1. Scope*

1.1 This specification covers wrought welding fittings for pressure piping, factory-made from nickel and nickel alloys. Threaded fittings as covered in ASME B16.11 are also covered by this specification. The term welding applies to butt-welding or socket-welding parts such as 45° and 90° elbows, 180° bends, caps, tees, reducers, lap-joint stub ends, and other types, as covered by ASME B16.9, ASME B16.11, MSS SP-43, MSS SP-95, and MSS SP-97.

1.1.1 Several grades of nickel and nickel alloys are included in this specification. Grades are designated with a prefix, WP or CR, based on the applicable ASME or MSS dimensional and rating standards.

1.1.2 Class WP fittings are those manufactured to the requirements of ASME B16.9, B16.11.

1.1.3 For each of the WP nickel and nickel alloy grades, several classes of fittings are covered to indicate whether seamless or welded construction was utilized. Class designations are also utilized to indicate the nondestructive test method and extent of nondestructive examination (NDE). Table 1 is general summary of the fitting classes applicable to all WP grades of nickel and nickel alloys covered by this specification. There are no classes for the CR grades. Specific requirements are covered elsewhere.

1.2 This specification does not apply to cast welding fittings.

1.3 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.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 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 become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

B127 Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
B160 Specification for Nickel Rod and Bar
B161 Specification for Nickel Seamless Pipe and Tube
B162 Specification for Nickel Plate, Sheet, and Strip
B163 Specification for Seamless Nickel and Nickel Alloy (UNS N06845) Condenser and Heat-Exchanger Tubes
B164 Specification for Nickel-Copper Alloy Rod, Bar, and Wire
B165 Specification for Nickel-Copper Alloy (UNS N04400) Seamless Pipe and Tube
B166 Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696), Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617), and Nickel-Iron-Chromium-Tungsten Alloy (UNS N06674) Rod, Bar, and Wire
B333 Specification for Nickel-Molybdenum Alloy Plate, Sheet, and Strip

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

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TABLE 1 Fitting Classes for WP Grades

