



Designation: A984/A984M – 03(Reapproved 2009)

Standard Specification for Steel Line Pipe, Black, Plain-End, Electric-Resistance- Welded¹

This standard is issued under the fixed designation A984/A984M; 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 electric-resistance-welded, black, plain-end, steel pipe for use in the conveyance of fluids under pressure. Pipe in sizes NPS 1 to 26, inclusive, with nominal wall thickness 0.750 in. [19.1 mm] or less, as given in ASME B36.10M is included. Pipe having other dimensions, in this size range, may be furnished provided such pipe complies with all other requirements of this specification.

1.2 It is intended that the pipe be capable of being circumferentially welded in the field when welding procedures in accordance with the requirements of the applicable pipeline construction code are used.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. 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.

2. Referenced Documents

2.1 ASTM Standards:²

- A370 Test Methods and Definitions for Mechanical Testing of Steel Products
- A450/A450M Specification for General Requirements for Carbon and Low Alloy Steel Tubes
- A530/A530M Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe
- A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

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.

2.2 API Standard:

API RP 5L3 Recommended Practice for Conducting Drop-Weight Tear Tests on Line Pipe³

2.3 ASME Standard:

ASME B36.10M Welded and Seamless Wrought Steel Pipe⁴

3. Terminology

3.1 *Definitions*—For terminology used in this specification, refer to Terminology A941.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *electric-resistance welding*, *n*—electric-resistance welding is a process of forming a longitudinal seam wherein the edges are pressed together mechanically after the heat for welding has been generated by the resistance to the flow of electric current.

3.2.2 *lot*, *n*—a quantity of pipe of the same ordered diameter, heat, wall thickness, and grade, as given in Table 1.

3.2.3 *specified outside diameter (OD)*, *n*—the outside diameter specified in the purchase order or the outside diameter listed in ASME B36.10M for the nominal pipe size specified in the purchase order.

4. General Requirements

4.1 Pipe furnished under this specification shall conform to the applicable requirements of Specification A530/A530M unless otherwise provided herein.

5. Ordering Information

5.1 It is the purchaser's responsibility to specify in the purchase order all information necessary to purchase the needed material. Examples of such information include, but are not limited to, the following:

5.1.1 Specification designation and year of issue,

5.1.2 Quantity (feet or metres),

5.1.3 Grade (standard or intermediate, see Table 2 and 8.1.6),

³ Available from The American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005.

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990.

TABLE 1 Lot Size and Sample Size for Mechanical and Impact Testing

Size Designation	Lot Size	Sample Size
<NPS 2	50 tons [45 Mg] or fraction thereof	1
NPS 2 through NPS 5	400 lengths	1
NPS 6 through NPS 12	200 lengths	1
>NPS 12	100 lengths	1

TABLE 2 Tensile Requirements

Grade	Yield Strength, Min		Yield Strength, ^A Max		Tensile Strength, Min	
	psi	MPa	psi	MPa	psi	MPa
35	35 000	240	65 000	450	60 000	415
50	50 000	345	77 000	530	70 000	485
60	60 000	415	80 000	550	75 000	515
70	70 000	485	87 000	600	80 000	550
80	80 000	550	97 000	670	90 000	620

^A See 8.1.1.

5.1.4 Size (either nominal (NPS) or outside diameter and wall thickness),

5.1.5 Length (see 12.4),

5.1.6 End finish (plain-end beveled or special, see 13.1),

5.1.7 End use of the pipe,

5.1.8 Special requirements,

5.1.9 Supplementary requirements, and

5.1.10 Bar coding (see 16.3).

6. Manufacture

6.1 Pipe shall be manufactured by the electric-resistance-welding process. The entire pipe shall be normalized or the weld seam and its heat-affected zones shall receive a continuous in-line heat treatment above the A_{c3} temperature. Complete penetration and coverage of the weld seam and its heat-affected zones by such heat treatment shall be confirmed by metallographic examination of weld area cross-section specimens, taken at least once per eight hours per operating shift, but more frequently if diameter or wall thickness changes are made.

6.2 The internal and external flash resulting from the welding process shall be removed (see 14.1 and 14.2).

7. Chemical Composition

7.1 The steel for any grade, by heat and product analyses, shall contain no more than 0.22 % carbon, 0.015 % sulfur, and 0.025 % phosphorus.

7.2 The steel shall contain no more than 0.0007 % boron, by heat analysis.

7.3 The carbon equivalent (CE) shall not exceed 0.40 %, calculated from the product analysis using the following equation:

$$CE = C + F \left[\frac{Mn}{6} + \frac{Si}{24} + \frac{Cu}{15} + \frac{Ni}{20} + \frac{(Cr + Mo + V + Cb)}{5} \right] \quad (1)$$

where:

F is a compliance factor that is dependent upon the carbon content, as given below:

Carbon Content, %	F	Carbon Content, %	F
< 0.06	0.53	0.15	0.88
0.06	0.54	0.16	0.92
0.07	0.56	0.17	0.94
0.08	0.58	0.18	0.96
0.09	0.62	0.19	0.97
0.10	0.66	0.20	0.98
0.11	0.70	0.21	0.99
0.12	0.75	0.22	1.00
0.13	0.80		
0.14	0.85		

7.4 Product analyses shall be made on at least two samples from each heat of steel.

7.5 All analyses shall be in accordance with Test Methods, Practices, and Terminology A751, and shall include all elements required in the carbon equivalent equation of 7.3, in addition to titanium, phosphorus, sulfur, and boron, except that product analysis for boron is not required.

7.6 If one or both of the product analyses representing a heat fails to conform to the specified requirements, the heat shall be rejected, or analyses shall be made on double the original number of test samples that failed, each of which shall conform to the specified requirements.

8. Mechanical Properties

8.1 Tension Test:

8.1.1 The material shall conform to the tensile requirements given in Table 2 and in 8.1.6. The yield strength maxima apply only to pipe NPS 8 and larger.

8.1.2 The yield strength corresponding to a total extension under load of 0.5 % of the gage length shall be determined.

8.1.3 A test specimen taken across the weld shall show a tensile strength not less than the minimum tensile strength specified for the grade of pipe required. Neither yield strength nor elongation determinations are required for transverse weld specimens. This test is not required for pipe smaller than NPS 8.

8.1.4 Transverse tension tests shall be performed on pipe NPS 8 and larger and the test specimens shall be taken opposite the weld. All transverse test specimens shall be approximately 1½ in. [38 mm] wide in the gage length and each shall represent the full wall thickness of the pipe from which the test specimen was cut.

8.1.5 Longitudinal tension tests shall be performed on pipe smaller than NPS 8. Longitudinal test specimens shall be either full-size test specimens or strip test specimens, at the option of the manufacturer. Strip test specimens shall be from a location approximately 90° from the weld.

8.1.6 Grades intermediate to those given in Table 2 may be furnished. For intermediate grades, the difference between the specified maximum yield strength and the specified minimum yield strength and the difference between the specified minimum tensile strength and the specified minimum yield strength shall be as given in Table 2 for the next higher listed grade. For each grade, the minimum elongation in 2 in. [50 mm] shall be calculated using the following equation:

$$e = C \frac{A^{0.2}}{U^{0.9}} \quad (2)$$

where: