Designation:C585–90 (Reapproved2004) Designation: C 585 – 09

Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)[1]

This standard is issued under the fixed designation C 585; 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 rigid thermal insulation for pipes and tubing.

1.2 This practice covers insulation supplied in cylindrical sections, usually split into half-sections, sections and lists recommended single layer inner and outer diameters of insulation having nominal wall thicknesses from 1½ to 5 in. (25(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]

C 168 Terminology Relating to Thermal Insulation Terminology Relating to Thermal Insulation

C 302 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 C 168.

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.

4.2While insulation may be manufactured to these recommended dimensions, care should be exercised in attempting to nest layers of different materials, or layers supplied by different manufacturers. Individual manufacturing processes may operate at slightly different tolerances. While the product will fit the pipe, it may not readily nest as the outer layer between the different materials or with different manufacturers. Care should be exercised to determine these differences before specifying or ordering nesting sizes.

4.3Dimensions in accordance with this practice 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.

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.

[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.

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.

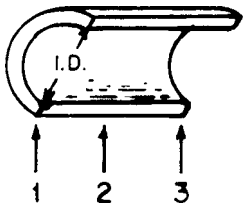

Fig. 1a Three Meaurement Locations

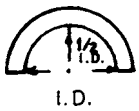

Fig. 1b Diameter and Half-Diameter Measurement Locations

FIG. 1 Inner Diameter Measurement Location

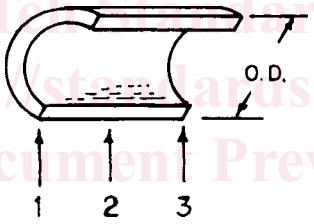

Fig. 2a Three Measurement Locations

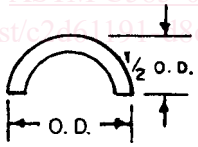

Fig. 2b Diameter and Half-Diameter Measurement Locations

FIG. 2 Outer Diameter Measurement Location

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.

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 ~~Note1—Suggested tolerances are shown for information purposes only.~~

~~5.1~~

6.1 *Measurement*:

~~5~~6.1.1 Measurement of inner and outer diameters shall be made to the nearest 1/32 in. (0.8 mm) using a steel tape or rule.

~~5.1.1.1~~

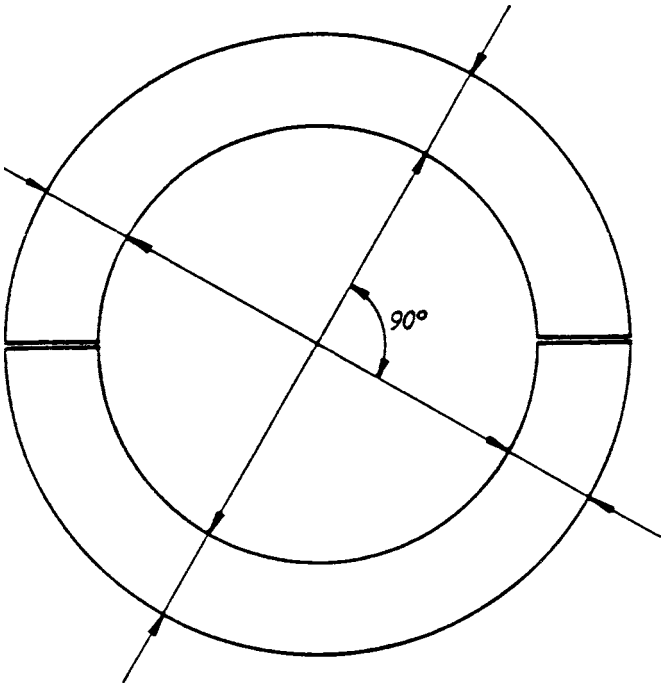

FIG. 3 Hinged Section Measurement Locations

6.1.1.1 *Uneven Insulation Inner & Outer Circumferential Surfaces* —Use Test Method C 302, 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).

