Designation: ~~B677 – 21~~ B677 – 23

Standard Specification for ~~Nickel-Iron-Chromium-Molybdenum and Iron-Nickel-Chromium-Molybdenum-Copper~~Nickel-Iron-Chromium-Molybdenum, Iron-Nickel-Chromium-Molybdenum-Copper, and Nickel-Iron-Chromium-Molybdenum-Nitrogen Seamless Pipe and Tube[1]

This standard is issued under the fixed designation B677; 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 UNS N08925, UNS N08354, ~~and~~ UNS N08926[2], and UNS N08935 seamless, cold-worked or hot-finished pipe and tube intended for general corrosive service.

1.2 ASTM International has adopted definitions whereby some grades, such as UNS N08904 previously in this specification, were recognized as stainless steels, because those grades have iron as the largest element by mass percent. Such grades are under the oversight of ASTM Committee A01 and its subcommittees. The products of N08904 previously covered in this specification are now covered by Specifications A269 and A312/A312M.

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 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:*[3]

A269 Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service

A312/A312M Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

B829 Specification for General Requirements for Nickel and Nickel Alloys Seamless Pipe and Tube

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

[3] 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**

B899 Terminology Relating to Non-ferrous Metals and Alloys
E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

3. Terminology

~~3.1 *average diameter, n*—the average of the maximum and minimum outside diameters as determined at any one cross section of the tube or pipe.~~

3.1 *Definitions:*

3.1.1 For definitions of terms used in this specification, refer to Terminology B899.

~~3.2 *pipe, n*—seamless tube conforming to the particular dimensions commercially known as standard pipe sizes.~~

~~3.3 *tube, n*—a hollow product of round or any other cross section having a continuous periphery.~~

4. General Requirements

4.1 Material furnished under this specification shall conform to the requirements of Specification B829 unless otherwise provided herein. In the case of conflict, the requirements of this specification shall take precedence.

5. Ordering Information

5.1 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:

5.1.1 Alloy name or UNS number.

5.1.2 ASTM designation and year of issue.

5.1.3 Finish.

5.1.4 *Dimensions:*

TABLE 1 Chemical Requirements

Element	UNS N08925	UNS N08926	UNS ~~N08354~~	
~~Carbon, max~~	~~0.020~~	~~0.020~~	~~0.030~~	
~~Manganese, max~~	~~1.0~~	~~2.00~~		~~1.00~~
~~Phosphorus, max~~	~~0.045~~	~~0.03~~	~~0.030~~	
~~Sulfur, max~~	~~0.030~~	~~0.01~~		~~0.010~~
~~Silicon, max~~	~~0.50~~	~~0.5~~		~~1.00~~
~~Nickel~~	~~24.0 to 26.0~~	~~24.00 to 26.00~~		~~22.0 to 24..0~~
Chromium	19.0 to 21.0	19.00 to 21.00		34.0 to 36.0
Molybdenum	6.0 to 7.0	6.0 to 7.0		7.0 to 8.0
Copper	0.8 to 1.5	0.5 to 1.5		...
Nitrogen	0.1 to 0.2	0.15 to 0.25		0.17 to 0.24
Iron	balance	balance	balance	

TABLE 1 Chemical Requirements[A]

Element	UNS N08925	UNS N08926	UNS N08935	UNS N08354
Carbon	0.020	0.020	0.030	0.030
Manganese	1.0	2.00	1.2	1.00
Phosphorus	0.045	0.03	0.030	0.030
Sulfur	0.030	0.01	0.020	0.010
Silicon	0.50	0.5	0.5	1.00
Nickel	24.0 to 26.0	24.00 to 26.00	34.0 to 36.0	22.0 to 24.0
Chromium	19.0 to 21.0	19.00 to 21.00	26.0 to 28.0	34.0 to 36.0
Molybdenum	6.0 to 7.0	6.0 to 7.0	6.1 to 7.1	7.0 to 8.0
Copper	0.8 to 1.5	0.5 to 1.5	0.4	...
Nitrogen	0.1 to 0.2	0.15 to 0.25	0.25 to 0.36	0.17 to 0.24
Iron	balance	balance	balance	balance

[A] Maximum unless range is given. Where ellipses (...) appear in this table, there is no requirement and analysis for the element need not be determined or reported.

TABLE 2 Mechanical Properties of Pipe and Tube

Alloy	Temper	Tensile Strength, min, ksi (MPa)	Yield Strength, 0.2 % offset, min, ksi (MPa)	Elongation in 2 in. or 50 mm (or 4*D*), min, %
UNS N08925	solution annealed	87 (600)	43 (300)	40
UNS N08354	solution annealed	93 (640)	43 (295)	40
UNS N08926	solution annealed	94 (650)	43 (295)	35
UNS N08935	solution annealed	109 (750)	58 (400)	35

5.1.4.1 *Tube*—Outside diameter and the average or minimum wall thickness.

5.1.4.2 *Pipe*—Standard pipe size and schedule.

5.1.4.3 *Length* (cut to length or random).

5.1.5 Quantity (feet or number of pieces).

5.1.6 *Nondestructive Testing* (see 8.2):

5.1.6.1 *Pressure Requirements*—Test pressure if other than required by 8.2.1.

5.1.6.2 Specify if an electric test is to be performed.

5.1.7 *Ends*—Plain ends cut and deburred will be furnished. If threaded ends or ends beveled for welding are desired, give details.

~~5.1.8 *Certification*—State if certification is required.~~

5.1.8 *Samples for Product (Check) Analysis*—State whether samples for product (check) analysis should be furnished (see 7.2).

5.1.9 *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 The material shall be supplied in the solution-treated condition.

NOTE 1—The recommended heat treatment shall consist of heating to a temperature of ~~2010 to 2100°F (1100 to 1150°C)~~2010 °F to 2100 °F (1100 °C to 1150 °C) for UNS N08925 and UNS N08926, followed by quenching in water or rapid cooling by other means. The recommended heat treatment shall consist of heating to a temperature of 1975 °F (1080 °C) minimum for UNS N08935, followed by water quenching or rapid cooling by other means.

7. Chemical Composition

7.1 The material shall conform to the requirements as to chemical composition prescribed in Table 1. One test is required for each lot as defined in Specification B829.

7.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product (check) analysis variations per Specification B829.

8. Mechanical Properties and Other Requirements

8.1 *Mechanical Properties*—The material shall conform to the mechanical properties prescribed in Table 2. One test is required for each lot as defined in Specification B829.

8.2 *Nondestructive Tests*—Each pipe and tube shall be subjected to either a hydrostatic test or a nondestructive electric test as described in Specification B829. The purchaser may specify which test is to be used.

8.2.1 *Hydrostatic Test*—The fiber stress for the purpose of calculating the hydrostatic test pressure shall be 20 000 psi (138 MPa).