Designation: A 814/A 814M – 08

Standard Specification for Cold-Worked Welded Austenitic Stainless Steel Pipe[1]

This standard is issued under the fixed designation A 814/A 814M; 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 two classes of flanged and cold-bending quality cold-worked straight-seam single or double welded austenitic steel pipe intended for high-temperature and general corrosive services.

NOTE 1—When the impact test criterion for a low-temperature service would be 15 ft·lbf [20 J] energy absorption or 15 mils [0.38 mm] lateral expansion, some of the austenitic stainless steel grades covered by this specification are accepted by certain pressure vessel or piping codes without the necessity of making the actual test. For example, Grades 304, 304L, and 347 are accepted by the ASME Pressure Vessel Code, Section VIII Division 1, and by the Chemical Plant and Refinery Piping Code, ANSI B31.3 for service at temperatures as low as −425 °F [−250 °C] without qualification by impact tests. Other AISI stainless steel grades are usually accepted for service temperatures as low as −325 °F [−200 °C] without impact testing. Impact testing may, under certain circumstances, be required. For example, materials with chromium or nickel content outside the AISI ranges, and for material with carbon content exceeding 0.10 %, are required to be impact tested under the rules of ASME Section VIII Division 1 when service temperatures are lower than −50 °F [−45 °C].

1.2 Grades TP304H, TP304N, TP316H, TP316N, TP321H, TP347H, and TP348H are modifications of Grades TP304, TP316, TP321, TP347, and TP348, and are intended for high-temperature service.

1.3 Two classes of pipe are covered as follows:

1.3.1 *Class SW*—Pipe, single-welded with no addition of filler metal and

1.3.2 *Class DW*—Pipe, double-welded with no addition of filler metal.

1.4 Optional supplementary requirements are provided for pipe where a greater degree of testing is desired. These supplementary requirements call for additional tests to be made and, when desired, one or more of these may be specified in the order.

1.5 Table 1 lists the dimensions of cold-worked single- or double-welded stainless steel pipe. Pipe having other dimensions may be furnished provided such pipe complies with all other requirements of this specification.

1.6 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification. The inch-pound units shall apply unless the "M" designation of this specification is specified in the order.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 480/A 480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

A 999/A 999M Specification for General Requirements for Alloy and Stainless Steel Pipe

E 112 Test Methods for Determining Average Grain Size

E 381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings

E 527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.2 *ASME Boiler and Pressure Vessel Code:*[3]

Section VIII Division 1, Pressure Vessels

2.3 *SAE Standard:*[4]

SAE J 1086 Practice for Numbering Metals and Alloys (UNS)

3. Ordering Information

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

[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 A01.10 on Stainless and Alloy 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.

[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 Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.

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

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TABLE 1 Pipe Dimensions[A]

NOTE 1—For pipe sizes not listed and for pipe ordered to the "M" designation of this specification, the dimensions and tolerances shall be by agreement between the purchaser and producer.

NPS No.	Outside Diameter	Outside Diameter Tolerance	Schedule	Wall	
				Thickness	Tolerance
⅛	0.405	+0.004	10	0.049	±0.004
		−0.002	40	0.068	±0.005
			80	0.095	±0.006
¼	0.540	+0.005	10	0.065	±0.005
		−0.003	40	0.088	±0.006
			80	0.119.	±0.009
⅜	0.675	+0.006	10	0.065	±0.005
		−0.004	40	0.091	±0.006
			80	0.126	±0.010
½	0.840	+0.007	5	0.065	±0.005
		−0.005	10	0.083	±0.006
			40	0.109	±0.009
			80	0.147	±0.011
¾	1.060	+0.010	5	0.065	±0.005
		−0.007	10	0.083	±0.006
			40	0.113	±0.009
			80	0.154	±0.011
1	1.315	+0.010	5	0.065	±0.005
		−0.007	10	0.109	±0.009
			40	0.133	±0.011
			80	0.179	±0.014
1¼	1.660	+0.012	5	0.065	±0.005
		−0.0080	10	0.109	±0.009
			40	0.140	±0.011
			80	0.191	±0.014
1½	1.900	+0.015	5	0.065	±0.005
		−0.008	10	0.109	±0.009
			40	0.145	±0.011
			80	0.200	±0.015
2	2.375	+0.018	5	0.065	±0.005
		−0.008	10	0.109	±0.009
			40	0.154	±0.011
			80	0.218	±0.015
2½	2.875	+0.020	5	0.065	±0.005
		−0.009	10	0.120	±0.010
			40	0.203	±0.015
			80	0.276	±0.020
3	3.500	+0.025	5	0.083	±0.006
		−0.010	10	0.120	±0.010
			40	0.216	±0.015
			80	0.300	±0.020
3½	4.000	+0.025	5	0.083	±0.006
		−0.010	10	0.120	±0.010
			40	0.226	±0.018
			80	0.318	±0.020
4	4.500	+0.025	5	0.083	±0.006
		−0.010	10	0.120	±0.010
			40	0.237	±0.019
			80	0.337	±0.020

[A] All dimensions in inches.

