outer diameters for nominal sizes of pipe are shown in Table 3 and Table 4, Table 7 and Table 9 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, Table 8, and Table 10. All Tables 3-10 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 overlap 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. (3.14159) to arrive at the maximum circumference; add the necessary longitudinal overlap 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.

NOTE 2—NPS (Nominal Pipe Size) is a dimensionless designator that has been substituted in the customary units section for the previous term *inch nominal pipe size*.

NOTE 3—NTS (Nominal Tube Size) is a dimensionless designator that has been substituted in the customary units section for the previous term *inch nominal tube size*.

NOTE 4—DN (Diameter Nominal) is a dimensionless designator that has been substituted in the customary units section for the previous term SI (metric) system to describe *millimeter nominal pipe or tube size*.

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 & and Tolerances for
Calcium Silicate, Cellular Foam Plastics, Cellular Glass, Mineral Fiber, and Perlite Preformed Insulation**

Customary and SI Units for Pipe				Insulation						
Nominal Pipe Size Note 2	DN Note 4	Outer Diameter		Inner Diameter		Tolerance				
		Names	in.	mm	in.	mm	Minus		Plus	
							in.	mm	in.	mm
—1/2		—0.840	—21.3	—0.86	—22	0	0	0.063	1.6	
1/2	15	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	
3/4	20	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	25	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 1/4	32	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	
1 1/2	40	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	50	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	
2 1/2	65	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	80	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	
3 1/2	90	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	100	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	
4 1/2	115	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	
5	125	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	
6	150	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	
7	175	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	
8	200	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	
9	225	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	
10	250	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	
11	275	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	
12	300	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	
14	350	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**

Customary and SI Units for Tube		Insulation								
Nominal Size Note 3	DN Note 4	Outer Diameter		Inner Diameter		Tolerance				
		Names	in.	mm	in.	mm	Minus		Plus	
							in.	mm	in.	mm
$\frac{3}{8}$	10	0.500	12.7	0.52	13	0	0	0.063	1.6	
$\frac{3}{8}$		0.500	12.7	0.52	13	0	0	0.063	1.6	
$\frac{1}{2}$		0.625	15.9	0.64	16	0	0	0.063	1.6	
$\frac{1}{2}$	15	0.625	15.9	0.64	16	0	0	0.063	1.6	
$\frac{3}{4}$		0.875	22.2	0.89	23	0	0	0.063	1.6	
$\frac{3}{4}$		0.875	22.2	0.89	23	0	0	0.063	1.6	
1	20	1.125	28.6	1.14	29	0	0	0.063	1.6	
1		1.125	28.6	1.14	29	0	0	0.063	1.6	
$1\frac{1}{4}$		1.375	34.9	1.39	35	0	0	0.063	1.6	
$1\frac{1}{4}$	32	1.375	34.9	1.39	35	0	0	0.063	1.6	
$1\frac{1}{2}$		1.625	41.3	1.64	42	0	0	0.063	1.6	
$1\frac{1}{2}$		1.625	41.3	1.64	42	0	0	0.063	1.6	
2	40	2.125	54.0	2.16	55	0	0	0.063	1.6	
2		2.125	54.0	2.16	55	0	0	0.063	1.6	
$2\frac{1}{2}$		2.625	66.7	2.66	68	0	0	0.063	1.6	
$2\frac{1}{2}$	65	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		3.125	79.4	3.16	80	0	0	0.063	1.6	
$3\frac{1}{2}$	80	3.625	92.1	3.66	93	0	0	0.063	1.6	
$3\frac{1}{2}$		3.625	92.1	3.66	93	0	0	0.063	1.6	
$3\frac{1}{2}$		3.625	92.1	3.66	93	0	0	0.063	1.6	
4	100	4.125	104.8	4.16	106	0.031	0.8	0.094	2.4	
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	
5	125	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	


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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	Customary Units for Insulation, Nominal Thickness									
Nominal Size	in.	1	1½	2	2½	3	3½	4	4½	5
mm	25	38	54	64	76	89	102	114	127	
Names	Outer Diameter, in. ^A									
NPS Note 2	Outer Diameter, in.									
½	2.88	4.00	5.00	6.62	7.62	8.62	9.62	10.75	11.75	11.75
¾	2.88	4.00	5.00	6.62	7.62	8.62	9.62	10.75	11.75	11.75
1	3.50	4.50	5.56	6.62	7.62	8.62	9.62	10.75	11.75	11.75
1¼	3.50	5.00	5.56	6.62	7.62	8.62	9.62	10.75	11.75	11.75
1½	4.00	5.00	6.62	7.62	8.62	9.62	10.75	11.75	12.75	12.75
2	4.50	5.56	6.62	7.62	8.62	9.62	10.75	11.75	12.75	12.75
2½	5.00	6.62	7.62	8.62	9.62	10.75	11.75	12.75	14.00	14.00
3	5.56	6.62	7.62	8.62	9.62	10.75	11.75	12.75	14.00	14.00
3½	6.62	7.62	8.62	9.62	10.75	11.75	12.75	12.75	14.00	14.00
4	6.62	7.62	8.62	9.62	10.75	11.75	12.75	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	15.00
5	7.62	8.62	9.62	10.75	11.75	12.75	14.00	15.00	16.00	16.00
6	8.62	9.62	10.75	11.75	12.75	14.00	15.00	16.00	17.00	17.00
7	...	10.75	11.75	12.75	14.00	15.00	16.00	17.00	18.00	18.00
8	...	11.75	12.75	14.00	15.00	16.00	17.00	18.00	19.00	19.00
9	...	12.75	14.00	15.00	16.00	17.00	18.00	19.00	20.00	20.00
10	...	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	21.00
11	...	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	22.00
12	...	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	23.00
14 ^B	...	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	24.00
14	...	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	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