<table>
<thead>
<tr>
<th>Class</th>
<th>Construction</th>
<th>Nondestructive Examination</th>
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<tbody>
<tr>
<td>S</td>
<td>Seamless</td>
<td>None</td>
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<tr>
<td>W</td>
<td>Welded</td>
<td>Radiography or Ultrasonic</td>
</tr>
<tr>
<td>WX</td>
<td>Welded</td>
<td>Radiography</td>
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<tr>
<td>WU</td>
<td>Welded</td>
<td>Ultrasonic</td>
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B335 Specification for Nickel-Molybdenum Alloy Rod
B408 Specification for Nickel-Iron-Chromium Alloy Rod and Bar
B409 Specification for Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip
B423 Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloy (UNS N08825, N08221, and N06845) Seamless Pipe and Tube
B424 Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825, UNS N08221, and UNS N06845) Plate, Sheet, and Strip
B425 Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825, UNS N08221, and UNS N06845) Rod and Bar
B435 Specification for UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Plate, Sheet, and Strip
B443 Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Plate, Sheet, and Strip
B444 Specification for Nickel-Chromium-Molybdenum-Columbium Alloys (UNS N06625 and UNS N06852) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Pipe and Tube
B446 Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625), Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219), and Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06650) Rod and Bar
B462 Specification for Forged or Rolled UNS N06030, UNS N06022, UNS N06035, UNS N06200, UNS N06059, UNS N10362, UNS N06686, UNS N08020, UNS N08024, UNS N08026, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, and UNS R20033 Alloy Pipe Flanges, Forged Fitting, and Values and Parts for Corrosive High-Temperature Service
B463 Specification for UNS N08020 Alloy Plate, Sheet, and Strip
B464 Specification for Welded UNS N08020 Alloy Pipe
B468 Specification for Welded UNS N08020 Alloy Tubes
B472 Specification for Nickel Alloy Billets and Bars for Reforging
B473 Specification for UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire
B511 Specification for Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes
B512 Specification for Nickel-Chromium-Silicon Alloy (UNS N08330) Billets and Bars
B514 Specification for Welded Nickel-Iron-Chromium Alloy Pipe
B515 Specification for Welded UNS N08120, UNS N08800, UNS N08810, and UNS N08811 Alloy Tubes
B516 Specification for Welded Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06603, UNS N06025, and UNS N06045) Tubes
B536 Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip
B564 Specification for Nickel Alloy Forgings
B572 Specification for UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Rod
B573 Specification for Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, N10242) Rod
B581 Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod
B582 Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip
B619 Specification for Welded Nickel and Nickel-Cobalt Alloy Pipe
B622 Specification for Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
B625 Specification for UNS N08925, UNS N08301, UNS N08932, UNS N08926, UNS N08354, and UNS R20033 Plate, Sheet, and Strip
B626 Specification for Welded Nickel and Nickel-Cobalt Alloy Tube
B673 Specification for UNS N08925, UNS N08354, and UNS N08926 Welded Pipe
B674 Specification for UNS N08925, UNS N08354, and UNS N08926 Welded Tube
B675 Specification for UNS N08367 Welded Pipe
B676 Specification for UNS N08367 Welded Tube
B677 Specification for UNS N08925, UNS N08354, and UNS N08926 Seamless Pipe and Tube
B688 Specification for Chromium-Nickel-Molybdenum-Iron (UNS N08366 and UNS N08367) Plate, Sheet, and Strip
B691 Specification for Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Rod, Bar, and Wire
B704 Specification for Welded UNS N06625, UNS N06219 and UNS N08825 Alloy Tubes
B705 Specification for Nickel-Alloy (UNS N06625, N06219 and N08825) Welded Pipe
B710 Specification for Nickel-Iron-Chromium-Silicon Alloy Welded Pipe
B729 Specification for Seamless UNS N08020, UNS N08026, and UNS N08024 Nickel-Alloy Pipe and Tube
B880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys
B899 Terminology Relating to Non-ferrous Metals and Alloys
E165 Practice for Liquid Penetrant Examination for General Industry
E1916 Guide for Identification of Mixed Lots of Metals
2.2 ASME Standards: 3
B16.9 Wrought Steel Butt Welding Fittings
B16.11 Forged Steel Fittings, Socket-Welding and Threaded
H34.1 Nickel Seamless Pipe and Tubing
H34.2 Nickel-Copper Alloy Seamless Pipe and Tubing
H34.3 Nickel-Chromium-Iron Alloy Seamless Pipe and Tubing
2.3 Manufacturers Standardization Society of the Valve and Fittings Industry Standards:
MSS SP-25 Standard Marking Systems for Valves, Fittings, Flanges, and Unions1
MSS SP-43 Standard Practice for Light Weight Stainless Steel Butt Welding Fittings4
MSS SP-95 Sewage (D) Nipples and Bull Plugs4
MSS SP-97 Forged Carbon Steel Branch Outlet Fittings–Socket Welding, Threaded and Butt Welding Ends5
Boiler and Pressure Vessel Code, Section VIII, Division 1 Pressure Vessels and Section IX, Welding Qualifications3
2.4 AWS Standards: 5
A5.11 Specification for Nickel and Nickel Alloy Covered Welding Electrodes
A5.14 Specification for Nickel and Nickel-Alloy Bare Welding Rods and Electrodes


3. Terminology

3.1 Terms defined in Terminology B899 shall apply unless otherwise defined in this standard.

4. Ordering Information

4.1 It is the responsibility of the purchaser to specify all requirements that are necessary for material ordered under this specification. Examples of such requirements include, but are not limited to, the following:

4.1.1 Quantity, number of fittings of each kind,
4.1.2 Description of Fitting and Nominal Dimensions (standard or special),
4.1.3 Alloy Composition,
4.1.4 Condition (temper) if applicable.
4.1.5 If neither grade of N06625 is specified, Grade 1 will be supplied.
4.1.6 For each Grade of WP fittings ordered, a Class should also be indicated.
4.1.6.1 Grade CR fittings shall not be substituted for fittings ordered to Grade WP, but Grade WP may be substituted for Grade CR.
4.1.6.2 For all Classes of WP fittings, unless S, W, WX, or WU is specified by the purchaser, any class may be furnished at the option of the supplier.
4.1.7 Purchaser Inspection—State which tests or inspections are to be witnessed (Section 10),
4.1.8 Samples for Product (Check) Analysis—State whether samples should be furnished (6.3),
4.1.9 Test reports (Section 12), and
4.1.10 Supplementary requirements, if any.

