Designation: A760/A760M – 15

Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains[1]

This standard is issued under the fixed designation A760/A760M; 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 corrugated steel pipe intended for use for storm water drainage, underdrains, the construction of culverts, and similar uses. Pipe covered by this specification is not normally used for the conveyance of sanitary or industrial wastes. The steel sheet used in fabrication of the pipe has a protective metallic coating of zinc (galvanizing), aluminum, 55 % aluminum-zinc alloy, or zinc-5 % aluminum-mischmetal alloy.

1.2 The several different metallic coatings may not provide equal protection of the base metal against corrosion or abrasion in all environments, or both. Some environments may be so severe that none of the metallic coatings included in this specification will provide adequate protection. Additional protection for corrugated steel pipe can be provided by use of coatings applied after fabrication of the pipe as described in Specification A849, or by use of polymer precoated corrugated steel pipe as described in Specification A762/A762M.

1.3 Section 9 is intended to be applied to corrugated steel pipe joints. The several different types of corrugated steel pipe joints provide various qualities. This specification is not intended for routine quality control testing or in-field acceptance testing, but is intended to establish performance limits of the pipe joints, as well as the test requirements and test methods for the joints as described herein.

1.4 This specification does not include requirements for bedding, backfill, or the relationship between earth cover load and sheet thickness of the pipe. Experience has shown that the successful performance of this product depends upon the proper selection of sheet thickness, type of bedding and backfill, controlled manufacture in the plant, and care in the installation. The installation procedure is described in Practice A798/A798M.

1.5 This specification is applicable to orders in either inch-pound units as A760 or in SI units as A760M. Inch-pound units and SI units are not necessarily equivalent. SI units are shown in brackets in the text for clarity, but they are the applicable values when the material is ordered to A760M.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A90/A90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
A153/A153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A307 Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
A428/A428M Test Method for Weight [Mass] of Coating on Aluminum-Coated Iron or Steel Articles
A449 Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
A563 Specification for Carbon and Alloy Steel Nuts
A563M Specification for Carbon and Alloy Steel Nuts (Metric)
A742/A742M Specification for Steel Sheet, Metallic Coated and Polymer Precoated for Corrugated Steel Pipe
A762/A762M Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
A796/A796M Practice for Structural Design of Corrugated Steel Pipe, Pipe-Arches, and Arches for Storm and Sanitary Sewers and Other Buried Applications
A798/A798M Practice for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications
A849 Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
A929/A929M Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
B633 Specification for Electrodeposited Coatings of Zinc on Iron and Steel

[1] This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.17 on Corrugated Steel Pipe Specifications.

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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.

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B695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
C1619 Specification for Elastomeric Seals for Joining Concrete Structures
D1056 Specification for Flexible Cellular Materials—Sponge or Expanded Rubber
F568M Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners (Metric) (Withdrawn 2012)[3]

2.2 *AASHTO Standards:*[4]

T241 Test for Helical Continuous Welded Seam Corrugated Steel Pipe
T249 Test for Helical Lock Seam Corrugated Pipe

2.3 *AISI Standard:*[5]

AISI 100 North American Specification for the Design of Cold-Formed Steel Structural Members

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *fabricator*—the producer of the pipe.

3.1.2 *manufacturer*—the producer of the sheet.

3.1.3 *minimized coating structure*—a coating characterized by a finer metallurgical coating structure obtained by a treatment designed to restrict the formation of the normal coarse-grain structure formed during solidification of the Zn-5 Al-MM alloy coating.

3.1.4 *purchaser*—the purchaser of the finished product.

3.1.5 *regular coating structure*—the normal coating structure resulting from unrestricted grain growth during normal solidification of the Zn-5 Al-MM alloy coating.

3.2 *Abbreviations:*

3.2.1 *55 Al-Zn*—55 % aluminum-zinc.

3.2.2 *MM*—mischmetal.

3.2.3 *Zn-5 Al-MM*—zinc-5 % aluminum-mischmetal.

4. Classification

4.1 The corrugated steel pipe covered by this specification is classified as follows:

4.1.1 *Type I*—This pipe shall have a full circular cross section, with a single thickness of corrugated sheet, fabricated with annular (circumferential) or helical corrugations.

4.1.2 *Type IA*—This pipe shall have a full circular cross section, with an outer shell of corrugated sheet and an inner liner of smooth (uncorrugated) sheet, fabricated with helical corrugations and lock seams.

