This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: A795/A795M – 21

Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use[1]

This standard is issued under the fixed designation A795/A795M; 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 black and hot-dipped galvanized welded and seamless steel pipe in NPS 1/2 to NPS 10, inclusive [DN 15 to DN 250, inclusive] (Note 1), with wall thicknesses as given in Table 1 and Table 2. Pipe having other wall thicknesses may be furnished provided such pipe complies with all other requirements of this specification and the outside diameter is as given in Table 2. Pipe ordered under this specification is intended for use in fire protection systems. The pipe may be bent, but it is not intended for bending made at ambient temperature wherein the inside diameter of the bend is less than twelve times the outside diameter of the pipe being bent (Note 2).

NOTE 1—The dimensionless designators NPS (nominal pipe size) and DN (nominal diameter) have been substituted in this standard for such traditional terms as "nominal diameter," "size," and "nominal size."

NOTE 2—Successful bending of pipe is a function of equipment and technique as well as pipe properties.

1.2 This pipe is suitable for joining by the following methods:

1.2.1 *Light-Weight Fire Protection Pipe*— Rolled groove, welding, and fittings for plain end pipe. See Table 1 for dimensions.

1.2.2 *Standard-Weight Fire Protection Pipe*—Cut or rolled groove, threading, welding, and fittings for plain end pipe. See Table 2 for dimensions.

1.2.3 For pipe having dimensions other than those of Table 1 and Table 2, the joining method must be compatible with the pipe dimensions. A complete listing of standard light weight dimensions appears in ASME B36.10 and B36.19.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 The following safety hazards caveat pertains only to the test method portion, Sections 8, 9, and 10, of this specification: *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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

A700 Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment

A751 Test Methods and Practices for Chemical Analysis of Steel Products

A865 Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints

B6 Specification for Zinc

E213 Practice for Ultrasonic Testing of Metal Pipe and Tubing

E309 Practice for Eddy Current Examination of Steel Tubular Products Using Magnetic Saturation

E570 Practice for Flux Leakage Examination of Ferromagnetic Steel Tubular Products

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.09 on Carbon Steel Tubular Products.

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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.

***A Summary of Changes section appears at the end of this standard**

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TABLE 1 Dimensions, Weights, and Test Pressure For Light-Weight Fire Protection Pipe—Schedule 10[A]

NPS Designator	DN Designator	Outside Diameter		Nominal Wall Thickness		Weight Plain End		Test Pressure			
								Furnace-Welded		Seamless and Electric-Resistance-Welded	
		in.	mm	in.	mm	lb/ft	kg/m	psi	kPa	psi	kPa
¾	20	1.050	[26.7]	0.083	[2.11]	0.86	[1.28]	500	[3400]	700	[4800]
1	25	1.315	[33.4]	0.109	[2.77]	1.41	[2.09]	500	[3400]	700	[4800]
1¼	32	1.660	[42.2]	0.109	[2.77]	1.81	[2.69]	500	[3400]	1000	[6900]
1½	40	1.900	[48.3]	0.109	[2.77]	2.09	[3.11]	500	[3400]	1000	[6900]
2	50	2.375	[60.3]	0.109	[2.77]	2.64	[3.93]	500	[3400]	1000	[6900]
2½	65	2.875	[73.0]	0.120	[3.05]	3.53	[5.26]	500	[3400]	1000	[6900]
3	80	3.500	[88.9]	0.120	[3.05]	4.34	[6.46]	500	[3400]	1000	[6900]
3½	90	4.000	[101.6]	0.120	[3.05]	4.98	[7.41]	500	[3400]	1200	[8300]
4	100	4.500	[114.3]	0.120	[3.05]	5.62	[8.37]	500	[3400]	1200	[8300]
5	125	5.563	[141.3]	0.134	[3.40]	7.78	[11.58]	[B]	[B]	1200	[8300]
6	150	6.625	[168.3]	0.134	[3.40]	9.30	[13.85]	[B]	[B]	1000	[6900]
8	200	8.625	[219.1]	0.188[C]	[4.78]	16.96	[25.26]	[B]	[B]	800	[5500]
10	250	10.750	[273.1]	0.188[C]	[4.78]	21.23	[31.62]	[B]	[B]	700	[4800]

[A] Schedule 10 corresponds to Schedule 10S as listed in ANSI B36.19 for NPS ¾ through 6 [DN 20 through 150] only.
[B] Furnace-welded pipe is not made in sizes larger than NPS 4 [DN 100].
[C] Not Schedule 10.