5. Materials and Manufacture

5.1 Material—The material for wrought welding fittings may consist of forgings, rods, bars, plates, sheets, and seamless or welded pipe that conform to all the requirements of the ASTM specifications for the particular product and alloy referred to in Table 2.

5.2 Manufacture:
5.2.1 Forging or shaping operations may be performed by hammering, pressing, piercing, extruding, upsetting, rolling, bending, or fusion welding, or by a combination of two or more of these operations. The forming procedure shall be so applied that it will not produce injurious defects in the fittings.
5.2.2 Grade WP fittings ordered as Class S shall be of seamless construction and shall meet all requirements of ASME B16.9 or B16.11.
5.2.3 All classes of fittings shall have the welders, welding operators, and welding procedures qualified under the provisions of Section IX of the ASME Boiler and Pressure Vessel Code.
5.2.4 Grade WP fittings ordered as Class W shall meet the requirements of ASME B16.9 and shall have all pipe welds made by the starting material manufacturer or the fitting manufacturer with the addition of filler radiographically examined throughout the entire length in accordance with Paragraph UW-51 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code, except as exempt by 5.2.4.1, and 5.2.4.2.
<table>
<thead>
<tr>
<th>Corrosion-Resistant Fittings</th>
<th>ASME Pressure Fittings</th>
<th>Alloy</th>
<th>UNS Designation</th>
<th>Pipe or Tube</th>
<th>Plate, Sheet, or Strip</th>
<th>Bar Forging and Forging Stock</th>
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</table>

\(^{a}\) When WP fittings are of welded construction or made from welded pipe, the symbol shall be supplemented with W or WX as applicable. If ultrasonic examination in accordance with 5.2.4.2 or 5.2.5.1 is used, the symbol shall be supplemented by WU or WXU as applicable.

\(^{b}\) See 2.1 and 5.1.

\(^{c}\) Yield strength shall be 25 000 psi (172 MPa) min, for all hot-formed, annealed fittings made from WPNC material.
5.2.4.1 The weld in the starting pipe, made to one of the pipe or tube product specifications listed in Table 2, shall not require radiography, provided that no filler metal is used in making the weld.

5.2.4.2 Instead of the radiographic examination, and at the option of the manufacturer, welds made by the fitting manufacturer may be ultrasonically examined in accordance with the Code requirements stated in 5.2.6.

5.2.5 Grade WP fittings ordered as Class WX shall meet the requirements of ASME B16.9 and shall have all welds, whether made by the fitting manufacturer or the starting material manufacturer, radiographically examined throughout their entire length in accordance with Paragraph UW-51 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code, except as exempt by 5.2.5.1. The radiography for this class of fittings may be done either prior to or after forming at the option of the manufacturer.

5.2.5.1 Instead of the radiographic examination, and at the option of the manufacturer, welds, whether made by the fitting manufacturer or the starting material manufacturer, may be ultrasonically examined in accordance with the Code requirements stated in 5.2.6.

5.2.6 Grade WP fittings ordered as Class WU shall meet the requirements of ASME B16.9 and shall have all welds, whether made by the fitting manufacturer of the starting material manufacturer, ultrasonically examined throughout their entire length in accordance with Appendix 12 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code. The ultrasonic examination of welds for this class may be performed either prior to or after forming at the option of the manufacturer.

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

5.2.8 Fittings covered in MSS SP-43, MSS SP-95, or MSS SP-97 and ordered as CR**** shall meet the requirements of MSS SP-43, MSS SP-95, or MSS SP-97, respectively, and do not require non-destructive examination.

5.2.9 All joints welded with filler metal shall be finished in accordance with the requirements of Paragraph UW-35 (a) of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code.

5.2.10 Radiographic examination of the weld buildup on cold-formed stub ends shall not be required provided that all the following steps are adhered to:

5.2.10.1 The weld procedure and welders or welding operators meet the requirements of 5.2.3.

5.2.10.2 All weld surfaces are liquid penetrant examined in accordance with Appendix 8 of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

5.2.10.3 Repair of areas in the weld is permitted, but 5.2.10.1 and 5.2.10.2 must be repeated.

5.2.10.4 Fittings shall be marked with the symbol WBU following the alloy designation (for example: WPN-WBU).

5.2.11 Stubends may be produced with the entire lap added as weld metal to a straight pipe section provided the welding satisfies the requirements of 5.2.3 for qualifications and 5.3 for heat treatment.

