Designation: A 774/A 774M – 06

Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures[1]

This standard is issued under the fixed designation A 774/A 774M; 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 five grades of as-welded, wrought austenitic stainless steel fittings for low-pressure piping and intended for low and moderate temperatures and general corrosive service. Users should note that certain corrosive conditions may restrict the use of one or more grades. For applications requiring a product that requires heat treatment or full pressure rating, refer to Specification A 403/A 403M. The term "fittings" applies to butt and socket welding parts such as 45° and 90° elbows, tees, reducers, wyes, laterals, crosses, and stub ends.

1.2 This specification covers as-welded fittings 3 through 48 in. [75 through 1225 mm] in outside diameter and in nominal wall thicknesses 0.062 through 0.500 in. [1.6 through 12.7 mm]. Table 1 and Table 2 list the common diameters and nominal thicknesses of fittings in this specification.

1.3 This specification does not apply to cast fittings. Cast austenitic steel fittings are covered by Specification A 351/A 351M.

1.4 Optional supplementary requirements are provided for fittings where a greater degree of examination is desired. These supplementary requirements call for additional tests. When desired, one or more of these may be specified in the order.

1.5 This specification is expressed in both inch-pound units and in SI units. However, unless the order specifies the applicable "M" specification designation (SI units), the material shall be furnished to inch-pound units.

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.

2. Referenced Documents

2.1 In addition to those reference documents listed in Specification A 960/A 960M, the following list of standards apply to this specification:

2.2 *ASTM Standards:* [2]

A 240/A 240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A 351/A 351M Specification for Castings, Austenitic, for Pressure-Containing Parts

A 403/A 403M Specification for Wrought Austenitic Stainless Steel Piping Fittings

A 960/A 960M Specification for Common Requirements for Wrought Steel Piping Fittings

E 527 Practice for Numbering Metals and Alloys (UNS)

2.3 *ASME Standard:*

Section IX , Welding Qualtifications, ASME Boiler and Pressure Vessel Code[3]

2.4 *MSS Standard:*

SP 43 Wrought Stainless Steel Butt Welding Fittings[4]

2.5 *AWS Standards:*

A5.4 Corrosion-Resisting Chromium and Chromium-Nickel Steel Covered Welding Electrodes[5]

A5.9 Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Rods and Bare Electrodes[5]

2.6 *SAE Standard:*

J1086 Unified Numbering System for Metals and Alloys[6]

[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 A01.22 on Steel Forgings and Wrought Fittings for Piping Applications and Bolting Materials for Piping and Special Purpose Applications.

Current edition approved March 1, 2006. Published March 2006. Originally approved in 1980. Last previous edition approved in 2002 as A 774/A 774M – 02.

[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.

[4] Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602.

[5] Available from American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126.

[6] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

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

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TABLE 1 Common Tubular Fittings Sizes, Outside Diameter[A]

in. [mm]	in. [mm]
3 [76]	12¾ [325]
3½ [90]	14 [355]
4 [100]	16 [405]
4½ [115]	18 [460]
6 [150]	20 [510]
6⅝ [170]	24 [610]
8 [205]	30 [760]
8⅝ [220]	36 [915]
10 [255]	40 [1015]
10¾ [275]	42 [1070]
12 [305]	48 [1220]

[A] Other sizes may be furnished provided they comply with all other requirements of this specification.

TABLE 2 Common Tubular Fittings Nominal Thicknesses[A]

in. or gage	in.	[mm]
16 gage	0.062	[1.6]
14 gage	0.078	[2.0]
12 gage	0.109	[2.8]
11 gage	0.125	[3.2]
10 gage	0.140	[3.6]
8 gage	0.172	[4.4]
3⁄16 in.	0.187	[4.8]
¼ in.	0.250	[6.4]
5⁄16 in.	0.312	[8.0]
⅜ in.	0.375	[9.5]
½ in.	0.500	[12.5]

[A] Other thicknesses may be furnished provided they comply with all other requirements of this specification.