~~5.1.1.2~~

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.

~~5.2~~

6.2 *Recommended Inner Diameters* :

~~5~~6.2.1 Inner diameters and ~~suggested~~ tolerances for nominal sizes of insulation for pipe are shown in Table 1. ~~Iron pipe in sizes for 4½ , 5, 7-in. (113, 125, 175-mm), and larger odd-numbered diameters is not standard, but insulation for these is included for multi-layer purposes.~~

~~5.2.2Inner diameters and suggested tolerances for nominal sizes of tubing through 6 in. (150-mm) are shown in~~ .

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

~~5.3~~

6.3 *Recommended Outer Diameters* :

~~5~~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. ~~It should be noted~~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 for nesting purposes only. When product is to be nested, it shall be so stated on order.~~

~~5.3.2Suggested maximum outer diameters for nominal sizes of pipe are shown in Table 7 and Table 8 and tubing in Table 9 and Table 10. Table 7, Table 8, Table 9, and Table 10 are for jacketing purposes only.~~

~~5.4*Approximate Insulation Wall Thickness*:~~

~~5.4.1For information purposes, the wall thicknesses of pipe insulation obtained by subtracting inner diameters in Table 1 from corresponding outer diameters in Table 3 and Table 4, and dividing the results by two, are shown in Table 11~~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 C 585 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

TABLE 7 9 Nominal Pipe Sizes and Wall Thickness for Inner and Outer Diameters o f lor Nominsual Watll Thickness on f Flexible Elastomer Nic and Pomlyolefina Cellular Pipe Size Ins (NPS), mulaxtion, mum, in.

Pipe		Insulation, Nominal Thickness				
Nominal Size	Pin.pe Outside Diameter	1	1½	2	2½	3
		mm	25	38	51	6425 mm
Names	mm	mm	13 mm	19 mm	25 mm	
15	76	89	102	114	127	
15	21.3	24.6	47.5	62.2	75.4	
in.				Outer Diameter, in.[A]		
½		3.25	4.38	5.38	7 8	910
½20	26.7	28.7	52.1	67.3	7 8	910
¾		3.25	4.38	5.38	7	8 9
25	33.4	36.6	62.0	76.2	7	8 9
1		3.88	4.88	6	7	8
32	42.2	45.2	70.6	85.9	7	8
1¼		3.88	5.38	6	7	8
40	48.3	51.6	77.0	92.2	7	8
1½		4.38	5.38	7	8	9
50	60.3	63.5	88.9	104	8	9
2		4.88	6	7	8	9
65	73.0	76.2	102	117	8	9
2½		5.38	7	8	9	10
80	88.9	94.0	121	134	9	10
3		6	7	8	9	10
90	102	107	135	150	9	10
3½		7	8	9	10	11.1312.13
100	114	119	149	163	10	11.1712.13
4		7	8	9	1011.13	12.13
125	141	146	174	189	2011.13	12.13
4½		8	9	10	11.13	12.13
150	168	173	201	217	11.13	12.13
5		9	9	10	11.13	12.13
200	219	224	252	267	11.13	12.13

TABLE 9a Inner and Outer Diameter Tolerances for Flexible Elastomeric and Polyolefin Cellular Insulation, millimeters