4.1.3 *Type IR*—This pipe shall have a full circular cross section with a single thickness of smooth sheet, fabricated with helical ribs projecting outwardly.

4.1.4 *Type IS*—This pipe shall have a full circular cross section with a single thickness of smooth sheet, fabricated with helical ribs projecting outwardly, and shall also have metallic-coated steel inserts placed in the ribs so that the inside surface of the pipe is essentially smooth.

4.1.5 *Type II*—This pipe shall be a Type I pipe which has been reformed into a pipe-arch, having an approximately flat bottom.

4.1.6 *Type IIA*—This pipe shall be a Type IA pipe which has been reformed into a pipe-arch, having an approximately flat bottom.

4.1.7 *Type IIR*——This pipe shall be a Type IR pipe which has been reformed into a pipe-arch, having an approximately flat bottom.

4.1.8 *Type IIS*—This pipe shall be a Type IS pipe which has been reformed into a pipe-arch, having an approximately flat bottom.

4.1.9 *Type III*—This pipe, intended for use as underdrains or for underground disposal of water, shall be a Type I pipe which has been perforated to permit the inflow or outflow of water.

4.1.10 *Type IIIA*—This pipe, intended for use as underdrains, shall consist of a semicircular cross section, having a smooth (uncorrugated) bottom with a corrugated top shield.

4.2 Perforations in Type III pipe are included in three classes as described in 8.3.2.

4.3 Zn-5 Al-MM alloy-coated material is available in two coating classes, or structures, as follows:

4.3.1 *Class A*—Minimized coating structure.

4.3.2 *Class B*—Regular coating structure.

5. Ordering Information

5.1 Orders for material to this specification shall include the following information as necessary, to adequately describe the desired product.

5.1.1 Name of material (corrugated steel pipe),

5.1.2 Type of metallic coating (zinc, aluminum, 55 Al-Zn alloy, Zn-5 Al-MM alloy (see 6.1)).

5.1.2.1 For Zn-5A1-MM coating, the class coating structure (Class A minimized, etc.) (4.3).

5.1.3 ASTM designation and year of issue, as A760-_____ for inch-pound units or as A760M-_____ for SI units.

5.1.4 Type of pipe (4.1),

5.1.5 Diameter of circular pipe (Table 1), or span and rise of pipe-arch section (Tables 2-9),

5.1.6 Length, either total length or length of each piece and number of pieces,

5.1.7 Description of corrugations (7.2),

5.1.8 Sheet thickness (8.1.2),

5.1.9 For Type I and Type II pipe, the pipe fabrication method, whether with annular corrugations or helical corrugations (see 7.1.1),

NOTE 1—Pipe with annular corrugations with spot welded or riveted seams is designed by different criteria compared to pipe with helical corrugations. Pipe with annular corrugations must consider seam strength. Therefore, consideration of the method of fabrication is important when pipe is installed under certain conditions of loading.

5.1.10 For Types IS and IIS pipe, the type of insert required, whether from metallic coated steel sheet or from polymer-precoated metallic-coated steel sheet (see 6.1 and 8.2),

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.

[5] Available from American Iron and Steel Institute (AISI), 25 Massachusetts Ave., NW, Suite 800, Washington, DC 20001, http://www.steel.org.

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TABLE 1 Pipe Sizes

Nominal Inside Diameter		Corrugation Sizes[A]				Ribbed Pipe			Minimum Outside Circumference[B]	
in.	mm	1½ by ¼ in. [38 by 6.5 mm]	2⅔ by ½ in. [68 by 13 mm]	3 by 1 in. [75 by 25 mm]	5 by 1 in. [125 by 25 mm]	¾ by ¾ by 7½ in. [19 by 19 by 190 mm]	¾ by 1 by 11½ in. [19 by 25 by 292 mm]	¾ by 1 by 8½ in. [19 by 25 by 216 mm]	in.	mm
4	100	X							11.4	264
6	150	X							17.7	441
8	200	X							24.0	598
10	250	X							30.2	755
12	300	X	X						36.5	912
15	375	X	X			X[C]			46.0	1148
18	450	X	X			X	X	X	55.4	1383
21	500		X			X	X	X	64.8	1620
24	600		X			X	X	X	74.2	1854
27	675		X			X	X	X	83.6	2091
30	750		X			X	X	X	93.1	2483
33	825		X			X	X	X	102.5	2561
36	900		X	X	X	X	X	X	111.9	2797
42	1050		X	X	X	X	X	X	130.8	3269
48	1200		X	X	X	X	X	X	149.6	3739
54	1350		X	X	X	X	X	X	168.4	4209
60	1500		X	X	X	X	X	X	187.0	4675
66	1650		X	X	X	X	X	X	205.7	5142
72	1800		X	X	X	X	X	X	224.3	5609
78	1950		X	X	X	X	X	X	243.0	6075
84	2100		X	X	X	X	X	X	261.7	6542
90	2250			X	X	X	X	X	280.3	7008
96	2400			X	X	X	X	X	299.0	7475
102	2550			X	X	X	X	X	317.6	7941
108	2700			X	X	X	X	X	336.3	8408
114	2850			X	X	X		X	355.0	8874
120	3000			X	X	X		X	373.6	9341
126	3150			X	X			X	392.3	9807
132	3300			X	X			X	410.9	10274
138	3450			X	X			X	429.6	10740
144	3600			X	X			X	448.3	11207

