Designation: B 462 – 00a

Standard Specification for Forged or Rolled UNS N06030, UNS N06022, UNS N06200, UNS N08020, UNS N08024, UNS N08026, UNS N08367, UNS N10276, UNS N10665, UNS N10675 and UNS R20033 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service[1]

This standard is issued under the fixed designation B 462; 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[2] covers forged or rolled UNS N06030, UNS N06022, UNS N06200, UNS N08020, UNS N08024, UNS N08026, UNS N08367, UNS N10276, UNS N10665, UNS N10675 and UNS R20033* pipe flanges, forged fittings, and valves and parts intended for corrosive high-temperature service.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels[3]

B 472 Specification for UNS N06030, UNS N06022, UNS N06200, UNS N08020, UNS N08026, UNS N08024, UNS N08926, UNS N08367, UNS N10276, UNS N10665, UNS N10675, and UNS R20033 Nickel Alloy Billets and Bars for Reforging[4]

E 8 Test Methods for Tension Testing of Metallic Materials[5]

B 880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys[4]

E 1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys[6]

E 1916 Guide for the Identification and/or Segregation of Mixed Lots of Metals[6]

2.2 *ANSI Standard:*

B16.5 Steel Pipe Flanges and Flanged Fittings (for applicable alloy UNS N08020)[7]

2.3 *Manufacturers' Standardization Society of the Valve and Fittings Industry Standard:*

SP-25 Standard Marking System for Valves, Fittings, Flanges, and Unions[8]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *forgings, n*—the term forgings as used in this specification shall be understood to cover one or all of the products mentioned in 1.1, either forged or rolled.

4. Ordering Information

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

4.1.1 Quantity (weight or number of pieces),
4.1.2 Name of material or UNS number,
4.1.3 Forging sketch when required (5.2.4),
4.1.4 Forging sectioning, if required (5.2.3),
4.1.5 ASTM designation and year of issue,
4.1.6 Inspection (14.1),
4.1.7 Supplementary requirements, if any, and
4.1.8 If possible, the intended end use.

NOTE 1—A typical ordering description is as follows: 200 forgings, UNS N08020, in accordance with the attached drawing and Specification B 462.

5. Materials and Manufacture

5.1 *Discard*—A sufficient discard shall be made from each ingot to secure freedom from injurious piping and undue

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[2] For ASME Boiler and Pressure Vessel Code applications see related Specification SB-462 in Section II of that Code.

* New designation established in accordance with Practice E 527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

[3] *Annual Book of ASTM Standards*, Vol 01.03.

[4] *Annual Book of ASTM Standards*, Vol 02.04.

[5] *Annual Book of ASTM Standards*, Vol 03.01.

[6] *Annual Book of ASTM Standards*, Vol 03.06.

[7] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[8] Available from the Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park St., N.E. Vienna, VA 22180.

segregation. The material shall have a homogeneous structure as shown by the macroetch test in 7.3.

5.2 *Manufacturing Practice*:

5.2.1 Material for forgings shall consist of billets or bars in accordance with Specification B 472.

5.2.2 The material shall be forged by hammering, pressing, rolling, extruding, or upsetting; it shall be brought as nearly as practicable to the finished shape and size by hot working; and shall be so processed as to cause metal flow during the hot-working operation in the direction most favorable for resisting the stresses encountered in service.

5.2.3 When specified in the order, a sample forging may be sectioned and etched to show flow lines and the condition as regards internal imperfections. In such cases, the question of acceptable and unacceptable character of metal flow shall be a subject for agreement between the manufacturer and the purchaser.

5.2.4 When specified in the order, the manufacturer shall submit for approval of the purchaser a sketch showing the shape of the rough forging before machining.

5.3 *Heat Treatment*:

5.3.1 The product of UNS N08020 alloy shall be furnished in the stabilized-annealed condition. The product of UNS N08024 shall be furnished in the annealed condition. The product of UNS N08026 and UNS R20033 alloys shall be furnished in the solution annealed condition.

