



Designation: B474/B474M – 19 (Reapproved 2023)

Standard Specification for Electric Fusion Welded Nickel and Nickel Alloy Pipe¹

This standard is issued under the fixed designation B474/B474M; 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 electric fusion welded pipe suitable for high-temperature or corrosive service as listed in [Table 1](#). (Although no restrictions are placed on the sizes of pipe that may be furnished under this specification, commercial practice is commonly limited to sizes not less than 8 in. [203 mm] nominal diameter.)

1.2 Five classes of pipe are covered as follows:

1.2.1 *Class 1*—Pipe shall be double welded by processes employing filler metal in all passes and shall be completely radiographed.

1.2.2 *Class 2*—Pipe shall be double welded by processes employing filler metal in all passes. No radiography is required.

1.2.3 *Class 3*—Pipe shall be single welded by processes employing filler metal in all passes and shall be completely radiographed.

1.2.4 *Class 4*—Same as Class 3 except that the weld pass exposed to the inside pipe surface may be made without the addition of filler metal.

1.2.5 *Class 5*—Pipe shall be double welded by processes employing filler metal in all passes and shall be spot radiographed.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *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 Safety Data Sheet (SDS) for this product/material as provided by the manufacturer, to establish appropriate safety, health,*

and environmental practices, and determine the applicability of regulatory limitations prior to use.

1.5 *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 ASTM Standards:²

[A262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels](#)

[A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)

[B127 Specification for Nickel-Copper Alloy Plate, Sheet, and Strip](#)

[B162 Specification for Nickel Plate, Sheet, and Strip](#)

[B168 Specification for Nickel-Chromium-Aluminum Alloys \(UNS N06699\), Nickel-Chromium-Iron Alloys \(UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696\), Nickel-Chromium-Cobalt-Molybdenum Alloy \(UNS N06617\), Nickel-Iron-Chromium-Tungsten Alloy \(UNS N06674\), and](#)

[B333 Specification for Nickel-Molybdenum Alloy Plate, Sheet, and Strip](#)

[B424 Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloys Plate, Sheet, and Strip](#)

[B435 Specification for Heat and Corrosion Resistant High Temperature Alloy Plate, Sheet, and Strip](#)

[B443 Specification for Nickel-Chromium-Molybdenum-Columbium Alloy and Nickel-Chromium-Molybdenum-Silicon Alloy Plate, Sheet, and Strip](#)

[B463 Specification for UNS N08020 Alloy Plate, Sheet, and Strip](#)

[B536 Specification for Nickel-Iron-Chromium-Silicon Alloys Plate, Sheet, and Strip](#)

¹ This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys.

Current edition approved Nov. 1, 2023. Published November 2023. Originally approved in 1968. Last previous edition approved in 2019 as B474/B474M – 19. DOI: 10.1520/B0474_B474M-19R23.

Designation established in accordance with ASTM E527 and SAE J 1086, Practice for Numbering Metals and Alloys (UNS).

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.



TABLE 1 Recommended Heat Treatment

Alloy	UNS Designation	PWHT ^{A,B} Deg. F. [Deg. C]	Quench
200 (Ni)	N02200	1650-1700 [900 to 928]	Rapid Air/water
201 (Low C)	N02201	1650-1700 [900 to 928]	Rapid Air/water
400 (Ni-Cu)	N04400	1650-1700 [900 to 928]	Rapid Air/water
X (Ni-Cr-Mo-Fe)	N06002	2150 [1177] ^C	Rapid Air/water
C22 ^D (Low C-Ni-Mo-Cr)	N06022	2050-[1120] ^C	Rapid Air/water
G30 ^D (Ni-Cr-Fe-Mo-Cu)	N06030	2150 [1177] ^C	Rapid Air/water
C2000 ^D (Ni-Cr-Mo-Cu)	N06200	2075-2125 [1135-1163] ^B	Rapid Air/water
230 ^D (Ni-Cr-W-Mo)	N06230	2150-2250 [1177-1232] ^B	Rapid Air/water
600 (Ni-Cr-Fe)	N06600	1800-1850 [983 to 1010]	Rapid Air/water
601 (Ni-Cr-Fe-Al)	N06601	1600-1650 [874 to 900] ^E	Rapid Air/water
625 (Ni-Cr-Mo-Cb) Grade 1	N06625	1600 [871] ^C	Rapid Air/water
625 (Ni-Cr-Mo-Cb) Grade 2	N06625	2000 [1093] ^C	Rapid Air/water
G3 ^D (Ni-Cr-Fe-Mo-Cu)	N06985	2100-2150 [1147 to 1177] ^B	Rapid Air/water
Alloy 20 (Cr-Ni-Fe-Mo-Cu-Cb)	N08020	1700-1850 [927 to 1010]	Rapid Air/water
825 (Ni-Fe-Cr-Mo-Cu)	N08825	1700-1800 [930 to 980] ^E	Rapid Air/water
C276 (Low C-Ni-Mo-Cr)	N10276	2050 [1121] ^C	Rapid Air/water
B2 (Ni-Mo)	N10665	1950 [1065] ^C	Rapid Air/water
B3 ^D (Ni-Mo)	N10675	1950 [1065] ^C	Rapid Air/water

^A Recommended temperatures—Different temperatures may be selected by either the purchaser or the manufacturer.

^B Set temperatures, ± 25 °F [± 14 °C].

^C Minimum set temperature.

^D Registered Trademark of Haynes International.

^E Heat treatment is highly dependent on intended service temperature — consult material manufacturer for specific heat treatments for end use temperature.

B575 Specification for Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium-Molybdenum-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Tungsten, and Low-Carbon Nickel-Molybdenum-Chromium Alloy Plate, Sheet, and Strip

B582 Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip

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

E8/E8M Test Methods for Tension Testing of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys

2.2 *American Society of Mechanical Engineers Standard*.³

ASME Boiler and Pressure Vessel Code, Section IX and Section VIII, Div. 1

2.3 *American Welding Society Standards*.⁴

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

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

A5.11 Nickel and Nickel Alloy Covered Welded Electrodes

A5.14 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 (feet, metres, or number of lengths),
- 4.1.2 Name of material or UNS number (electric-fusion-welded pipe),
- 4.1.3 Alloy (**Table 1**),
- 4.1.4 Class (see **1.2**),
- 4.1.5 Size (outside diameter and minimum wall thickness),
- 4.1.6 Length (specific or random),
- 4.1.7 ASTM designation and year of issue,
- 4.1.8 Authorization for repair of plate defects by welding without prior approval if such is intended (see **9.4**),
- 4.1.9 Circumferential weld permissibility (see **8.3.2**), and
- 4.1.10 Supplementary requirements.

5. Materials and Manufacture

5.1 *Materials*—The plate material shall conform to the requirements of the appropriate raw material specification listed in **2.1**.

5.2 Welding:

5.2.1 The joints shall be full penetration double-welded or single-welded butt joints employing fusion welding processes 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. Where backing rings or strips are employed, the ring or strip material shall be of the same P-number (**Table QW-422** of

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126, <http://www.aws.org>.