[A]An“ X” indicates standard corrugation sizes for each nominal diameter of pipe.
[B]Measured in valley of annular corrugations. Not applicable to helically corrugated pipe.
[C]Additional size for Type IS pipe.

TABLE 2 Pipe Arch Requirements—2⅔ by ½-in. Corrugations (A760)

Pipe Arch Size, in.	Equivalent Diameter, in.	Span,[A] in.	Rise,[A] in.	Minimum Corner Radius, in.	Maximum B,[B] in.
17 by 13	15	17	13	3	5¼
21 by 15	18	21	15	3	6
24 by 18	21	24	18	3	7¼
28 by 20	24	28	20	3	8
35 by 24	30	35	24	3	9½
42 by 29	36	42	29	3½	10½
49 by 33	42	49	33	4	11½
57 by 38	48	57	38	5	13½
64 by 43	54	64	43	6	15
71 by 47	60	71	47	7	16½
77 by 52	66	77	52	8	18
83 by 57	72	83	57	9	20

[A] A tolerance of ±1 in. or 2 % of equivalent diameter, whichever is greater, is permissible in span and rise.
[B] B is defined as the vertical dimension from a horizontal line across the widest portion of the arch to the lowest portion of the base.

TABLE 3 Pipe Arch Requirements—68 by 13-mm Corrugations [A760M]

Pipe Arch Size, mm	Equivalent Diameter, mm	Span,[A] mm	Rise,[A] mm	Minimum Corner Radius, mm	Maximum B,[B] mm
430 by 330	375	430	330	75	135
530 by 380	450	530	380	75	155
610 by 460	525	610	460	75	185
710 by 510	600	710	510	75	205
780 by 560	675	780	560	75	225
885 by 610	750	870	630	75	240
970 by 690	825	970	690	75	255
1060 by 740	900	1060	740	90	265
1240 by 840	1050	1240	840	100	290
1440 by 970	1200	1440	970	130	345
1620 by 1100	1350	1620	1100	155	380
1800 by 1200	1500	1800	1200	180	420
1950 by 1320	1650	1950	1320	205	460
2100 by 1450	1800	2100	1450	230	510

[A] A tolerance of ±25 mm or 2 % of equivalent diameter, whichever is greater, is permissible in span and rise.
[B] B is defined as the vertical dimension from a horizontal line across the widest portion of the arch to the lowest portion of the base.

NOTE 2—Aluminized steel Type 2 inserts are not available with a polymer coating

NOTE 3—See Specification A849 for additional ordering information appropriate to post-coatings on pipe.

5.1.11 Joining systems, including the type of joint from 9.2 and gasket, if required (If no joining system is specified, the fabricator shall select a soil tight joining system.),

5.1.12 For Type III pipe, class of perforations, if other than Class 1 (8.3.2),

5.1.13 Certification, if required (14.1), and

5.1.14 Special requirements.

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TABLE 4 Pipe Arch Requirements—3 by 1-in. or 5 by 1-in. Corrugations (A760)