6	9	10	11.13	12.1313.1314.3815.3816.3817.38	
Inner Diameters of Insulation, millimeters	9	10	11.13	12.1313.1314.3815.3816.3817.38	EachDiameterTolerances, millimeters
7	...	11.13	12.13	13.1314.3815.3816.3817.3818.38	
25.4 to 63.5	...	±1.13	12.13	13.1314.3815.3816.3817.3818.382	
8	...	12.1313.13	14.38	15.3816.3817.3818.3819.38	
76.2 to 146	...	1±2.313.13	14.38	15.3816.3817.3818.3819.38	
9	...	13.13	14.38	15.3816.3817.3818.3819.3820.38	
173 to 224	...	1±3.13	14.38	15.3816.3817.3818.3819.3820.38	
10	...	14.38	15.38	16.3817.3818.3819.3820.3821.38	
Outer Diameters of Insulation, millimeters	...	14.38	15.38	16.3817.3818.3819.3820.3821.38	Each Outer DiameterTolerances,millimete
11	...	15.	38 16.3817.38	18.3819.3820.3821.3822.38	
47.5 to 114	...	15.±	38 16.817.38	18.3819.3820.3821.3822.38	
1 2	...	16.38	17.38	18.3819.3820.3821.3822.3823.38	
117 to 201	...	1±6.38	17.38	18.3819.3820.3821.3822.3823.384	
14[B]	...	17.50	18.50	19.5020.5021.5022.5023.5024.50	
217 to 279	...	17.50	1±8.50	19.5020.5021.5022.5023.5024.50	

[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.

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 $p\bar{i}$ (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. Corresponding values for tubing are shown in Table 12.

TABLE 8 10 Nominal Tube Sizes and Wall Thickness for Inner and Outer Diameters o f lor Nominsual Watll Thickness on f Flexible Elastomer Nic and Pomlyolefina Cellular Pipe Size Ins (NPS), mulaxtimumon, mm

Pipe / Nominal Size	Tube Outsin.de Diameter	–1	Insulation, NominalThicknubess –1½	–2	–2½	–3
		mm	25	38	51	64
Names	mm	mm	13 mm	19 mm	64	76
in.			Outer Diameter, mm[A]			
–½		83	112	137	178	203
½10	12.7	15.2	38.1	48.9	178	203
–¾		–83	112	137	178	203
15	15.9	19.1	41.9	54.6	178	203
–1		–99	124	153	178	203
20	22.2	25.4	50.8	64.0	78	6.203
–1¼		–99	137	153	178203	229
25	28.6	31.8	57.6	72.4	8203	229
–1½		112	137	178	203	229
32	35.0	38.1	64.0	78.7	203	229
–2		124	153	178	203	229254
40	41.3	44.5	70.4	86.0	203	22954
–2½		137	178	203	229	254
50	54.0	57.2	83.1	97.8	229	254
–3		153	178	203	229	254
65	66.7	69.9	95.8	111	1229	254
–3½		178	203	229	254	283308
80	79.4	82.6	109	123	254	2813308
–4		178	203	229	254	283
90	92.1	95.3	124	137	154	283
–4½		203	229	254	283	308
100	104.8	108	137	151	283	308

–5	229	229	254	283	308	334365	39	
	229	229	254	283	308	334365	39	
1416								

TABLE 10a Inner and Outer Diameter Tolerances for Flexible Elastomeric and Polyolefin Cellular Insulation, millimeters

–6	229	254	283	308	334	365391	416	441	
Inner Diameters of Insulation, millimeters	229	254	283	308	334	365391	416	441Each Diameter Tolerances, millimeters	
–7	...	283	308	334365391416441			467		
15.2 to 38.1	± 1....	283	308	334365391416441			4672		
–8	...	308	334	365	391	416441	467	492	
44.5 to 108	± 2....	308	334	365	391	416441	467	492	
–9	...	334	365	391	416	441467	492	518	
Outer Diameters of Insulation, millimeters	...	334	365	391	416	441467	492	518Each Outer Diameter Tolerances, millimeters	
10	...	365	391	416	441	467492518543			
38.1 to 88.9	...	± 365	391	416	441	467492	51.8		
11	...	391	41 6441	467	492	518543	568		
95.3 to 163	...	391	41± 6441467		492	518543	568		
12	...	416	441	467	492518	543		568	594
14[B]	...	445	470	495	521546	572		597	622

[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.