3.1.1 Quantity (feet, centimetres, or number of lengths),

3.1.2 Name of material (austenitic steel pipe),

3.1.3 Class (1.3). If not specified by the purchaser, the producer shall have the option to furnish either single-welded (SW) or double-welded (DW) pipe,

3.1.4 Grade (Table 2),

3.1.5 Size (NPS or outside diameter and schedule number or average wall thickness),

3.1.6 Length (specific or random) (Section 10),

3.1.7 End finish (Section on Ends of Specification A 999/A 999M),

3.1.8 Optional requirements (Section 9), (Supplementary Requirements S1 to S8),

3.1.9 Test report required (Section on Certification of Specification A 999/A 999M),

3.1.10 Specification designation, and

3.1.11 Special requirements or exceptions to the specification.

4. Materials and Manufacture

4.1 *Manufacture*:

4.1.1 The pipe shall be made by a machine-welding or an automatic-welding process, welding from one or both sides and producing full penetration welds with no addition of filler metal in the welding operation.

4.1.2 Weld repairs, with the addition of compatible filler metal, may be made to the weld joint in accordance with the requirements of the section on Repair by Welding of Specification A 999/A 999M.

4.1.3 Prior to final heat treatment of the pipe, the weld bead must be cold-worked by methods such as forging, planishing, drawing, swaging or bead rolling so as to obtain a flush condition on the inside and outside of the pipe. Undercuts shall be limited to shallow rounded depressions of less than 0.005 in. [0.127 mm] deep on either the inside or outside surface of the pipe with no encroachment of the minimum permitted wall thickness.

4.1.4 The pipe shall be pickled free of scale. When bright annealing is used, pickling is not necessary.

4.2 *Heat Treatment*:

4.2.1 All pipe shall be furnished in the heat-treated condition. The heat-treatment procedure, except for H grades, S30815, N 08367 and S 31254, shall consist of heating the pipe to a minimum temperature of 1900 °F [1040 °C] and quenching in water or rapidly cooling by other means.

4.2.2 All H grades and S30815 shall be furnished in the solution-treated condition. The minimum solution treating temperature for Grades TP321H, TP347H, and TP348H shall be 2000 °F [1100 °C] and for Grades TP304H and TP316H, 1900 °F [1040 °C]. The minimum temperature for S30815 shall be 1920 °F [1050 °C].

4.2.3 The heat-treatment procedure for S 31254 shall consist of heating the pipe to a minimum temperature of 2100 °F [1150 °C] and quenching in water or rapidly cooling by other means.

4.2.4 The heat-treatment procedure for S31727 and S32053 shall consist of heating the pipe to a minimum temperature of 1975 to 2155 °F [1080 to 1180 °C] and quenching in water or rapidly cooling by other means.

4.2.5 UNS N 08367 shall be solution annealed from 2025 °F minimum followed by rapid quenching.

4.3 H grades and S30815 shall have a minimum grain size of 7 or coarser when measured in accordance with Test Methods E 112.

5. Chemical Composition

5.1 The steel shall conform to the chemical composition prescribed in Table 2.

5.2 When specified on the purchase order, a product analysis shall be supplied from one tube or coil of steel per heat. The product analysis tolerance of Specification A 480/A 480M shall apply.

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TABLE 2 Chemical Requirements