Pipe Arch Size, in.	Equivalent Diameter, in.	Span,[A] in.	Rise,[A] in.	Minimum Corner Radius, in.
40 by 31	36	40 – 1.8	31 + 1.8	5
46 by 36	42	46 – 2.1	36 + 2.1	6
53 by 41	48	53 – 2.4	41 + 2.4	7
60 by 46	54	60 – 2.7	46 + 2.7	8
66 by 51	60	66 – 3.0	51 + 3.0	9
73 by 55	66	73 – 3.3	55 + 3.3	12
81 by 59	72	81 – 3.6	59 + 3.6	14
87 by 63	78	87 – 4.4	63 + 4.4	14
95 by 67	84	95 – 4.8	67 + 4.8	16
103 by 71	90	103 – 5.2	71 + 5.2	16
112 by 75	96	112 – 5.6	75 + 5.6	18
117 by 79	102	117 – 5.9	79 + 5.9	18
128 by 83	108	128 – 6.4	83 + 6.4	18
137 by 87	114	137 – 6.9	87 + 6.9	18
142 by 91	120	142 – 7.1	91 + 7.1	18

[A] Negative and positive numbers listed with span and rise dimensions are negative and positive tolerances, no tolerance in opposite direction.

TABLE 5 Pipe Arch Requirements—75 by 25-mm or 125 by 25-mm Corrugations [A760M]

Pipe Arch Size, mm	Equivalent Diameter, mm	Span,[A] mm	Rise,[A] mm	Minimum Corner Radius, mm
1010 by 790	900	1010 – 45	790 + 45	130
1160 by 920	1050	1160 – 55	920 + 55	155
1340 by 1050	1200	1340 – 60	1050 + 60	180
1520 by 1170	1350	1520 – 70	1170 + 70	205
1670 by 1300	1500	1670 – 75	1300 + 75	230
1850 by 1400	1650	1850 – 85	1400 + 85	305
2050 by 1500	1800	2050 – 95	1500 + 95	355
2200 by 1620	1950	2200 – 110	1620 + 110	355
2400 by 1720	2100	2400 – 120	1720 + 120	410
2600 by 1820	2250	2600 – 130	1820 + 130	410
2840 by 1920	2400	2840 – 145	1920 + 145	460
2970 by 2020	2550	2970 – 150	2020 + 150	460
3240 by 2120	2700	3240 – 165	2120 + 165	460
3470 by 2220	2850	3470 – 175	2220 + 175	460
3600 by 2320	3000	3600 – 180	2320 + 180	460

[A] Negative and positive numbers listed with span and rise dimensions are negative and positive tolerances, no tolerance in opposite direction.

TABLE 6 Pipe-Arch Requirements—¾ by ¾ by 7½-in. Rib Corrugation[A]

Pipe-Arch Size, in.	Equivalent Diameter, in.	Span,[B] in.	Rise,[B] in.	Minimum Corner Radius, in.
20 by 16	18	20 – 1.0	16 + 1.0	5
23 by 19	21	23 – 1.0	19 + 1.0	5
27 by 21	24	27 – 1.5	21 + 1.5	5
33 by 26	30	33 – 1.5	26 + 1.5	5
40 by 31	36	40 – 1.8	31 + 1.8	5
46 by 36	42	46 – 2.1	36 + 2.1	6
53 by 41	48	53 – 2.4	41 + 2.4	7
60 by 46	54	60 – 2.7	46 + 2.7	8
66 by 51	60	66 – 3.0	51 + 3.0	9
73 by 55	66	73 – 3.3	55 + 3.3	12
81 by 59	72	81 – 3.6	59 + 3.6	14
87 by 63	78	87 – 3.9	63 + 3.9	14
95 by 67	84	95 – 4.2	67 + 4.2	16
103 by 71	90	103 – 4.5	71 + 4.5	16
112 by 75	96	112 – 4.8	75 + 4.8	18
117 by 79	102	117 – 5.1	79 + 5.1	18

[A] For Type IIR and Type IIS pipe.
[B] Negative and positive numbers listed with span and rise dimensions are negative and positive tolerances; no tolerance in opposite direction.

TABLE 7 Pipe-Arch Requirements—19 by 19 by 190-mm Rib Corrugation[A]