3. Ordering Information

3.1 See Specification A 960/A 960M and the following:

3.1.1 Dimensions (outside diameter and specified wall thickness, see Table 1 and Table 2),

3.1.2 Grade (Table 3), and

3.1.3 End use, if known.

4. General Requirements

4.1 Product furnished to this specification shall conform to the requirements of Specification A 960/A 960M, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the requirements of Specification A 960/A 960M constitutes non-conformance with this specification. In case of a conflict between the requirements of this specification and Specification A 960/A 960M, this specification shall prevail.

5. Manufacture

5.1 The fittings shall be made from flat-rolled steel, such as in Specification A 240/A 240M. The flat rolled steel shall be in the solution annealed condition unless other heat treat conditions are agreed upon by the manufacturer and the purchaser. The fittings shall be formed by a hot or cold process, and welded by a shielded welding process with or without the addition of filler metal.

5.2 Fittings shall be furnished clean and free of scale.

5.3 *Welding*:

5.3.1 The joints shall be full penetration double-welded or single-welded butt joints employing fusion-welding processes with or without the addition of filler metal as defined under Definitions, ASME Boiler and Pressure Vessel Code, Section IX. This specification makes no provision for any difference in weld quality requirements regardless of the weld joint-type employed (single or double) in making the weld. Welding procedures and welding operators shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX.

5.3.2 For fittings employing multiple passes, the root-pass may be made without the addition of filler metal.

5.3.3 The alloy content (chromium, nickel, molybdenum, columbium, and tantalum) of the deposited weld metal shall conform to that required of the base metal or for equivalent weld metal as given in the AWS filler metal specification A5.4 or A5.9, except that, when welding on Types 304L base metal, the deposited weld metal shall correspond, respectively, to AWS Types E308L (ER308L) and, when welding on Type 321 base metal, the weld metal shall correspond to AWS Types E347 (ER347 or ER321).

6. Chemical Composition

6.1 The steel shall conform to requirements of chemical composition for the respective material prescribed in Table 3 and Table 4.

6.2 The steel shall not contain any unspecified elements for the ordered grade to the extent that it conforms to the

TABLE 3 Chemical Requirements

NOTE—Where an ellipsis (...) appears in this table, there is no requirement.

Grade	Composition, %											
	UNS Designation[A]	Carbon, max[B]	Manganese, max	Phosphorus, max	Sulfur, max	Silicon, max	Chromium	Nickel	Molybdenum	Titanium	Columbium plus Tantalum	Nitrogen, max
TP 304L	S30403	0.030	2.00	0.045	0.030	1.00	18.0–20.0	8.0–12.0	...	...	...	0.10
TP 316L	S31603	0.030	2.00	0.045	0.030	1.00	16.0–18.0	10.0–14.0	2.00–3.00	...	...	0.10
TP 317L	S31703	0.030	2.00	0.045	0.030	1.00	18.0–20.0	11.0–15.0	3.0–4.0	...	...	0.10
TP 321	S32100	0.08	2.00	0.045	0.030	1.00	17.0–19.0	9.0–12.0	...	[C]	...	...
TP 347	S34700	0.08	2.00	0.045	0.030	1.00	17.0–19.0	9.0–12.0	...	...	[D]	...

[A] New designation established in accordance with Practice E 527 and SAE J1086.
[B] The carbon analysis shall be reported to the nearest 0.01 % except for the low carbon (0.030) types, that shall be reported to the nearest 0.001 %.
[C] Ti = 5X(C+N) – 0.70.
[D] The columbium plus tantalum content shall be not less than ten times the carbon content and not more than 1.10 %.

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TABLE 4 Product Analysis Tolerances[A]

Element	Tolerance Over the Maximum Limit or Under the Minimum Limit
Carbon	0.005
Manganese	0.040
Phosphorus	0.010
Sulfur	0.005
Silicon	0.050
Chromium	0.200
Nickel	0.100
Molybdenum	0.100
Nitrogen	0.005

[A] This table does not apply to heat analysis.

requirements of another grade for which that element is a specified element having a required minimum content.

6.3 Mill certificates of analysis of each heat of steel shall be furnished on request.

7. Mechanical Properties

7.1 The material used in making these fittings shall conform to the test requirements listed in Table 5 for the specified grade. Mechanical tests made on the sheet or plate by the manufacturer shall qualify the sheet or plate material.