TABLE 2 Dimensions, Weights, Test Pressures For Standard-Weight Fire Protection Pipe—Schedule 30 and Schedule 40

NPS Designator	DN Designator	Specified Outside Diameter		Nominal Wall Thickness[A]		Weight Plain End		Weight Threaded and Coupled[B]		Test Pressure			
										Furnace-Welded		Seamless and Electric-Resistance-Welded	
		in.	mm	in.	mm	lb/ft	kg/m	lb/ft	kg/m	psi	kPa	psi	kPa
½	15	0.840	[21.3]	0.109	[2.77]	0.85	[1.27]	0.85	[1.27]	700	[4800]	700	[4800]
¾	20	1.050	[26.7]	0.113	[2.87]	1.13	[1.69]	1.13	[1.68]	700	[4800]	700	[4800]
1	25	1.315	[33.4]	0.133	[3.38]	1.68	[2.50]	1.68	[2.50]	700	[4800]	700	[4800]
1¼	32	1.660	[42.2]	0.140	[3.56]	2.27	[3.39]	2.28	[3.40]	1000	[6900]	1000	[6900]
1½	40	1.900	[48.3]	0.145	[3.68]	2.72	[4.05]	2.73	[4.07]	1000	[6900]	1000	[6900]
2	50	2.375	[60.3]	0.154	[3.91]	3.66	[5.45]	3.69	[5.50]	1000	[6900]	1000	[6900]
2½	65	2.875	[73.0]	0.203	[5.16]	5.80	[8.64]	5.83	[8.68]	1000	[6900]	1000	[6900]
3	80	3.500	[88.9]	0.216	[5.49]	7.58	[11.29]	7.62	[11.35]	1000	[6900]	1000	[6900]
3½	90	4.000	[101.6]	0.226	[5.74]	9.12	[13.58]	9.21	[13.71]	1200	[8300]	1200	[8300]
4	100	4.500	[114.3]	0.237	[6.02]	10.80	[16.09]	10.91	[16.25]	1200	[8300]	1200	[8300]
5	125	5.563	[141.3]	0.258	[6.55]	14.63	[21.79]	14.82	[22.07]	[C]	[C]	1200	[8300]
6	150	6.625	[168.3]	0.280	[7.11]	18.99	[28.29]	19.20	[28.60]	[C]	[C]	1200	[8300]
8	200	8.625	[219.1]	0.277[A]	[7.04]	24.72	[36.82]	25.57	[38.09]	[C]	[C]	1200	[8300]
10	250	10.750	[273.1]	0.307[A]	[7.80]	34.27	[51.05]	35.78	[53.29]	[C]	[C]	1000	[6900]

[A] NPS ½ through 6 [DN 15 through 150]—Schedule 40; NPS 8 and 10 [DN 200 and 250]—Schedule 30.
[B] Based on 20-ft [6.1-m] lengths.
[C] Furnace-welded pipe is not made in sizes larger than NPS 4 [DN 100].

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2.2 *ASME Standards:*
B1.20.1 Pipe Threads, General Purpose, Inch[3]
B36.10 Welded and Seamless Wrought Steel Pipe[3]
B36.19 Stainless Steel Pipe[3]
2.3 *Federal Standard:*
Fed. Std. No. 123 Marking for Shipments (Civil Agencies)[4]
2.4 *Military Standards:*
MIL-STD-129 Marking for Shipment and Storage[4]
MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage[4]

[3] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, http://www.asme.org.
[4] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *defect*—an imperfection of sufficient size or magnitude to be cause for rejection.

3.1.2 *imperfection*—any discontinuity or irregularity found in the pipe.

4. Classification

4.1 Pipe may be furnished in the following types (Note 3):

4.1.1 *Type F*—Furnace-butt welded, continuous welded,

4.1.2 *Type E*—Electric-resistance-welded, or

4.1.3 *Type S*—Seamless.

NOTE 3—See Annex A1 for definitions of the types of pipe.

5. Ordering Information

5.1 Orders for material under this specification should include the following, as required, to describe the desired material adequately:

5.1.1 Quantity (feet, metres, or number of lengths),

5.1.2 Name of material (steel pipe),

5.1.3 Type (seamless, electric-resistance-welded, or furnace-welded),

5.1.4 Grade (seamless and electric-resistance-welded only),

5.1.5 Size (NPS or DN designator and weight class; standard weight or light weight; or outside diameter) and wall thickness (Table 1 and Table 2),

5.1.6 Finish (black, galvanized, or other type of coating as specified by the purchaser),

5.1.7 Length (specific or random),

5.1.8 End finish,

5.1.8.1 Plain end, square cut,

5.1.8.2 Plain end, beveled,

5.1.8.3 Cut groove (Note 4),

5.1.8.4 Rolled groove (Note 4),

5.1.8.5 Threads only,

5.1.8.6 Threaded and coupled, and

5.1.8.7 Couplings power tight.

NOTE 4—Type of groove specified by the purchaser.

