



Designation: A887 – 20

Standard Specification for Borated Stainless Steel Plate, Sheet, and Strip for Nuclear Application¹

This standard is issued under the fixed designation A887; 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 chromium-nickel stainless steel plate, sheet, and strip, modified by the addition of natural or enriched boron, for nuclear application.

1.2 Borated stainless steels covered by this specification, because of their particular alloy content and specialized properties, may require special care in their fabrication and welding. Specific procedures are of fundamental importance, and it is presupposed that all parameters will be in accordance with approved methods capable of producing the desired properties in the finished fabrication.

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 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

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

[A480/A480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip](#)

[A751 Test Methods and Practices for Chemical Analysis of Steel Products](#)

3. General Requirements

3.1 The following requirements for orders for material furnished under this specification shall conform to the applicable requirements of the current edition of Specification [A480/A480M](#).

- 3.1.1 Definitions,
- 3.1.2 General requirements for delivery,
- 3.1.3 Ordering information,
- 3.1.4 Process,
- 3.1.5 Dimensions and permissible variations,
- 3.1.6 Workmanship, finish, and appearance,
- 3.1.7 Retreatment,
- 3.1.8 Inspection,
- 3.1.9 Rejection and reheating,
- 3.1.10 Material test report,
- 3.1.11 Certification, and
- 3.1.12 Packaging, marking, and loading.

4. Heat Treatment

4.1 The austenitic chromium-nickel steels shall be solution-annealed to meet the mechanical property requirements of this specification. Solution-annealing shall consist of heating the material to a temperature of 1900 °F (1040 °C) minimum for an appropriate time followed by water quenching or rapidly cooling by other means.

5. Chemical Composition

5.1 The chemical analysis of representative material shall be performed, as agreed upon between the purchaser and supplier, to determine the percentages of the elements identified in [Table 1](#). The chemical composition thus determined shall be reported to the purchaser, or his representative, and shall conform to the requirements specified in [Table 1](#).

5.2 When a product (check or verification) analysis is performed, the chemical composition thus determined may

¹ This specification is under the jurisdiction of ASTM Committee [A01](#) on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee [A01.17](#) on Flat-Rolled and Wrought Stainless Steel.

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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

TABLE 1 Chemical Requirements Composition^A

UNS Designation	Type	Carbon	Manganese	Phosphorous	Sulfur	Silicon	Chromium	Nickel	Boron	Other Elements ^B
S30460	304B	0.08	2.00	0.045	0.030	0.75	18.00–20.00	12.00–15.00	0.20–0.29	N 0.10 max
S30461	304B1	0.08	2.00	0.045	0.030	0.75	18.00–20.00	12.00–15.00	0.30–0.49	N 0.10 max
S30462	304B2	0.08	2.00	0.045	0.030	0.75	18.00–20.00	12.00–15.00	0.50–0.74	N 0.10 max
S30463	304B3	0.08	2.00	0.045	0.030	0.75	18.00–20.00	12.00–15.00	0.75–0.99	N 0.10 max
S30464	304B4	0.08	2.00	0.045	0.030	0.75	18.00–20.00	12.00–15.00	1.00–1.24	N 0.10 max
S30465	304B5	0.08	2.00	0.045	0.030	0.75	18.00–20.00	12.00–15.00	1.25–1.49	N 0.10 max
S30466	304B6	0.08	2.00	0.045	0.030	0.75	18.00–20.00	12.00–15.00	1.50–1.74	N 0.10 max
S30467	304B7	0.08	2.00	0.045	0.030	0.75	18.00–20.00	12.00–15.00	1.75–2.25	N 0.10 max

^A Maximum, unless range or minimum is indicated.

^B Cobalt concentration shall be limited to 0.2 maximum, unless a lower concentration is agreed upon between the purchaser and the supplier.

vary from the specified limits by the amounts shown in **Table 1**, Product Analysis Tolerances, of Specification **A480/A480M**.

5.3 Methods and practices relating to chemical analysis required by this specification shall be in accordance with Test Methods, Practices, and Terminology **A751**.

5.4 Boron determination not covered in Test Methods, Practices, and Terminology **A751** shall be made as agreed upon between the purchaser and the supplier.

6. Mechanical Properties

6.1 *Tensile Properties*—The material shall conform to the tensile property requirements specified in **Table 2**.

6.2 *Hardness*—The material shall conform to the hardness requirements as specified in **Table 2**.

6.3 *Grade*—The grade of the material is defined by the uniformity of the dispersion of the boron within the melt. Grade A corresponds to the near-optimal dispersion, while Grade B corresponds to a less-than-optimal dispersion of the boron. Conventional wrought metallurgical practice conforms to Grade B properties. The quality of the boron dispersion is measured indirectly through the ductility requirements, as specified in **Table 2**.

7. Special Tests

7.1 If any special tests are required that are pertinent to the intended application of the material ordered, they shall be agreed upon between the supplier and the purchaser.

7.2 Charpy V-notch impact testing is not required unless it is specified on the purchase order. If so specified, impact testing shall be performed in accordance with Test Methods and Definitions **A370**. The impact test results thus determined shall be reported to the purchaser, or his representative, and shall conform to the requirements specified in **Table 3**. If subsize impact test specimens are used, the applicable requirements shall be agreed upon between the purchaser and the supplier.

8. Number of Tests

8.1 In the case of sheet or strip produced in coil form, two or more hardness tests (one from each end of the coil); one impact test, when required; and one or more tension tests shall be made on specimens taken from each coil. If the hardness difference between the two ends of the coil exceeds 5 HRB, or equivalent, tensile properties must be determined on both ends.

8.2 In the case of sheet, strip, or plate produced in cut lengths, one tension test; one impact test, when required; and one or more hardness tests shall be made on each 100 or less pieces of the same heat and nominal thickness rolled separately or continuously and heat treated within the same operating period, either as a lot or continuously.

NOTE 1—The term “continuously,” as applied to heat treatment, is meant to describe a heat-treating operation in which one cut length follows another through the furnace. Interspersion of different melts is permissible if they are of approximately the same nominal thickness and are heat treated in the same operating period and under the same conditions (time and temperature), provided that each heat is tested.

TABLE 2 Mechanical Test Requirements

UNS Designation	Type	Grade	Tensile Strength, min		Yield Strength, min		Elongation in 2 in. or 50 mm, min, %	Hardness, max	
			ksi	MPa	ksi	MPa		Brinell	Rockwell B
			S30460	304B	A	75	515	30	205
		B	75	515	30	205	40.0	201	92
S30461	304B1	A	75	515	30	205	40.0	201	92
		B	75	515	30	205	35.0	201	92
S30462	304B2	A	75	515	30	205	35.0	201	92
		B	75	515	30	205	27.0	201	92
S30463	304B3	A	75	515	30	205	31.0	201	92
		B	75	515	30	205	19.0	201	92
S30464	304B4	A	75	515	30	205	27.0	217	95
		B	75	515	30	205	16.0	217	95
S30465	304B5	A	75	515	30	205	24.0	217	95
		B	75	515	30	205	13.0	217	95
S30466	304B6	A	75	515	30	205	20.0	241	100
		B	75	515	30	205	9.0	241	100
S30467	304B7	A	75	515	30	205	17.0	241	100
		B	75	515	30	205	6.0	241	100