6. Keywords

6.1 pipe thermal insulation diameter; pipe thermal insulation dimension; pipe thermal insulation thickness; thermal insulation; thermal insulating materials-pipe; thermal insulating materials-rigid; tubing thermal insulation thickness

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
~~⅛~~	~~0.840~~	~~21.3~~	~~0.86~~	~~22~~	~~0~~	~~0~~		~~1.6~~
¼	0.840	21.3	0.86	22	0	0	0.063	1.6
~~⅜~~	~~1.050~~	~~26.7~~	~~1.07~~	~~27~~	~~0~~	~~0~~		~~1.6~~
⅜	1.050	26.7	1.07	27	0	0	0.063	1.6
~~½~~	~~1.315~~	~~33.4~~	~~1.33~~	~~34~~	~~0~~	~~0~~		~~1.6~~
½	1.315	33.4	1.33	34	0	0	0.063	1.6
~~¾~~	~~1.660~~	~~42.2~~	~~1.68~~	~~43~~	~~0~~	~~0~~		~~1.6~~
¾	1.660	42.2	1.68	43	0	0	0.063	1.6
~~1~~	~~1.900~~	~~48.3~~	~~1.92~~	~~49~~	~~0~~	~~0~~		~~1.6~~
1	1.900	48.3	1.92	49	0	0	0.063	1.6
~~1¼~~	~~2.375~~	~~60.3~~	~~2.41~~	~~61~~	~~0~~	~~0~~		~~2.4~~
1¼	2.375	60.3	2.41	61	0	0	0.094	2.4
~~1½~~	~~2.875~~	~~73.0~~	~~2.91~~	~~74~~	~~0~~	~~0~~		~~2.4~~
1½	2.875	73.0	2.91	74	0	0	0.094	2.4
~~2~~	~~3.500~~	~~88.9~~	~~3.53~~	~~90~~	~~0~~	~~0~~		~~2.4~~
2	3.500	88.9	3.53	90	0	0	0.094	2.4
~~2½~~	~~4.000~~	~~101.6~~	~~4.03~~	~~102~~		~~0.8~~		~~2.4~~
2½	4.000	101.6	4.03	102	0.031	0.8	0.094	2.4
~~3~~	~~4.500~~	~~114.3~~	~~4.53~~	~~115~~		~~0.8~~		~~2.4~~
3	4.500	114.3	4.53	115	0.031	0.8	0.094	2.4
~~3½~~	~~5.000~~	~~127.0~~	~~5.03~~	~~128~~		~~0.8~~		~~2.4~~
3½	5.000	127.0	5.03	128	0.031	0.8	0.094	2.4
~~4~~	~~5.563~~	~~141.4~~	~~5.64~~	~~143~~		~~0.8~~		~~2.4~~
4	5.563	141.4	5.64	143	0.031	0.8	0.094	2.4
~~5~~	~~6.625~~	~~168.3~~	~~6.70~~	~~170~~		~~0.8~~		~~2.4~~
5	6.625	168.3	6.70	170	0.031	0.8	0.094	2.4
~~6~~	~~7.625~~	~~193.7~~	~~7.70~~	~~196~~		~~0.8~~		~~2.4~~
6	7.625	193.7	7.70	196	0.031	0.8	0.094	2.4
~~7~~	~~8.625~~	~~219.1~~	~~8.70~~	~~221~~		~~0.8~~		~~2.4~~
7	8.625	219.1	8.70	221	0.031	0.8	0.094	2.4
~~8~~	~~9.625~~	~~244.5~~	~~9.70~~	~~246~~		~~0.8~~		~~2.4~~
8	9.625	244.5	9.70	246	0.031	0.8	0.094	2.4
~~9~~	~~10.750~~	~~273.0~~	~~10.83~~	~~275~~		~~0.8~~		~~2.4~~
9	10.750	273.0	10.83	275	0.031	0.8	0.094	2.4
~~10~~	~~11.750~~	~~298.4~~	~~11.83~~	~~300~~		~~0.8~~		~~2.4~~
10	11.750	298.4	11.83	300	0.031	0.8	0.094	2.4
~~11~~	~~12.750~~	~~323.8~~	~~12.84~~	~~326~~		~~1.6~~		~~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~~		~~1.6~~		~~4.0~~
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.