Pipe-Arch Size, mm	Equivalent Diameter, mm	Span,[B] mm	Rise,[B] mm	Minimum Corner Radius, mm
500 by 410	450	500 – 25	410 + 25	130
580 by 490	525	580 – 25	490 + 25	130
680 by 540	600	680 – 40	540 + 40	130
750 by 620	675	750 – 40	620 + 40	130
830 by 670	750	830 – 40	670 + 40	130
900 by 750	825	900 – 45	750 + 45	130
1010 by 790	900	1010 – 45	790 + 45	130
1160 by 920	1050	1160 – 55	920 + 55	155
1340 by 1050	1200	1340 – 60	1050 + 60	180
1520 by 1170	1350	1520 – 70	1170 + 70	205
1670 by 1300	1500	1670 – 75	1300 + 75	230
1850 by 1400	1650	1850 – 85	1400 + 85	305
2050 by 1500	1800	2050 – 90	1500 + 90	355
2200 by 1620	1950	2200 – 100	1620 + 100	355
2400 by 1720	2100	2400 – 105	1720 + 105	410
2600 by 1820	2250	2600 – 115	1820 + 115	410
2840 by 1920	2400	2840 – 120	1880 + 120	450
2920 by 1980	2550	2920 – 130	1980 + 130	450

[A] For Type IIR and Type IIS pipe.
[B] Negative and positive numbers listed with span and rise dimensions are negative and positive tolerances; no tolerance in opposite direction.

6. Materials and Manufacture

6.1 *Steel Sheet for Pipe*—All pipe fabricated under this specification shall be formed from zinc-coated sheet, aluminum-coated sheet, 55 % aluminum-zinc alloy-coated sheet, zinc-5 % aluminum-mischmetal alloy-coated sheet all conforming to Specification A929/A929M. If the type of metallic coating is not stated in the order, zinc-coated sheet conforming to Specification A929/A929M shall be used. All pipe furnished on the order shall have the same metallic coating, unless otherwise specified.

6.2 *Steel Sheet for Coupling Bands*—The sheet used in fabricating coupling bands shall have the same coating and shall conform to the same specification listed in 6.1 as that used for fabrication of the pipe furnished under the order.

6.3 *Rivets*—The rivets used in riveted pipe shall be of the same material as the base metal specified for the corrugated sheets. They shall be thoroughly galvanized or sherardized. If bolts and nuts are substituted for rivets (see 7.3.1), they shall meet the following requirements:

	Bolts	Nuts
For A760 pipe	A449	A563, Grade C
[For A760M pipe]	[F568M, Class 8.8]	[A563M, Class 12]

The bolts and nuts shall be hot-dip galvanized in conformance with Specification A153/A153M, or be mechanically galvanized in conformance with Specification B695, Class 40.

6.4 *Hardware for Joining Systems*—Bolts and nuts for coupling bands shall conform to the following requirements:

	Bolts	Nuts
For A760 pipe	A307	A563, Grade A
[For A760M pipe]	[F568M, Class 4.6]	[A563M, Class 5]

6.4.1 Bolts, nuts, and other threaded items used with joining systems shall be zinc coated by one of the following processes: hot-dip process as provided in Specification A153/A153M;

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TABLE 8 Pipe Arch Requirements—¾ by 1 by 11½-in. Rib Corrugation

Pipe Arch Size, in.	Equivalent Diameter, in.	Span,[A] in.	Rise,[A] in.	Minimum Corner Radius, in.
20 by 16	18	20 – 1.0	16 + 1.0	5
23 by 19	21	23 – 1.0	19 + 1.0	5
27 by 21	24	27 – 1.5	21 + 1.5	5
33 by 26	30	33 – 1.5	26 + 1.5	5
40 by 31	36	40 – 1.8	31 + 1.8	5
46 by 36	42	46 – 2.1	36 + 2.1	6
53 by 41	48	53 – 2.4	41 + 2.4	7
60 by 46	54	60 – 2.7	46 + 2.7	8
66 by 51	60	66 – 3.0	51 + 3.0	9

[A] Negative and positive numbers listed with span and rise dimensions are negative and positive tolerances, no tolerance in opposite direction.

TABLE 9 Pipe Arch Requirements—19 by 25 by 292-mm Rib Corrugation

Pipe Arch Size, mm	Equivalent Diameter, mm	Span,[A] mm	Rise,[A] mm	Minimum Corner Radius, mm
500 by 410	450	500– 25	410 + 25	130
580 by 490	525	580– 25	490 + 25	130
680 by 540	600	680– 40	540 + 40	130
750 by 620	675	750– 40	620 + 40	130
830 by 670	750	830– 40	670 + 40	130
900 by 750	825	900– 45	750 + 45	130
1010 by 790	900	1010 – 45	790 + 45	130
1160 by 920	1050	1160 – 55	920 + 55	155
1340 by 1050	1200	1340 – 60	1050 + 60	180
1520 by 1170	1350	1520 – 70	1170 + 70	205
1670 by 1300	1500	1670 – 75	1300 + 75	230
1850 by 1400	1650	1850 – 85	1400 + 85	305
2050 by 1500	1800	2050 – 95	1500 + 95	355

[A] Negative and positive numbers listed with span and rise dimensions are negative and positive tolerances, no tolerance in opposite direction.

electroplating process as provided in Specification B633, Class Fe/Zn 8; or mechanical process as provided in Specification B695, Class 8. Other hardware items used with coupling bands shall be zinc coated by one of the following processes: hot-dip process as provided in Specification A153/A153M; electroplating process as provided in Specification B633, Class Fe/Zn 25; or mechanical process as provided in Specification B695, Class 25.