7.2 Mechanical properties of fittings made to this specification are not verified unless specific tests and limits have been agreed upon between the purchaser and manufacturer.

8. Heat Treatment

8.1 Heat treatment is not required (see 16.1).

9. Permissible Variations in Nominal Dimensions

9.1 Refer to MSS SP 43 for tolerances for fittings covered by this specification. For fittings not covered in MSS SP 43 (wyes and laterals) acceptance limits must be agreed upon between the purchaser and manufacturer.

10. Hydrostatic Tests

10.1 Hydrostatic testing of the fittings is not required by this specification.

11. Surface Quality

11.1 See Specification A 960/A 960M.

11.2 When the removal of a surface discontinuity reduces the wall thickness below 87½ % of the specified nominal wall thickness at any point, the fitting shall be subject to rejection or to repair as provided in Section 14.

12. Inspection

12.1 The manufacturer shall afford the purchaser's inspector all reasonable facilities necessary to satisfy him that the material is being furnished in accordance with the specification. Mill inspection by the purchaser shall not interfere unnecessarily with the manufacturer's operations. All tests and inspections shall be made at the place of manufacture, unless otherwise agreed to.

12.2 Other tests, when required by agreement, shall be made from material of the lots covered in the order.

NOTE 1—A lot shall consist of all fittings of the same type, size, and wall thickness, manufactured from one heat of material and using one lot number of electrode or one heat of weld wire.

13. Repair of Defects

13.1 Injurious defects that are deeper than the minimum specified in Section 12 may be repaired with the approval of the purchaser. Such defects shall be entirely removed by either chipping, machining, or grinding before welding. Rewelding shall be in accordance with 5.3 of this specification.

14. Rejection and Rehearing

14.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for rehearing.

14.2 Fittings that develop defects in shop working or application operations may be rejected. Upon rejection the manufacturer shall be notified in writing.

15. Certification

15.1 See Specification A 960/A 960M.

16. Product Marking

16.1 Each fitting shall be legibly marked with the manufacturer's name or brand, the schedule number or pressure class or thickness, the specified size, the specification number, the grade of material listed in Table 1, the heat number or manufacturer's heat identification, and the letters "HT-O" to indicate that there has been no heat treating after welding or forming.

NOTE 2—For purposes of identification marking, the manufacturer is considered the organization that certifies the piping component complies with the specification.

TABLE 5 Mechanical Test Requirements

Type[A]	UNS Designation	Tensile Strength		Yield Strength		Elongation in 2 in. [50 mm], min, %	Hardness, max[B]	
		ksi	[MPa]	ksi	[MPa]		Brinell	Rockwell B
304L	S30403	70-95	485-655	25	170	40.0	183	88
316L	S31603	70-95	485-655	25	170	40.0	217	95
317L	S31703	75-100	515-690	30	205	35.0	217	95
321	S32100	75-100	515-690	30	205	40.0	217	95
347	S34700	75-100	515-690	30	205	40.0	202	92

[A] Unless otherwise indicated, a grade designation originally assigned by the American Iron and Steel Institute (AISI).
[B] Either Brinell or Rockwell B Hardness is permissible.

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16.2 The specification year of issue and revision letter, if any, are not required for product marking.

17. Packaging

17.1 The manufacturer shall box, crate, or package in secure lifts or bundles to ensure safe delivery. If specified, the ends shall be protected with wooden or plastic plugs. Special packaging requiring extra operations other than those above must be specified by the purchaser.

18. Keywords

18.1 austenitic stainless steel; corrosive service applications; pipe fittings-steel; piping applications; stainless steel fittings; temperature service applications-low

SUPPLEMENTARY REQUIREMENTS

Supplementary requirements shall not be considered unless specified in the order, in which event, any or all of the supplementary tests specified in Specification A 960/A 960M shall be made at the place of manufacture, unless otherwise agreed upon. The tests specified shall be witnessed by the purchaser's inspector before shipment of material if so specified in the order.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this specification since the last issue, A 774/A 774M – 02, that may impact the use of this specification. (Approved March 1, 2006)

(*1*) Changed "T*i*" to "Ti" in Note C of Table 3.

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