



Standard Specification for Welded Nickel-Iron-Chromium Alloy Pipe¹

This standard is issued under the fixed designation B514; 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 specification² covers nickel-iron-chromium alloys in the form of welded, cold-worked, and annealed pipe for general corrosive service and heat-resisting applications. These products are furnished in three alloys: UNS N08120, UNS N08800, and UNS N08810.³ Alloy UNS N08800 is employed normally in service temperatures up to and including 1100°F (593°C). Alloys UNS N08120 and UNS N08810 are employed normally in service temperatures above 1100°F where resistance to creep and rupture is required, and are annealed to develop controlled grain size for optimum properties in this temperature range.

1.2 This specification covers outside diameter and nominal wall pipe shown in ANSI B36.19. Pipe having other dimensions may be furnished provided such pipe complies with all other requirements of the specification.

1.3 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.

1.4 *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 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.*

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 Oct. 1, 2014. Published October 2014. Originally approved in 1970. Last previous edition approved in 2009 as B514 – 05 (2009). DOI: 10.1520/B0514-05R14.

² For ASME Boiler and Pressure Code applications see related Specification SB-514 in Section II of that Code.

³ New designation established in accordance with ASTM E527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

2. Referenced Documents

2.1 *ASTM Standards*:⁴

B775 Specification for General Requirements for Nickel and Nickel Alloy Welded Pipe

B899 Terminology Relating to Non-ferrous Metals and Alloys

2.2 *ANSI Standard*:

B36.19 Stainless Steel Pipe⁵

3. Terminology

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

4. General Requirement

4.1 Material furnished in accordance with this specification shall conform to the applicable requirements of the current edition of Specification **B775** unless otherwise provided herein.

5. Ordering Information

5.1 Orders for material under this specification should include the following information:

5.1.1 Alloy name or UNS number.

5.1.2 ASTM designation and year of issue.

5.1.3 Condition (temper) (**Table 1**).

5.1.4 *Dimensions*:

5.1.4.1 Nominal pipe size or outside diameter and schedule number or nominal wall thickness.

5.1.4.2 Length (specific or random).

5.1.5 Quantity (feet or metres, or number of pieces).

5.1.6 *Certification*—State if certification or a report of test results is required.

⁴ 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.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

TABLE 1 Mechanical Property Requirements

Alloy	Condition (Temper)	Tensile Strength, min, psi (MPa)	Yield Strength, 0.2 % Offset, min, psi (MPa)	Elongation in 2 in. or 50 mm, min, %
UNS N08120	annealed	90 000 (621)	40 000 (276)	30
UNS N08800	annealed	75 000 (520)	30 000 (207)	30
UNS N08810	annealed	65 000 (450)	25 000 (170)	30

5.1.7 *Samples for Product (Check) Analysis*—State whether samples for product (check) analysis should be furnished.

5.1.8 *Purchaser Inspection*—If the purchaser wishes to witness tests or inspection of material at the place of manufacture, the purchase order must so state indicating which tests or inspections are to be witnessed.

6. Materials and Manufacture

6.1 Pipe shall be made from flat-rolled alloy by an automatic welding process with no addition of filler metal. Subsequent to welding and prior to final solution treatment, the material shall be cold worked either in both weld and base metal or in weld metal only.

6.2 Pipe shall be furnished with a scale-free finish. When bright annealing is used, descaling is not necessary.

7. Chemical Composition

7.1 The material shall conform to the requirements as to chemical composition prescribed in **Table 2**.

TABLE 2 Chemical Requirements

Element	Composition Limits, %	
	Alloy N08120	Alloys N08800 and N08810
Nickel	35.0 min	30.0 min
	39.0 max	35.0 max
Chromium	23.0 min	19.0 min
	27.0 max	23.0 max
Iron	remainder	39.5 min ^A
Manganese, max	1.5	1.5
Carbon	0.02 min	^B
	0.10 max	
Copper, max	0.50 max	0.75
Silicon, max	1.0	1.0
Sulfur, max	0.03	0.015
Aluminum	0.40 max	0.15 min
	...	0.60 max
Titanium	0.20 max	0.15 min
	...	0.60 max
Columbium	0.4 min	...
	0.9 max	...
Molybdenum	2.50 max	...
Phosphorus	0.040 max	...
Tungsten	2.50 max	...
Cobalt, max	3.0	...
Nitrogen	0.15 min	...
	0.30 max	...
Boron	0.010 max	...

^A Iron shall be determined arithmetically by difference.

^B Alloy UNS N08800: 0.10 max. Alloy UNS N08810: 0.05 to 0.10.

7.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product (check) analysis variations in Table 1 of Specification **B775**.

8. Mechanical and Other Requirements

8.1 *Mechanical Properties*—The material shall conform to the requirements for mechanical properties prescribed in **Table 1**.

8.2 *Grain Size*—A transverse sample representing the full-wall thickness of annealed alloys UNS N08120 and N08810 shall conform to an average grain size of ASTM No. 5 or coarser.

8.3 *Flattening Test*—Pipe shall be capable of withstanding, without cracking, flattening 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 deg from the direction of the applied flattening force.

8.4 *Annealing Temperature*—Alloy UNS N08120 shall be annealed at 2150°F (1177°C) minimum; alloy UNS N08810 shall be annealed at 2050°F (1120°C) minimum.

8.5 *Nondestructive Test Requirements:*

8.5.1 *Category 1*—Each piece of each lot shall be subject to one of the following four tests: hydrostatic, pneumatic (air underwater), eddy current, or ultrasonic.

8.5.2 *Category 2*—Each piece in each lot shall be subjected to a leak test and an electric test as follows:

8.5.2.1 *Leak Test*—Hydrostatic or pneumatic (air underwater).

8.5.2.2 *Electric Test*—Eddy current or ultrasonic.

8.6 The manufacturer shall have the option to test Category 1 or Category 2 and select the nondestructive test methods, if not specified by the purchaser.

8.7 *Transverse Guided Bend Test*—At the option of the pipe manufacturer, the transverse guided bend test may be substituted in lieu of the flattening test. Two bend specimens shall be taken transversely from pipe or the test specimens may be taken from a test plate of the same material and heat as pipe, which is attached to the end of the cylinder and welded as a prolongation of the pipe longitudinal seam. One test is required for each lot as defined in Specification **B775**.

9. Number of Tests

9.1 *Chemical Analysis*—One per lot.

9.2 *Mechanical Properties*—One test per lot.


9.3 *Flattening or Transverse Guided Bend Test*—One test per lot.

9.4 *Grain Size*—One test per lot.

9.5 *Nondestructive*—Each piece in each lot.

10. Keywords

10.1 UNS N08120; UNS N08800; UNS N08810; welded pipe

 **B514 – 05 (2014)**

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; <http://www.copyright.com/>