Grade	UNS Designation[A]	Composition, %													
		Carbon, max[B]	Manganese, max[B]	Phosphorus, max	Sulfur, max	Silicon	Nickel	Chromium	Molybdenum	Titanium	Columbium plus Tantalum	Tantalum, max	Nitrogen[C]	Vanadium	Copper	Cerium
TP 201	S20100	0.15	5.5–7.5	0.060	0.030	1.00	3.5–5.5	16.0–18.0	. . .	. . .	. . .	. . .	0.25	. . .	. . .	. . .
TP 201LN	S20153	0.03	6.4–7.5	0.045	0.015	0.75	4.0–5.0	16.0–17.5	. . .	. . .	. . .	. . .	0.10–0.25	. . .	1.00	. . .
TP 304	S30400	0.08	2.00	0.045	0.030	1.00 max	8.0–11.0	18.0–20.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 304H	S30409	0.04–0.10	2.00	0.045	0.030	1.00 max	8.0–11.0	18.0–20.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 304L	S30403	0.030[D]	2.00	0.045	0.030	1.00 max	8.0–13.0	18.0–20.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 304N	S30451	0.08	2.00	0.045	0.030	1.00 max	8.0–11.0	18.0–20.0	. . .	. . .	. . .	. . .	0.10–0.16	. . .	. . .	. . .
TP 304LN	S30453	0.030	2.00	0.045	0.030	1.00 max	8.0–11.0	18.0–20.0	. . .	. . .	. . .	. . .	0.10–0.16	. . .	. . .	. . .
TP 309Cb	S30940	0.08	2.00	0.045	0.030	1.00 max	12.0–16.0	22.0–24.0	. . .	. . .	10 × C min, 1.10 max	. . .	. . .	. . .	. . .	. . .
TP309S	S30908	0.08	2.00	0.045	0.030	1.00 max	12.0–15.0	22.0–24.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 310Cb	S31040	0.08	2.00	0.045	0.030	1.00 max	19.0–22.0	24.0–26.0	. . .	. . .	10 × C min, 1.10 max	. . .	. . .	. . .	. . .	. . .
TP 310S	S31008	0.08	2.00	0.045	0.030	1.00 max	19.0–22.0	24.0–26.0	0.75 max	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 316	S31600	0.08	2.00	0.045	0.030	1.00 max	10.0–14.0	16.0–18.0	2.00–3.00	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 316H	S31609	0.04–0.10	2.00	0.045	0.030	1.00 max	10.0–14.0	16.0–18.0	2.00–3.00	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 316L	S31603	0.030[D]	2.00	0.045	0.030	1.00 max	10.0–14.0	16.0–18.0	2.00–3.00	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 316N	S31651	0.08	2.00	0.045	0.030	1.00 max	10.0–14.0	16.0–18.0	2.00–3.00				0.10–0.16	. . .	. . .	. . .
TP 316LN	S31653	0.030	2.00	0.045	0.030	1.00 max	10.0–14.0	16.0–18.0	2.00–3.00	. . .	. . .	. . .	0.10–0.16	. . .	. . .	. . .
TP 317	S31700	0.08	2.00	0.045	0.030	1.00 max	11.0–14.0	18.0–20.0	3.0–4.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP 317L	S31703	0.030	2.00	0.045	0.030	1.00 max	11.0–15.0	18.0–20.0	3.0–4.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .
. . .	S31727	0.030	1.00	0.030	0.030	1.00	14.5–16.5	17.5–19.0	3.8–4.5	. . .	. . .	. . .	0.15–0.21	. . .	2.8–4.0	. . .
. . .	S32053	0.030	1.00	0.030	0.010	1.00	24.0–26.0	22.0–24.0	5.0–6.0	. . .	. . .	. . .	0.17–0.22	. . .	. . .	. . .
TP 321	S32100	0.08	2.00	0.045	0.030	1.00 max	9.00–13.0	17.0–19.0	. . .	[E]	. . .	. . .	. . .	. . .	. . .	. . .
TP 321H	S32109	0.04–0.10	2.00	0.045	0.030	1.00 max	9.00–13.0	17.0–19.0	. . .	[F]	. . .	. . .	. . .	. . .	. . .	. . .
TP 347	S34700	0.08	2.00	0.045	0.030	1.00 max	9.00–13.0	17.0–19.0	. . .	. . .	[G]	. . .	. . .	. . .	. . .	. . .
TP347H	S34709	0.04–0.10	2.00	0.045	0.030	1.00 max	9.00–13.0	17.0–19.0	. . .	. . .	[H]	. . .	. . .	. . .	. . .	. . .
TP 348	S34800	0.08	2.00	0.045	0.030	1.00 max	9.00–13.0	17.0–19.0	. . .	. . .	[G]	0.10	. . .	. . .	. . .	
TP 348H	S34809	0.04–0.10	2.00	0.045	0.030	1.00 max	9.00–13.0	17.0–19.0	. . .	. . .	[H]	0.10	. . .	. . .	. . .	. . .
TP XM-10	S21900	0.08	8.0–10.0	0.045	0.030	1.00 max	5.5–7.5	19.0–21.5	. . .	. . .	. . .	. . .	0.15–0.40	. . .	. . .	. . .
TP XM-11	S21903	0.04	8.0–10.0	0.045	0.030	1.00 max	5.5–7.5	19.0–21.5	. . .	. . .	. . .	. . .	0.15–0.40	. . .	. . .	. . .
TP XM-15	S38100	0.08	2.00	0.030	0.030	1.50–2.50	17.5–18.5	17.0–19.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
TP XM-19	S20910	0.06	4.0–6.0	0.045	0.030	1.00 max	11.5–13.5	20.5–23.5	1.50–3.00	. . .	0.10–0.30	. . .	0.20–0.40	0.10–0.30	. . .	. . .
TP XM-29	S24000	0.08	11.5–14.5	0.060	0.030	1.00 max	2.3–3.7	17.0–19.0	. . .	. . .	. . .	. . .	0.20–0.40	. . .	. . .	. . .
. . .	S31254	0.020	1.00	0.030	0.010	0.80 max	17.5–18.5	19.5–20.5	6.0–6.5	. . .	. . .	. . .	0.18–0.22	. . .	0.50–1.00	. . .
. . .	S30815	0.05–0.10	0.80	0.040	0.030	1.40–2.00	10.0–12.0	20.0–22.0	. . .	. . .	. . .	. . .	0.14–0.20	. . .	. . .	0.03–0.08
	N08367	0.030	2.00	0.040	0.030	1.00 max	23.5-25.5	20.0-22.0	6.0-7.0	. . .	. . .	. . .	0.18-0.25	. . .	0.75 max	. . .