5.1.9 ASTM designation.

6. Materials and Manufacture

6.1 The steel for both welded and seamless pipe shall be made by one or more of the following processes: open-hearth, electric-furnace, or basic-oxygen.

6.2 Welded pipe NPS 4 [DN 100] and under may be furnace-welded or electric-resistance welded. Welded pipe over NPS 4 [DN 100] shall be electric-resistance-welded.

6.3 The weld seam of electric-resistance-welded pipe in Grade B shall be heat treated after welding to a minimum of 1000 °F [540 °C] so that no untempered martensite remains, or otherwise processed in such a manner that no untempered martensite remains.

7. Chemical Composition

7.1 The steel shall conform to the requirements as to chemical composition specified in Table 3.

7.2 An analysis of two pipes from each lot of 500 lengths, or fraction thereof, may be made by the purchaser. The chemical composition thus determined shall conform to the requirements specified in Table 3.

TABLE 3 Chemical Requirements

	Composition, max, %			
	C	Mn	P	S
Type E (electric-resistance-welded pipe) & Type S (seamless pipe)				
Open-hearth, electric-furnace or basic-oxygen:				
Grade A	0.25	0.95	0.035	0.035
Grade B	0.30	1.20	0.035	0.035
Type F (furnace-welded pipe)				
Open-hearth, electric-furnace, or basic oxygen			0.050	0.045

7.3 Methods, practices, and definitions for chemical analysis shall be in accordance with Test Methods, Practices, and Terminology A751.

7.4 If the analysis of either pipe does not conform to the requirements specified in Table 3, analyses shall be made on additional pipes of double the original number from the same lot, each of which shall conform to the requirements specified in Table 3.

8. Hydrotest

8.1 Each length of pipe shall be subjected to a hydrostatic test by the manufacturer. The minimum test pressure shall be as prescribed in Table 1 and Table 2. This does not prohibit testing at a higher pressure at the manufacturer's option. The manufacturer may apply the hydrostatic test to pipe with plain ends, with threads only, or with threads and couplings. The hydrostatic test may be applied to single or multiple lengths.

8.2 The hydrostatic test shall be applied, without leakage through the pipe wall, to each length of pipe.

NOTE 5—The hydrostatic test pressures given herein are inspection test pressures. They are not intended as a basis for design and do not have any direct relationship to working pressures.

9. Nondestructive Electric Test

9.1 As an alternative to the hydrostatic test, and when accepted by the purchaser, test each pipe with a nondestructive electric test in accordance with Practice E213, Practice E309, or Practice E570. It is the intent of this test to reject pipe containing defects.

9.2 The following information is for the benefit of the user of this specification:

9.2.1 The ultrasonic examination referred to in this specification is intended to detect longitudinal discontinuities having a reflective area similar to or larger than the reference notch. The examination may not detect circumferentially oriented imperfections or short, deep defects.

9.2.2 The eddy-current examination referenced in this specification has the capability of detecting significant discontinuities, especially of the short, abrupt type.

9.2.3 The flux leakage examination referred to in this specification is capable of detecting the presence and location of significant longitudinally or transversely oriented discontinuities. The provisions of this specification only require longitudinal calibration for flux leakage. Different techniques need to be employed for the detection of differently oriented imperfections.

9.2.4 The hydrostatic test referred to in Section 8 is a test method provided for in many product specifications. This test has the capability of finding defects of a size permitting the test fluid to leak through the tube wall and may be either visually seen or detected by a loss of pressure. This test may not detect very tight, through-the-wall defects or defects that extend an appreciable distance into the wall without complete penetration.

9.2.5 A purchaser interested in ascertaining the nature (type, size, location, and orientation) of discontinuities that can be

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detected in the specific application of these examinations should discuss this with the manufacturer of the tubular product.

9.3 In order to accommodate the various types of nondestructive electric testing equipment and techniques in use, the calibration tube shall contain, at the option of the producer, any one or more of the following discontinuities to establish a minimum sensitivity level for rejection.

9.3.1 *Drilled Hole*—Drill a hole radially and completely through the pipe wall, care being taken to avoid distortion of the pipe while drilling. The diameter of the hole shall not be larger than 0.031 in. [0.8 mm] for pipe under 0.125 in. [3.2 mm] in wall thickness, not larger than 0.0625 in. [1.6 mm] for pipe between 0.125 in. [3.2 mm] and 0.200 in. [5.0 mm] in wall thickness, and not larger than 0.125 in. [3.2 mm] for pipe over 0.200 in. [5.0 mm] in wall thickness.