6.5 *Gaskets*—If gaskets are used in joining systems, they shall be a band of expanded rubber meeting the requirements of Specification D1056, or elastomeric seals meeting the requirements of Specification C1619.

6.6 *Metallic-Coated Steel Inserts*—Metallic-coated steel inserts for Type IS and Type IIS pipe shall be of the same material specified for the pipe in 6.1 and shall have a metallic coating of the same type and coating weight. In addition to these requirements, when specified in the order, the metallic-coated steel insert shall be fabricated from polymer precoated sheet conforming to Specification A742/A742M.

7. Fabrication

7.1 *General Requirements*—Pipe shall be fabricated in full circular cross section except for Type IIIA pipe which is described in 8.4.

7.1.1 Type I pipe shall have annular corrugations with lap joints fastened with rivets or resistance spot welds, or shall have helical corrugations with a continuous lock seam or welded seam extending from end to end of each length of pipe. The type of fabrication used shall be the option of the fabricator unless otherwise specified.

7.1.2 Type IA pipe shall be fabricated with a smooth liner and helically corrugated shell integrally attached at helical lock seams extending from end to end of each length of pipe. The shell shall have corrugations of nominal 2⅔ or 3-in. [68 or 75-mm] pitch.

7.1.3 Type IR pipe shall be fabricated with helical ribs projecting outward with a continuous lock seam extending from end to end of each length of pipe.

7.1.4 Type IS pipe shall be fabricated with helical ribs projecting outward with a continuous lock seam extending from end to end of each length of pipe, and shall also have metallic-coated steel inserts placed in the ribs in conformance with 7.8 so that the inside surface of the pipe is essentially smooth.

7.2 *Corrugations*—The corrugations shall be either annular or helical as provided in 7.1. The direction of the crests and valleys of helical corrugations shall not be less than 60° from the axis of the pipe for pipe diameters larger than 21 in. [525 mm], and not less than 45° from the axis for pipe diameters of 21 in. [525 mm] and smaller.

7.2.1 For Type I and IA pipe, corrugations shall form smooth continuous curves and tangents. The dimensions of the corrugations shall be in accordance with Table 10 for the size indicated in the order, except if the depth measurement of one or more corrugations is less than the minimum depth in Table 10. Then the depth of all corrugations between adjacent seams shall be measured and the values of Table 11 for minimum average depth and minimum corrugation depth shall apply.

NOTE 4—Inspection frequently consists of measurement of the depth of one or a few corrugations. If such measurement indicates insufficient

TABLE 10 Corrugation Requirements for Types I, IA, II, IIA, and III Pipe

Nominal Size	Maximum Pitch[A]	Minimum Depth[B]	Inside Radius[C]	
			Nominal	Minimum
		inches		
1½ by ¼ [D]	1⅞	0.24	9/32	0.25
2⅔ by ½	2⅞	0.48	11/16	0.5
3 by 1	3¼	0.95	9/16	0.5
5 by 1	5 5/16	0.95	1.57	1.4
		millimetres		
38 by 6.5[D]	48	6.0	7	6.5
68 by 13	73	12	17	12
75 by 25	83	24	14	12
125 by 25	135	24	40	36

[A] Pitch is measured from crest to crest of corrugations, at 90° to the direction of the corrugations.
[B] Depth is measured as the vertical distance from a straightedge resting on the corrugation crests parallel to the axis of the pipe to the bottom of the intervening valley. If the depth measurement of one or more corrugations is less than the value indicated herein, the depth of all corrugations between seams shall be measured, and the requirements of Table 11 shall be applied (see 7.2.1).
[C] Minimum inside radius requirement does not apply to a corrugation containing a helical lock seam.
[D] The corrugation size of 1½ by ¼ in. (38 by 6.5 mm) is available only in helically corrugated pipe.

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