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[A] New designation established in accordance with Practice E 527 and SAE J 1086.
[B] Maximum, unless otherwise indicated.
[C] The method of analysis for nitrogen shall be a matter of agreement between the purchaser and manufacturer.
[D] For small diameter or thin walls or both, where many drawing passes are required, a carbon maximum of 0.040 % is necessary in grades TP304L and TP316L. Small outside diameter tubes are defined as those less than 0.500 in. [12.7 mm] in outside diameter and light wall tubes as those less than 0.049 in. [1.2 mm] in average wall thickness (0.044 in. [1 mm] in minimum wall thickness).
[E] The titanium content shall be not less than five times the carbon content and not more than 0.70 %.
[F] The titanium content shall be not less than four times the carbon content and not more than 0.70 %.
[G] The columbium plus tantalum content shall be not less than ten times the carbon content and not more than 1.10 %.
[H] The columbium plus tantalum content shall be not less than eight times the carbon content and not more than 1.10 %.

6. Tensile Requirements

6.1 The tensile properties of the material shall conform to the requirements prescribed in Table 3.

7. Permissible Variations in Dimensions

7.1 *Specified Diameter*—The diameter at any point in each length of pipe shall be within the tolerance specified in Table 1.

7.2 *Alignment (Camber)*—Using a 3-ft [1.0-m] straightedge placed so that both ends are in contact with the pipe, the camber shall not be more than 0.030-in. [0.8-mm].

7.3 *Thickness*—The wall thickness at any point in the pipe shall be within the thickness tolerance specified in Table 3, except that for pipe in which the wall thickness exceeds 0.188-in. [4.8-mm] a weld reinforcement of up to 0.015-in. [0.38-mm] is permitted on the inside of the pipe.

TABLE 3 Tensile Requirements

Grade	UNS Designation	Tensile Strength, min ksi [MPa]	Yield Strength, min ksi [MPa]
TP201	S20100	75 [515]	38 [260]
TP201LN	S20153	95 [665]	45 [130]
TP304L	S30403	70 [485]	25 [170]
TP316L	S31603	70 [485]	25 [170]
TP304	S30400	75 [515]	30 [205]
TP304H	S30409	75 [515]	30 [205]
TP309CB	S30940	75 [515]	30 [205]
TP309S	S30908	75 [515]	30 [205]
TP310Cb	S31040	75 [515]	30 [205]
TP310S	S31008	75 [515]	30 [205]
TP316	S31600	75 [515]	30 [205]
TP316H	S31609	75 [515]	30 [205]
TP317	S31700	75 [515]	30 [205]
TP317L	S31703	75 [515]	30 [205]
TP321	S32100	75 [515]	30 [205]
TP321H	S32109	75 [515]	30 [205]
TP347	S34700	75 [515]	30 [205]
TP347H	S34709	75 [515]	30 [205]
TP348	S34800	75 [515]	30 [205]
TP348H	S34809	75 [515]	30 [205]
TPXM-10	S21900	90 [620]	50 [345]
TPXM-11	S21903	90 [620]	50 [345]
TPXM-15	S38100	75 [515]	30 [205]
TPXM-29	S24000	100 [690]	55 [380]
TPXM-19	S20910	100 [690]	55 [380]
TP304N	S30451	80 [550]	35 [240]
TP316N	S31651	80 [550]	35 [240]
TP304LN	S30453	75 [515]	30 [205]
TP316LN	S31653	75 [515]	30 [205]
...	S31254	94 [650]	44 [300]
...	S31727	80 [550]	36 [245]
...	S32053	93 [640]	43 [295]
...	S30815	87 [600]	45 [310]
. . .	N08367		
	t≤0.187	100 [690]	45 [310]
	t>0.187	95 [655]	45 [310]

