



Designation: A 539 – 90a

Standard Specification for Electric-Resistance-Welded Coiled Steel Tubing for Gas and Fuel Oil Lines¹

This standard is issued under the fixed designation A 539; 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.

This specification has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This specification covers one grade of electric-resistance-welded coiled steel tubing 2 $\frac{3}{8}$ in. (60.3 mm) and under in outside diameter and 0.035 to 0.125 in. (0.89 to 3.18 mm), inclusive, in average wall thickness. The tubing is intended for conveyance of gas and fuel oil.

1.2 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

A 450/A 450M Specification for General Requirements for Carbon, Ferritic Alloy, and Austenitic Alloy Steel Tubes²

E 30 Test Methods for Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron, and Wrought Iron³

3. General Requirements for Delivery

3.1 Material furnished to this specification shall conform to the applicable requirements of the current edition of Specification A 450/A 450M, unless otherwise provided herein.

4. Ordering Information

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

- 4.1.1 Quantity (number of feet),
- 4.1.2 Name of material (electric-resistance-welded tubing),
- 4.1.3 Tube size (specified outside diameter and wall thickness),
- 4.1.4 Check analysis (see 6.1),
- 4.1.5 Specification designation,
- 4.1.6 End use of material, and
- 4.1.7 Test pressure, if higher than minimum specified (see 11.4).

5. Chemical Composition

5.1 The steel shall conform to the requirements as to chemical composition prescribed in Table 1. For referee purposes, Test Methods E 30 shall be used.

5.2 Supplying an alloy grade of steel that specifically requires the addition of any element other than those listed in Table 1 is not permitted.

6. Check Analysis

6.1 When requested in the purchase order, a check analysis shall be made by the supplier from one coil per lot (Note 1). The chemical composition, thus determined, shall conform to the specified requirements.

NOTE 1—A lot consists of 250 coils or less of one size produced from the same heat of steel.

6.2 If the original test for check analysis fails, retests of two additional coils shall be made. Both retests, for the elements in question, shall meet the requirements of the specification; otherwise, all remaining material in the lot shall be rejected or, at the option of the producer, each coil may be tested for acceptance. Coils which do not meet the requirements of this specification shall be rejected.

7. Tensile Requirements

7.1 The material shall conform to the requirements as to tensile properties prescribed in Table 2.

NOTE 2—Footnote A of Table 2 gives the computed minimum elongation values for each $\frac{1}{32}$ in. (0.79 mm) decrease in wall thickness. Where the wall thickness lies between two values shown, the minimum elongation value shall be determined by the following equation:

$$E = 48t + 15.00$$

where:

E = elongation in 2 in. or 50 mm, %, and
 t = actual thickness of specimen, in. (mm).

8. Height of Flash

8.1 The inside welding flash need not be removed. The height of flash shall not exceed the wall thickness or $\frac{3}{32}$ in. (4.8 mm) whichever is smaller.

¹ This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys, and is the direct responsibility of Subcommittee A01.10 on Tubing.

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² Annual Book of ASTM Standards, Vol 01.01.

³ Annual Book of ASTM Standards, Vol 03.05.

TABLE 1 Chemical Requirements

Element	Composition, %, max
Carbon	0.15
Manganese	0.63
Phosphorus	0.035
Sulfur	0.055



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TABLE 2 Tensile Requirements

Tensile strength, min, ksi (MPa)	45 (310)
Yield strength, min, ksi (MPa)	35 (241)
Elongation in 2 in. or 50 mm, min, %:	21
Basic minimum elongation for 0.125-in. (3.18-mm) wall	
For tube walls lighter than 0.125 in. (3.18 mm), a deduction for each 1/32 in. (0.79 mm) decrease in wall thickness below 0.125 in. from the basic minimum elongation of the following percentage points	1.50 ^A

^A The following table gives the computed minimum values:

Wall Thickness		Elongation in 2 in. or 50 mm, min, %
in.	mm	
1/8 (0.125)	3.18	21.0
3/32 (0.094)	2.38	20.0
1/16 (0.062)	1.59	18.0
1/32 (0.031)	0.79	17.0

9. Dimensions and Permissible Variations

9.1 The outside diameter shall not vary more than ± 0.007 in. (± 0.18 mm) from the specified size.

9.2 The minimum wall thickness at any point shall be not more than 10.0 % under the specified wall thickness.

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10. Workmanship, Finish, and Appearance

10.1 Tubing shall be free of imperfections in excess of 10 % of the specified wall thickness and shall have a workmanlike finish.

11. Number of Tests

11.1 One longitudinal tension test shall be made on one length from each lot of 250 coils or fraction thereof.

11.2 A flattening test shall be made on both crop ends cut from each coil of tubing, with the weld located alternately at zero and 90° from the line of direction of force.

11.3 Each tube shall be tested by the non-destructive electric method.

11.4 Each coil of tubing shall be pressure tested at the mill at 150 psi (1034 kPa) gage min pressure for a minimum of 10 s.

12. Product Marking

12.1 In addition to the marking specified in Specification A 450/A 450M, the marking shall include the test pressure, when that pressure is higher than the minimum specified in 11.4. The marking shall be legibly stenciled on a tag securely attached to each coil.