5.2.11.1 Grade WP****Class W – Radiographic examination of the welds, made with the addition of filler metal, is required. See 5.2.4.

5.2.11.2 Grade WP****Class WX – Radiographic examination of all welds, made with or without the addition of filler metal is required. See 5.2.5.

5.2.11.3 Grade WP****Class WU – Ultrasonic examination of all welds, made with or without the addition of filler metal, is required. See 5.2.6.

5.2.11.4 Grade CR – Nondestructive examination is not required. See 5.2.8.

5.2.12 Stubends may be produced with the entire lap added by the welding of a ring, made from plate or flat bar of the same alloy grade and composition, to the outside of a straight section of pipe, provided the weld is a double welded full penetration joint and satisfies the requirements of 5.2.3 for qualifications and 5.3 for heat treatment.

5.2.12.1 Grade WP****Class W – Radiographic examination of all welds, made with the addition of filler metal, is required. See 5.2.4.

5.2.12.2 Grade WP****Class WX – Radiographic examination of all welds, made with or without the addition of filler metal, is required. See 5.2.5.

5.2.12.3 Grade WP****Class WU – Ultrasonic examination of all welds, made with or without the addition of filler metal, is required. See 5.2.6.

5.2.12.4 Grade CR – Nondestructive examination is not required. See 5.2.8.

5.3 Heat Treatment—All fittings shall be furnished heat treated. See Table 3 for recommended heat treatments. All forming or welding shall be done and completed prior to any final heat treatment. For seamless fittings made without forming, heat treatment, if any, shall be agreed upon between purchaser and manufacturer.

6. Chemical Composition

6.1 The material shall conform to the requirements as to chemical composition for the respective material prescribed in Table 2.

6.2 Records of chemical analysis made in accordance with the applicable specification listed in Table 2 shall be certification that the material of the fitting meets the requirements of this specification.

6.3 If a product (check) analysis is made by the purchaser, the material shall conform to the requirements for product (check) analysis prescribed for the respective product in Table 2 and Specification B880, for check analysis.

6.4 In fittings of welded construction, the alloy content 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 A5.11 and A5.14.

7. Mechanical Properties and Other Requirements

7.1 Tensile Requirements:

7.1.1 (All Table 2 alloys except for UNS N06625 Grade 1 or Grade 2)
7.1.1.1 Material used in the manufacture of the fittings shall conform to the requirements for tensile properties as prescribed for the respective product in Table 2.

7.1.1.2 Finished fittings shall conform to the properties for the respective material and temper as prescribed in the specifications referred to in Table 2. When required, the properties of fittings made from forging stock shall be as agreed upon between the producer and the purchaser.

7.1.1.3 Tension tests of the finished fittings are not required, unless otherwise agreed upon between the manufacturer and the purchaser.

7.1.2 Tensile Requirements (For fittings made to meet the mechanical properties of UNS N06625 Grade 1):

7.1.2.1 At the option of the manufacturer, the material used in the manufacture of UNS N06625 Grade 1 fittings shall conform to the mechanical property requirements of either UNS N06625 Grade 1 or Grade 2 as prescribed for the respective product in Table 2.

7.1.2.2 Tension tests are required in accordance with 7.1.2.3.

7.1.2.3 Tension tests are required per lot (Note S2.3) per furnace charge. Tension specimens may be obtained from a
fitting or a representative test piece (Note S2.2). Tension specimens representing fittings of welded construction, made with the addition of filler metal, are to include the weld and be prepared so that the weld is at the specimen’s midlength location.

7.1.2.4 The finished fittings shall conform to the minimum UNS N06625 Grade 1 mechanical properties as prescribed for the respective starting raw material product listed in Table 2 except that fittings of welded construction are exempt from the tensile ductility requirement (elongation) and the yield strength requirements. The minimum mechanical properties for fittings made from forging stock shall be as agreed upon between manufacturer and purchaser.