8. Lengths

8.1 Pipe lengths shall be in accordance with the following regular practice.

8.1.1 Unless otherwise agreed upon, all sizes up to and including NPS 4 are available in a length up to 24 ft (Note 2) with the permissible range of 15 of 24 ft (Note 2).

NOTE 2—The value(s) applies when the inch-pound designation of this specification is the basis of purchase. When the "M" designation of this specification is the basis of purchase, the corresponding metric value(s) shall be agreed upon between the manufacturer and purchaser.

8.1.2 If definite cut lengths are desired, the lengths required shall be specified in the order. No pipe shall be under the specified length and not more than ¼ in. [6 mm] over that specified.

8.1.3 No jointers are permitted unless otherwise specified.

9. Workmanship, Finish, and Appearance

9.1 The finished pipes shall be free of injurious imperfections and shall have a workmanlike finish. Minor imperfections may be removed by grinding, provided the wall thicknesses are not decreased to less than that permitted in Section 9.

10. General Requirements

10.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification A 999/A 999M unless otherwise provided herein.

11. Examination of Double-Welded Pipe

11.1 Both ends of each double-welded (Class DW) pipe shall be visually examined to determine that complete fusion was attained between the two welds. In lieu of examining the ends of the pipe, this examination may be performed on cropped ends removed from both ends of each double welded pipe.

12. Mechanical Tests Required

12.1 *Transverse or Longitudinal Tension Test*—One tension test shall be made on a specimen for lots of not more than 100 pipes. Tension tests shall be made on specimens from two tubes for lots of more than 100 pipes.

NOTE 3—The term "lot", for mechanical tests, applies to all pipe of the same nominal size and wall thickness (or schedule) which is produced from the same heat of steel and subjected to the same finishing treatment (*1*) in a continuous heat-treatment furnace, or (*2*) in a batch-type heat-treatment furnace, equipped with recording pyrometers and automatically controlled within a 50 °F [30 °C] range, the larger of (*a*) Each 200 ft [60 m] or fraction thereof or, (*b*) That pipe heat treated in the same batch furnace charge.

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12.2 *Flattening Test*—For material heat treated in a batch-type furnace, flattening tests shall be made of 5 % of the pipe from each heat-treated lot. For material heat treated by the continuous process, this test shall be made on a sufficient number of pipe to constitute 5 % of the lot, but in no case less than two lengths of pipe.

12.2.1 For pipe where the diameter equals or exceeds NPS 10, a transverse-guided face bend test of the weld may be conducted instead of a flattening test in accordance with the method outlined in the steel tubular product supplement of Test Methods and Definitions A 370. The ductility of the weld shall be considered acceptable when there is no evidence of cracks in the weld or between the weld and the base metal after bending. Test specimens from 5 % of the lot shall be taken from the pipe or test plates of the same material as the pipe, the test plates being attached to the end of the cylinder and welded as a prolongation of the pipe longitudinal seam.

12.3 *Hydrostatic Test*—Each length of pipe shall be subjected to the hydrostatic test in accordance with Specification A 999/A 999M.

13. Product Marking

13.1 In addition to the marking specified in Specification A 999/A 999M, the marking shall include the manufacturer's identifying mark and double-welded pipe shall be identified with the mark (DW). For Grades TP304H, TP316H, TP321H, TP347H, TP348H, and S 30815, the marking shall also include the heat number and heat-treatment lot identification. If specified in the purchase order, the marking for pipe larger than NPS 4 shall include the weight.

14. Keywords

14.1 austenitic stainless steel pipe; cold-worked pipe

SUPPLEMENTARY REQUIREMENTS

One or more of the following supplementary requirements shall apply only when specified in the purchase order. The purchaser may specify a different frequency of test or analysis than is provided in the supplementary requirement. Subject to agreement between the purchaser and manufacturer, retest and retreatment provisions of these supplementary requirements may also be modified.