NOTE 2—The recommended annealing temperatures all followed by water quenching or rapidly cooling by other means are: UNS N06030—2125°F–2175°F (1163°C–1191°C), UNS N06022—2025°F–2075°F (1107°C–1135°C), UNS N06200—2075°F–2125°F (1135°C–1163°C), UNS N08020—1700 to 1850°F (927 to 1010°C), UNS N08024—1925 to 1975°F (1052 to 1079°C), UNS N08026—2050 to 2200°F (1121 to 1204°C), UNS N10276—2025°F–2075°F (1107°C–1135°C), UNS N10665—1925°F–2000°F (1052°C–1093°C), UNS N10675—1925°F–2000°F (1052°C–1093°C), and UNS R20033—2010 to 2150°F (1100–1180°C).

5.3.2 Alloy N08367 shall be furnished in the solution annealed condition.

5.3.2.1 The recommended heat treatment shall consist of heating to a minimum temperature of 2025°F (1105°C) and quenching in water, or rapidly cooling, by other means.

5.3.3 Heat treatment may be performed before machining.

6. Chemical Composition

6.1 The material shall conform to the requirements as to chemical composition prescribed in Table 1.

6.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the requirements

TABLE 1 Chemical Requirements

Element	Composition, %				
	UNS N08026	UNS N08020	UNS N08024	UNS N08367	UNS R20033
Carbon, max	0.03	0.07	0.03	0.030	0.015
Manganese, max	1.00	2.00	1.00	2.00	2.0
Phosphorus, max	0.03	0.045	0.035	0.040	0.02
Sulfur, max	0.03	0.035	0.035	0.030	0.01
Silicon, max	0.50	1.00	0.50	1.00	0.50
Nickel	33.00–37.20	32.00–38.00	35.00–40.00	23.50 to 25.50	30.0–33.0
Chromium	22.00–26.00	19.00–21.00	22.50–25.00	20.00 to 22.00	31.0–35.0
Molybdenum	5.00–6.70	2.00–3.00	3.50–5.00	6.00 to 7.00	0.50–2.0
Copper	2.00–4.00	3.00–4.00	0.50–1.50	0.75 max	0.30–1.20
Columbium (Nb) + tantalum	...	8 × carbon–1.00	0.15–0.35	...	...
Nitrogen	0.10–0.16	...	...	0.18 to 0.25	0.35–0.60
Iron	remainder[A]	remainder[A]	remainder[A]	remainder	balance

Element	Composition, %					
	UNS N06030	UNS N06022	UNS N06200	UNS N10276	UNS N10665	UNS N10675
Carbon, max	0.03	0.015	0.010	0.010	0.02	0.01
Manganese, max	1.5	0.50	0.50	1.0	1.0	3.0
Phosphorous, max	0.04	0.02	0.025	0.04	0.04	0.030
Sulfur, max	0.02	0.02	0.010	0.03	0.03	0.010
Silicon, max	0.8	0.08	0.08	0.08	0.10	0.10
Nickel	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder
Chromium	28.0-31.5	20.0-22.5	22.0-24.0	14.5-16.5	1.0 max	1.0-3.0
Molybdenum	4.0-6.0	12.5-14.5	15.0-17.0	15.0-17.0	26.0-30.0	27.0-32.0
Copper	1.0-2.4		1.3-1.9			0.20
Columbium (Nb) + tantalum	0.30-1.50					
Nitrogen	. . .					
Iron	13.0-17.0	2.0-6.0	3.0 max	4.0-7.0	2.0 max	1.0-3.0
Cobalt, max	5.0	2.5	2.0	2.5	1.0	3.0
Tungsten	1.5-4.0	2.5-3.5		3.0-4.5		3.0 max
Vanadium, max		0.35		0.35		0.20
Titanium, max						0.2
Zirconium, max						0.10
Columbium (Nb)						0.20 max
Tantalum						0.20 max
Nickel + Molybdenum						94.0-98.0
Aluminum, max			0.50			0.50

[A] Iron shall be determined arithmetically by difference.