



Designation: B751 – 21

Standard Specification for General Requirements for Nickel and Nickel Alloy Welded Tube¹

This standard is issued under the fixed designation B751; 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 contains various requirements that, with the exception of Sections 6 and 7, are mandatory requirements to the following ASTM nickel and nickel alloy, longitudinally welded tubular product specifications:

Title of Specification	ASTM Designation
Welded UNS N08020, N08024, and UNS N08026 Alloy Tubes	B468
Welded UNS N08120, UNS N08800, UNS N08810, UNS N08811 Alloy Tubes	B515
Welded Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06603, UNS N06025, and UNS N06045) Tubes	B516
Welded Nickel and Nickel-Cobalt Alloy Tube	B626
UNS N08904, UNS N08925, and UNS N08926 Welded Tube	B674
UNS N08366 and UNS N08367 Welded Tube	B676
Welded UNS N06625, N06219, and N08825 Alloy Tubes	B704
Ni-Cr-Mo-Co-W-Fe-Si Alloy (UNS N06333) Welded Tube	B726
Welded Nickel (UNS N02200/UNS N02201) and Nickel Copper Alloy (UNS N04400) Tube	B730

1.2 One or more of the test requirements of Section 6 apply only if specifically stated in the product specification or in the purchase order.

1.3 In case of conflict between a requirement of the product specification and a requirement of this general specification, only the requirement of the product specification need be satisfied.

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 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 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.

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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 ASTM Standards:²

- A1047/A1047M Test Method for Pneumatic Leak Testing of Tubing
- B468 Specification for Welded UNS N08020 Alloy Tubes
- B515 Specification for Welded Nickel-Iron-Chromium Alloy Tubes
- B516 Specification for Welded Nickel-Chromium-Aluminum Alloy (UNS N06699) and Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06601, UNS N06603, UNS N06025, UNS N06045, UNS N06690, and UNS N06693) Tubes
- B626 Specification for Welded Nickel and Nickel-Cobalt Alloy Tube
- B674 Specification for Nickel-Iron-Chromium-Molybdenum and Iron-Nickel-Chromium-Molybdenum-Copper Welded Tube
- B676 Specification for UNS N08367 Welded Tube
- B704 Specification for Welded Nickel Alloy Tubes
- B726 Specification for Nickel-Chromium-Molybdenum-Cobalt-Tungsten-Iron-Silicon Alloy (UNS N06333) Welded Tube
- B730 Specification for Welded Nickel (UNS N02200/UNS N02201) and Nickel Copper Alloy (UNS N04400) Tube
- B880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys
- E8/E8M Test Methods for Tension Testing of Metallic Materials
- E18 Test Methods for Rockwell Hardness of Metallic Materials

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.

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

- E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E39 Methods for Chemical Analysis of Nickel (Withdrawn 1995)³
E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys (Withdrawn 2003)³
E112 Test Methods for Determining Average Grain Size
E213 Practice for Ultrasonic Testing of Metal Pipe and Tubing
E273 Practice for Ultrasonic Testing of the Weld Zone of Welded Pipe and Tubing
E309 Practice for Eddy Current Examination of Steel Tubular Products Using Magnetic Saturation
E426 Practice for Electromagnetic (Eddy Current) Examination of Seamless and Welded Tubular Products, Titanium, Austenitic Stainless Steel and Similar Alloys
E571 Practice for Electromagnetic (Eddy-Current) Examination of Nickel and Nickel Alloy Tubular Products
E1473 Test Methods for Chemical Analysis of Nickel, Cobalt and High-Temperature Alloys

2.2 Other Documents:

- SNT-TC-1A Recommended Practice for Nondestructive Personnel Qualification and Certification⁴

3. Terminology

3.1 Definitions:

3.1.1 *average diameter, n*—the average of the maximum and minimum outside diameters, as determined at any one cross section of the tube.

3.1.2 *nominal wall, n*—a specified wall thickness with a plus and minus tolerance from the specified thickness.

3.1.3 *thin wall tube, n*—tube with specified wall thickness 3 % or less of the specified outside diameter.

3.1.4 *welded tube, n*—a hollow product of round or any other cross section having a continuous periphery.

4. Dimensions and Permissible Variations

4.1 *Diameter and Wall Thickness*—Individual measurements shall not exceed the tolerances specified in **Table 1**. The permissible variation in outside diameter is not sufficient to

provide for ovality in thin-walled tubes. For thin-walled tubes the maximum and minimum diameters at any cross section shall not deviate from the nominal diameter by more than twice the permissible variation in outside diameter given in the table; however, the mean diameter at that cross section must still be within the permissible variation.

4.2 *Length*—When material is ordered cut-to-length, the length shall conform to the permissible variations prescribed in **Table 2**.

4.3 *Straightness*—Material shall be reasonably straight and free of bends and kinks.

4.4 *Ends*—Ends shall be plain or cut and deburred.

5. Workmanship, Finish, and Appearance

5.1 The material shall be uniform in quality and temper, smooth, and free of imperfections that would render it unfit for use.

6. Test Requirements

6.1 Flange Test:

6.1.1 A length of tube not less than three times the specified diameter or 4 in. (102 mm), whichever is longer, shall be capable of having a flange turned over at a right angle to the body of the tube without cracking or showing imperfections rejectable under the provisions of the product specification. The width of the flange shall not be less than 15 % of the tube diameter.

6.1.2 The flanged specimen shall not exhibit through wall cracking or any cracking observable without magnification.

6.2 Flattening Test:

6.2.1 A length of tube not less than 4 in. (102 mm), shall be flattened under a load applied gradually at room temperature until the distance between the platens is five times the wall thickness. The weld shall be positioned 90° from the direction of the applied flattening force.

6.2.2 The flattened specimen shall not exhibit cracks.

6.2.3 Superficial ruptures resulting from surface imperfections shall not be a cause for rejection.

6.3 *Flare Test*—The flare test shall consist of flaring a test specimen with an expanding tool having an included angle of 60° until the specified outside diameter has been increased by 30 %. The flared specimen shall not exhibit cracking through the wall.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlington Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

TABLE 1 Permissible Variations for Outside Diameter and Wall Thickness of Welded Tube^{A,B}

Specified Outside Diameter in. (mm)	Outside Diameter		Permissible Variations of Thickness of Specified Nominal Wall, %		Thickness of Specified Minimum Wall, %	
	+	–	+	–	+	–
Over 0.125 (3.2) to 5/8 (16), excl	0.004 (0.10)	0.005 (0.13)	12.5	12.5	28	0
5/8 (16) to 1 1/2 (38), incl	0.0075 (0.19)	0.0075 (0.19)	12.5	12.5	28	0
Over 1 1/2 (38) to 3 (76), incl	0.010 (0.25)	0.010 (0.25)	12.5	12.5	28	0
Over 3 (76) to 4 1/2 (114), incl	0.015 (0.38)	0.015 (0.38)	12.5	12.5	28	0
Over 4 1/2 (114) to 6 (152), incl	0.020 (0.51)	0.020 (0.51)	12.5	12.5	28	0

^A These permissible variations in outside diameter apply only to material as finished at the mill before subsequent swaging, expanding, bending, polishing, or other fabricating operations.

^B The ovality provisions of 4.1 apply.