



Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service¹

This standard is issued under the fixed designation A234/A234M; 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 standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification² covers wrought carbon steel and alloy steel fittings of seamless and welded construction covered by the latest revision of ASME B16.9, B16.11, MSS-SP-79, MSS-SP-83, MSS-SP-95, and MSS-SP-97. These fittings are for use in pressure piping and in pressure vessel fabrication for service at moderate and elevated temperatures. Fittings differing from these ASME and MSS standards shall be furnished in accordance with Supplementary Requirement S58 of Specification **A960/A960M**.

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

1.3 This specification does not cover cast welding fittings or fittings machined from castings. Cast steel welding fittings are governed by Specifications **A216/A216M** and **A217/A217M**.

1.4 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.

1.5 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. 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.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 In addition to those reference documents listed in Specification **A960/A960M**, the following list of standards apply to this specification.

2.2 ASTM Standards:³

A105/A105M Specification for Carbon Steel Forgings for Piping Applications

A216/A216M Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service

A217/A217M Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service

A960/A960M Specification for Common Requirements for Wrought Steel Piping Fittings

2.3 ASME Standards:⁴

B16.9 Steel Butt-Welding Fittings

B16.11 Forged Steel Fittings, Socket Welding and Threaded

2.4 ASME Boiler and Pressure Vessel Code:⁴

Section III

Section V

Section VIII, Division 1

Section IX

2.5 MSS Standards:⁵

MSS-SP-25 Standard Marking System for Valves, Fittings, Flanges, and Unions

MSS-SP-79 Socket Welding Reducer Inserts

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.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-234 in Section II of that Code.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁵ Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602, <http://www.mss-hq.com>.

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



MSS-SP-83 Steel Pipe Unions, Socket-Welding and Threaded

MSS-SP-95 Swage(d) Nipples and Bull Plugs

MSS-SP-97 Integrally Reinforced Forged Branch Outlet Fittings—Socket Welding, Threaded and Buttwelding Ends

2.6 *ASNT Standard*.⁶

SNT-TC-1A Recommended Practice for Nondestructive Testing Personnel Qualification and Certification

2.7 *AWS Specifications*.⁷

A5.5/A5.5M Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding

A5.23/A5.23M Specification for Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding

A5.28/A5.28M Specification for Low-Alloy Steel Electrodes for Gas Shielded Arc Welding

A5.29/A5.29M Low-Alloy Steel Electrodes for Flux Cored Arc Welding

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification refer to Specification **A960/A960M**.

4. Ordering Information

4.1 See Specification **A960/A960M**.

5. General Requirements

5.1 Product furnished to this specification shall conform to the requirements of Specification **A960/A960M**, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the requirements of Specification **A960/A960M** constitutes non-conformance with this specification. In case of a conflict between the requirements of this specification and Specification **A960/A960M**, this specification shall prevail.

6. Materials

6.1 The starting material for fittings shall be killed steel, consisting of forgings, bars, plates, sheet, and seamless or fusion-welded tubular products with filler metal added and shall conform to the chemical requirements of **Table 1**. Unless otherwise specified for carbon steel plates and sheet, the steel may be made to either coarse grain or fine grain practice. Grade WP9 shall be made to fine grain practice.

6.2 A starting material specification that specifically requires the addition of any element beyond those listed for the materials in **Table 1** for the applicable grade of material is not permitted. This does not preclude the use of deoxidizers or the judicious use of elements for grain size control.

7. Manufacture

7.1 Forging or shaping operations may be performed by hammering, pressing, piercing, extruding, upsetting, rolling,

bending, fusion welding, machining, or by a combination of two or more of these operations. The forming procedure shall be so applied that it will not produce injurious imperfections in the fittings.

7.2 Fittings NPS-4 and under may be machined from hot-forged or rolled, cold-sized, and straightened bar stock having the chemical composition of the Grade in **Table 1** and the mechanical properties of the Grade in **Table 2**. Heat treatment shall be in accordance with Section 8. All caps machined from bar stock shall be examined by liquid penetrant or magnetic particle in accordance with S52 or S53 in Specification **A960/A960M**.

7.3 All welds including welds in tubular products from which fittings are made shall be (1) made by welders, welding operators, and welding procedures qualified under the provisions of ASME Section IX, (2) heat treated in accordance with Section 8 of this specification, and (3) radiographically examined throughout the entire length of each weld in accordance with Article 2, ASME Section V with acceptance limits in accordance with Paragraph UW-51 of ASME Section VIII, Division 1 of the ASME Boiler & Pressure Vessel Code. In place of radiographic examination, welds may be ultrasonically examined in accordance with Appendix 12 of Section VIII. The NDE of welds in Grades WPB, WPC, WP1, WP11 Class 1, WP11 Class 2, WP11 Class 3, WP12 Class 1, WP12 Class 2, and WPR may be performed either prior to or after forming. NDE of welds in Grades WP5, WP9, WP91 Types 1 and 2, WP911, WP92, WP22 Class 1, WP22 Class 3, and WP24 shall be done after forming.

7.3.1 All welds in WP91 Types 1 and 2 shall be made with one of the following welding processes and consumables: SMAW, A5.5/A5.5M E90XX-B9; SAW, A5.23/A5.23M EB9 + flux; GTAW, A5.28/A5.28M ER90S-B9; and FCAW A5.29/A5.29M E91T1-B9. In addition, the Ni+Mn content of all welding consumables used to fabricate WP91 Type 1 and Type 2 fittings shall not exceed 1.0 %.

7.3.2 All welds in WP92 and WP911 shall be made using welding consumables meeting the chemical requirements for the grade in **Table 1**.

7.3.3 All welds in WP115 shall be made using deposited filler metal suitable for the composition being welded. Any defects shall be thoroughly chipped or ground out before welding and each welded length shall be re-heat treated or stress relieved as required by the application specification. Alternately, the weld shall be made with the welding products and procedures of **7.3.1**.

7.4 Personnel performing NDE examinations shall be qualified in accordance with SNT-TC-1A.

7.5 The welded joints of the fittings shall be finished in accordance with the requirements of Paragraph UW-35 (a) of ASME Section VIII, Division 1.

7.6 All butt-weld tees manufactured by cold-forming method(s) shall be liquid penetrant or magnetic particle examined by one of the methods specified in Supplementary Requirement S52 or S53 in Specification **A960/A960M**. This examination shall be performed after final heat treatment. Only the side wall area of the tees need be examined. This area is defined by a

⁶ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlington Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

⁷ Available from American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126, <http://www.aws.org>.