9.3.2 *Transverse Tangential Notch*—Using a round tool or file with a ¼-in. [6-mm] diameter, file or mill a notch tangential to the surface and transverse to the longitudinal axis of the pipe. The notch shall have a depth not exceeding 12½ % of the specified wall thickness of the pipe.

9.3.3 *Longitudinal Notch*—Machine a notch 0.031 in. [0.8 mm] or less in width in a radial plane parallel to the pipe axis on the outside surface of the pipe, to have a depth not exceeding 12½ % of the specified wall thickness of the pipe. The length of the notch shall be compatible with the testing method.

9.3.4 *Compatibility*—The discontinuity in the calibration pipe shall be compatible with the testing equipment and method being used.

9.3.5 For flux leakage testing, the longitudinal calibration reference notches shall be straight-sided notches machined in a radial plane parallel to the pipe axis. For specified wall thicknesses less than 0.500 in. [12.7 mm], outside and inside notches shall be used. For specified wall thicknesses equal to or greater than 0.500 in. [12.7 mm], only an outside notch shall be used. The notch depth shall not exceed 12.5 % of the specified wall thickness. The notch length shall not exceed 1 in. [25 mm], and the notch width shall not exceed the notch depth. Outside diameter and inside diameter notches shall be located sufficiently apart to allow separation and identification of the signals.

9.4 Reject pipe producing a signal equal to or greater than the calibration discontinuity.

10. Flattening Test

10.1 Perform the flattening test on pipe in accordance with the following:

10.1.1 *Electric-Resistance-Welded Pipe*— Flatten a specimen at least 4 in. [100 mm] in length cold between paralleled plates in three steps with the weld located either 0 or 90° from the line of direction of force as required in 10.1.1.1. During the first step, a test for ductility of the weld, no cracks or breaks on the inside or outside surfaces shall occur until the distance between the plates is less than two thirds of the original outside diameter of the pipe. As a second step, continue the flattening. During the second step, a test for the ductility exclusive of the weld, no cracks or breaks on the inside or outside surfaces shall occur until the distance between the plates is less than one third of the original outside diameter of the pipe, but is not less than five times the wall thickness of the pipe. During the third step, a test for soundness, continue the flattening until the specimen breaks or the opposite walls of the specimen meet. Evidence of laminated or unsound material or of incomplete weld that is revealed during the entire flattening test shall be cause for rejection.

10.1.1.1 For pipe produced in single lengths, perform the flattening test specified in 10.1.1 on both crop ends from each length of pipe. Alternate the tests from each end with the weld at 0° and at 90° from the line of direction of force. For pipe produced in multiple lengths, perform the flattening test on crop ends representing the front and back of each coil with the weld at 90° from the line of direction of force, and on two intermediate rings representing each coil with the weld 0° from the line of direction of force.

10.1.1.2 For pipe that is to be subsequently reheated throughout its cross section and hot formed by a reducing process, the manufacturer shall have the option of obtaining the flattening test specimens required by 10.1.1.1 either prior to or after such hot reducing.

10.1.2 *Furnace-Welded Pipe*—For furnace-welded pipe, flatten a specimen not less than 4 in. [100 mm] in length cold between parallel plates in three steps. Locate the weld 90° from the line of the direction of force. During the first step, a test for quality of the weld, no cracks or breaks on the inside, outside, or end surfaces shall occur until the distance between the plates is less than three fourths of the original outside diameter of the pipe. As a second step, continue the flattening. During the second step, a test for ductility exclusive of the weld, no cracks or breaks on the inside, outside, or end surfaces shall occur until the distance between the plates is less than 60 % of the original outside diameter of the pipe. During the third step, a test for soundness, continue the flattening until the specimen breaks or the opposite walls of the specimen meet. Evidence of laminated or unsound material, or of incomplete weld that is revealed during the entire flattening test, shall be cause for rejection.

10.2 Surface imperfections in the test specimen before flattening, but revealed during the first step of the flattening test, shall be judged in accordance with the workmanship requirements in Section 15.

10.3 Superficial ruptures as a result of surface imperfections shall not be cause for rejection.

11. Coating

11.1 Galvanized pipe shall be coated with zinc inside and outside by the hot-dip process. The zinc used for the coating shall be any grade of zinc conforming to Specification B6. The galvanized pipe shall be free from uncoated areas, blisters, flux deposits, and gross dross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

11.2 *Weight of Coating:*

11.2.1 The weight of the zinc coating shall not be less than 1.5 oz/ft^2 [0.46 kg/m^2] as determined from the average of two