S1. Product Analysis

S1.1 For all pipe NPS 5 and larger in nominal size, there shall be one product analysis made of a representative sample from one piece for each ten lengths or fraction thereof from each heat of steel.

S1.2 For pipe smaller than NPS 5 in nominal size there shall be one product analysis made from ten lengths per heat of steel or from 10 % of the number of lengths per heat of steel, whichever number is smaller.

S1.3 Individual lengths failing to conform to the chemical requirements specified in Section 6 shall be rejected.

S2. Transverse Tension Tests

S2.1 There shall be one transverse tension test made from one end of 10 % of the lengths furnished per heat of steel. This applies only to pipe NPS 8 and larger in nominal size.

S2.2 If a specimen from any length fails to conform to the tensile properties specified, that length shall be rejected.

S3. Flattening Test

S3.1 The flattening test of Specification A 999/A 999M shall be made on a specimen from one or both ends of each pipe. Crop ends may be used. If this supplementary requirement is specified, the number of tests per pipe shall also be specified. If a specimen from any length fails because of ductility prior to satisfactory completion of the first step of the flattening test requirement, that pipe shall be rejected subject to retreatment in accordance with Specification A 999/A 999M and satisfactory retest. If a specimen from any length of pipe fails because of a lack of soundness, that length shall be rejected, unless subsequent retesting indicates that the remaining length is sound.

S4. Etching Tests

S4.1 The steel shall be homogeneous as shown by etching tests conducted in accordance with the appropriate portions of Method E 381. Etching tests shall be made on a cross section from one end or both ends of each pipe and shall show sound welds and reasonably uniform material free of injurious laminations, cracks, and similar objectionable imperfections. If this supplementary requirement is specified, the number of tests per pipe required shall also be specified. If a specimen from any length shows objectionable imperfections, the length shall be rejected subject to the removal of the defective end and subsequent retests indicating the remainder of the length to be sound and reasonably uniform material.

S5. Eddy Current Examination

S5.1 Pipe soundness shall be determined through eddy-current examination made in accordance with requirements as agreed upon between the pipe manufacturer and purchaser.

S6. Ultrasonic Examination

S6.1 Pipe soundness shall be determined through ultrasonic examination made in accordance with requirements as agreed upon between the pipe manufacturer and purchaser.

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S7. Corrosion Requirements

S7.1 *Boiling Nitric Acid Test*—Except for Grade TP 321, coupons representing finished pipe made of nonmolybdenum-bearing material (0.50 % and less molybdenum) shall meet the requirements Practice C of Practices A 262. The condition of the test specimens and the corrosion rates are as follows: Types 304L, 304LN, 347, and Type 348 shall be tested in the sensitized condition (heated for 1 h at 1240 °F [670 °C]) and the rate of penetration shall not exceed 0.0020 in. [0.05 mm]/month. All other nonmolybdenum-bearing types, except for Grade TP 321, shown in Table 2 shall be tested in the annealed and unsensitized condition and the rate of penetration when solution tested in accordance with Practice C shall not exceed 0.0015 in./month [0.038 mm/month].

S7.2 *Acidified Copper Sulfate Test*—Coupons representing finished pipe made of molybdenum-bearing material (over 0.50 % molybdenum) and Type 321 shall meet the requirements of Practice E of Practices A 262. The condition of the test specimen is as follows: Types 316L, 316LN, 317L and 321 shall be tested in the sensitized condition (heated for 1 h at 1240 °F [670 °C]). All molybdenum-bearing types shown in Table 2 shall be tested in the annealed and unsensitized condition. All specimens shall meet the requirements of the prescribed bend tests.

S8. Flange Test

S8.1 A section of pipe shall be capable of having a flange turned over at a right angle to the body of the pipe without cracking. The width of the flange shall be not less than 15 % of the oustide diameter of the pipe.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this specification since the last issue, A 814/A 814M – 07, that may impact the use of this specification. (Approved March 1, 2008)

(*1*) Added Types 201 and 201LN to Table 2 and Table 3.

Committee A01 has identified the location of selected changes to this specification since the last issue, A 814/A 814M – 05, that may impact the use of this specification. (Approved September 1, 2007)

(*1*) Added new 4.2.4 and renumbered subsequent paragraphs.

(*2*) Added S31727 and S32053 to Table 2 and Table 3.

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