7.1.3 Tensile Requirements (For fittings made to meet the mechanical properties of UNS N06625 Grade 2):

7.1.3.1 At the option of the manufacturer, the material used in the manufacture of UNS N06625 Grade 2 fittings shall conform to the mechanical property requirements of either UNS N06625 Grade 1 or Grade 2 as prescribed for the respective product in Table 2.

7.1.3.2 Tension tests are not required provided the grade of starting raw material is designated as UNS N06625 Grade 2 in the raw material manufacturer’s MTR description and the final heat treat temperature of the fittings is in compliance with the recommended solution annealing heat treat procedure for the grade. Tension tests are required if the grade of starting raw material is designated as UNS N06625 Grade 1 in the raw material manufacturer’s MTR description.

7.1.3.3 Tension tests, if required, are to be performed per lot (Note S2.3) provided that all heat treatments are performed in furnaces controlled within a ± 25°F range of set point and are equipped with calibrated recording pyrometers so that all other subsequent heat treatments can be conducted within the same ± 25°F temperature range as the furnace charge that contained the test specimen. Tension specimens may be obtained from a fitting or a representative test piece. In this paragraph only, a representative test piece is defined as a test specimen from the same heat of fitting raw material having approximately the same amount of working. In addition, the test piece representing fittings manufactured from bars, plate or forgings shall have a cross section equal to the greatest cross section of the fitting, a test piece representing fittings manufactured from pipe shall have an outside diameter and wall thickness equal to those of the fitting and a test piece for fittings of welded construction, made with the addition of filler metal, shall be prepared to the same welding procedures and from the same heat of material as the fittings it represents. Tension specimens representing fittings of welded construction, made with the addition of filler metal, are to include the weld and be prepared so that the weld is at the specimen’s midlength location.

7.1.3.4 The finished fittings shall conform to the minimum UNS N06625 Grade 2 mechanical properties as prescribed for the representative starting raw material product listed in Table 2 except that fittings of welded construction are exempt from the tensile ductility requirement (elongation) and the yield strength requirements. The minimum mechanical properties for fittings made from forging stock shall be as agreed upon between manufacturer and purchaser.

7.2 Hydrostatic Tests:

7.2.1 Hydrostatic testing of wrought fittings is not required by this specification.

7.2.2 All fittings shall be capable of withstanding without failure, leakage, or impairment of their serviceability, a test pressure prescribed in the specifications for the pipe with which the fitting is recommended to be used.

8. Dimensions

8.1 Fittings or components produced in accordance with this specification shall have sizes, shapes, and dimensions in accordance with those specified in ASME B16.9, ASME B16.11, MSS SP-43, MSS SP-95, MSS SP-97, ASME H34.1, ASME H34.2, or ASME H34.3.

9. Workmanship, Finish, and Appearance

9.1 The fittings shall be free of injurious defects and have a workmanlike finish. Minor defects may be removed by grinding, provided the wall thickness is not decreased to less than the allowable specification minimum and provided the grinding is smooth and leaves no shoulders.

9.2 The fittings shall be cleaned free of scale.

10. Inspection

10.1 Inspection of the material by the purchaser at the place of manufacture shall be made as agreed upon between the purchaser and the manufacturer as part of the purchase contract.

11. Rejection and Rehearing

11.1 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 a rehearing.

12. Certifications

12.1 Test reports are required for all fittings covered by this specification. Each test report shall include the following information:

12.1.1 The year-date of the specification and class to which the fitting was furnished,

12.1.2 Heat numbers or serial number traceable to heat numbers,

12.1.3 Chemical analyses for all starting materials,

12.1.4 Mechanical properties for all starting materials, or actual mechanical properties if tension testing was required,

12.1.5 For construction with filler metal added, weld metal chemical analyses or AWS classification,

12.1.6 For welded stub ends, the construction method per 5.2.11 or 5.2.12 shall be stated,

12.1.7 Heat treatment per Table 3,

12.1.8 Results of all nondestructive examinations,

12.1.9 Results of all tests required by Supplementary Requirements and the order, and

12.1.10 Statement that the fitting was manufactured, sampled, tested and inspected in accordance with the specification and was found to meet the requirements.
13. Product Marking

13.1 The manufacturer’s name or trademark, material, grade, if applicable, the size and schedule number, the designation as shown in Table 2, under “Marking,” either column 1 for Grade CR fittings or column 2 for Grade WP fittings, shall be stamped, stenciled, or otherwise permanently marked on each fitting. Grade WP fitting marking also must include the suffix in accordance with 5.2. On wall thicknesses thinner than 0.083 in., no steel stamps or other indented markings shall be used. When the size does not permit complete marking, identification marks may be omitted in the sequence shown in MSS SP-25. See Table 4 for marking example of grades and classes.

