



Designation: A1005/A1005M – 00 (Reapproved 2004)

Standard Specification for Steel Line Pipe, Black, Plain End, Longitudinal and Helical Seam, Double Submerged-Arc Welded¹

This standard is issued under the fixed designation A1005/A1005M; 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 double submerged-arc welded, black, plain end steel pipe for use in the conveyance of fluids under pressure. Pipe in sizes NPS 16 and larger, as given in **ASME B36.10**, are included; pipe having other dimensions, in this size range, are permitted, provided such pipe complies with all other requirements of this specification.

1.2 It is intended that pipe be capable of being 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 inch-pound units or in SI units are to be regarded separately as standard. The values in each system are not exact equivalents, therefore, each system is to be used independently of the other, without combining values in any way.

1.4 The following precautionary statement pertains to the test method portion, Section 14 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 and health practices and determine the applicability of regulatory limitations prior to use.*

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

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.

Current edition approved Sept 1, 2004. Published October 2004. Originally approved in 2000. Last previous edition approved in 2000 as A1005/A1005M – 00^ε. DOI: 10.1520/A1005_A1005M-00R04.

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.

A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

2.2 ASME Standards:

ASME B36.10 Welded and Seamless Wrought Steel Pipe³

ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels³

ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications³

2.3 API Publications:

API RP 5L3 Recommended Practice for Conducting Drop-Weight Tear Tests on Line Pipe⁴

API Standard 1104 Welding of Pipelines and Related Facilities⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *double submerged-arc welding, n*—a welding process that produces coalescence of metals by heating them with an arc of arcs between a bare metal electrode or electrodes and the work pieces, using at least one pass from the inside and at least one pass from the outside to make the longitudinal, helical, and skelp end weld seams, whichever are applicable, the arc or arcs and the molten metal are shielded by a blanket of granular, fusible material on the work pieces.

3.1.2 *jointer, n*—not more than three lengths of pipe circumferentially welded together to produce a single length that complies with the length provisions of this specification.

3.1.3 *skelp, n*—the flat rolled product intended to be formed into pipe.

3.1.4 *skelp end, n*—the weld joining the ends of two lengths of skelp.

3.1.5 *specified outside diameter, n*—the outside diameter shown in B36.10M or that stated on the order.

3.1.6 *test lot, n*—a quantity of pipe of the same ordered diameter, heat, and wall thickness.

3.2 *Definitions:* For definitions of other terms used in this specification, refer to Terminology **A941**.

³ Available from American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990.

⁴ Available from American Petroleum Institute (API), 1220 L Street, N.W., Washington, DC 20005-4070.

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 Information items to be considered, if appropriate, for inclusion in the purchase order are as follows:

- 5.1.1 Specification designation and year of issue,
- 5.1.2 Quantity (feet or metres),
- 5.1.3 Grade (see **Table 1** or **8.5**),
- 5.1.4 Size, either nominal (NPS) or outside diameter and wall thickness,
- 5.1.5 Nominal length (see **16.3**),
- 5.1.6 Diameter tolerances for pipe larger than NPS 43 (see **16.4**),
- 5.1.7 End finish (plain and beveled or special, see **17.1**),
- 5.1.8 Jointers (See Section **19**),
- 5.1.9 Special requirements,
- 5.1.10 Supplementary requirements,
- 5.1.11 Charpy V-notch impact energy (see **9.4**), and
- 5.1.12 Bar coding (see **21.2**).

6. Materials and Manufacture

6.1 Skelp widths for helical seam pipe shall be neither less than 0.8 nor more than 3.0 times the pipe's specified outside diameter.

6.2 The longitudinal, helical, and skelp end welds, whichever are applicable, shall be made using welding procedures qualified in accordance with the requirements of the **ASME Boiler and Pressure Vessel Code, Section IX**.

6.3 Skelp end welds shall not be permitted in finished pipe, except for helical seam pipe having its skelp end welds manufactured by double submerged-arc welding. For such pipe, skelp ends shall have been properly prepared for welding. Junctions of skelp end welds and helical seam welds shall not be located within 12 in. [300 mm] of pipe ends or jointer welds. Junctions of skelp end welds and jointer welds shall be separated by a minimum circumferential distance of 6 in. [150 mm] from junctions of the helical seam weld and the jointer weld. Skelp end welds shall be permitted at finished pipe ends, provided that there is a minimum circumferential separation of 6 in. [150 mm] between the skelp end weld and the helical seam weld at the applicable pipe ends.

7. Chemical Composition

7.1 The steel for any grade shall contain no more than 0.16 % carbon, by heat and product analyses.

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 any reported 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 on the carbon content as follows:

Carbon Content, %	F	Carbon Content, %	F
<0.06	0.53	0.11	0.70
0.06	0.54	0.12	0.75
0.07	0.56	0.13	0.80
0.08	0.58	0.14	0.85
0.09	0.62	0.15	0.88
0.10	0.66	0.16	0.92

7.4 A heat analysis shall be made for each heat of steel furnished under this specification.

7.5 Product analyses shall be made on at least two samples from each heat of steel. Product analysis for boron is not required.

7.6 Except as provided in **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.

7.7 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 requirements.

8. Tensile Property Requirements

8.1 Except as allowed by **8.5** the material shall conform to the requirements for tensile properties given in **Table 1**.

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

8.3 A test specimen taken across the longitudinal, helical, or skelp end weld, whichever are applicable, shall show a tensile strength not less than the minimum tensile strength specified for the grade of pipe required. Test specimens shall contain the weld reinforcement and shall exhibit at least 10 % elongation in 2 in. [50 mm].

8.4 Transverse body tension test specimens shall be taken opposite the weld, for longitudinally welded pipe. For helical welded pipe the transverse body tension test shall be taken 90° to the axis of the pipe and approximately halfway between adjacent weld convolutions.

8.5 Grades intermediate to those given in **Table 1** shall be furnished if so specified in the purchase order. For such grades, the permissible yield strength range shall be as given in **Table 1** for the next higher grade, and the required minimum tensile strength shall exceed the required minimum yield strength by the same amount as given in **Table 1** for the next higher grade.

8.6 The ratio of yield strength to tensile strength for all pipe body tests shall not exceed 0.90 for Grades 70 and lower. For grades higher than Grade 70, the ratio shall not exceed 0.93.

TABLE 1 Tensile Requirements^A

Grade	Yield Strength, min psi	Yield Strength, max MPa	Yield Strength, max psi	Yield Strength, max MPa	Tensile Strength, min psi	Tensile Strength, min MPa
35	35000	[240]	65 000	[450]	60 000	[415]
50	50000	[345]	77 000	[530]	70 000	[485]
60	60000	[415]	80 000	[550]	75 000	[515]
70	70000	[485]	87 000	[600]	80 000	[550]
80	80000	[550]	97 000	[670]	90 000	[620]

^A Yield strength requirements do not apply to transverse weld tests.