NOTE 1—When steel stamps are used, the marking shall not be deep enough to cause cracks or to reduce the wall thickness of the fittings below the minimum allowed by the applicable specification.

14. Keywords

14.1 nickel alloy fittings

### SUPPLEMENTARY REQUIREMENTS

These requirements shall not be considered unless specified in the order, in which event the supplementary requirements specified shall be made at the place of manufacture, unless otherwise agreed upon.

**S1. Product Analysis** (Note S2.1)

S1.1 A product analysis shall be made from each heat of base metal and, if of welded construction, from each lot (Note S2.3) number of welding material of the fittings offered for delivery. The analysis shall conform to the requirements specified in Section 6.

**S2. Tension Test** (Note S2.1)

S2.1 One tension test shall be made on one fitting or representative test piece (Note S2.2) per lot (Note S2.3) of fittings. If the fittings are of welded construction, made with the addition of filler metal, the tension specimen shall include the weld and be prepared so that the weld is at the midlength location of the specimen. However, in no case shall the tensile properties of the finished fittings be less than the requirements of the pipe specifications listed in Table 2, except that weld specimens are exempt from the tensile ductility requirements.

NOTE S2.1—If the results of any of the tests specified in Sections S1 or S2 do not conform to requirements, retests may be made at the manufacturer’s expense on additional fittings or representative test pieces of double the original number from the same heat or lot as defined in Section S1 or S2. If either of the additional test pieces fails, the lot shall be rejected.

NOTE S2.2—Representative Test Piece: Where the test specimen for the tension test cannot be taken from a fitting due to size limitations, a representative test shall be obtained. The test piece shall be from the same heat and heat treated in the same batch or charge as the fittings it represents, and shall have approximately the same amount of working. In addition, test pieces representing fittings manufactured from bars, plate, or forgings shall have a cross section equal to the greatest cross section of the fitting, and test pieces representing fittings manufactured from pipe shall have an outside diameter and wall thickness equal to those of the fitting. The test piece for fittings of welded construction, made with the addition of filler metal, shall be prepared to the same weld procedures and from the same heats of material as the fittings it represents.

NOTE S2.3—A lot shall consist of all fittings of the same type, size, and wall thickness, manufactured from one heat of material, and, if welding is performed, using the same size and AWS classification welding product.

**S3. Liquid Penetrant Test**

S3.1 All surfaces shall be liquid penetrant tested. The method shall be in accordance with Practice E165. Acceptance limits shall be as specified by the purchaser.

**S4. Hydrostatic Test**

S4.1 A hydrostatic test shall be applied as agreed upon between the manufacturer and purchaser.

**S5. Bar Stock Fittings**

S5.1 Fittings machined from solid bar stock are not permitted.
S6. Positive Material Identification Examination

S6.1 Product shall receive Positive Material Identification to ensure that the purchaser is receiving product of the correct material grade prior to shipment of the product. This examination is a method to assure that no material grade mix-up has happened during manufacturing and marking of the product. 


S6.3 The quantity examined shall be 100 % of the product.

S6.4 All product that is not of the correct material grade shall be rejected.

S6.5 The method of product marking after examination shall be agreed upon between the manufacturer and purchaser.

SUMMARY OF CHANGES

Committee B02 has identified the location of selected changes to this standard since the last issue (B366 - 10) that may impact the use of this standard. (Approved October 1, 2010.)

(1) Added a new material N10362 to Table 2 and Table 3.

Committee B02 has identified the location of selected changes to this standard since the last issue (B366 - 04b) that may impact the use of this standard. (Approved April 1, 2010.)

(1) Alloy N08904 was removed from Table 2 and Table 3.