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Standard Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength¹

This standard is issued under the fixed designation A 285/A 285M; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification² covers carbon steel plates of low- and intermediate-tensile strengths which may be made by killed, semi-killed, capped, or rimmed steel practices at the producer's option. These plates are intended for fusion-welded pressure vessels.

1.2 Plates under this specification are available in three grades having different strength levels as follows:

Grade	Tensile Strength, ksi [MPa]
A	45–65 [310–450]
B	50–70 [345–485]
C	55–75 [380–515]

1.3 The maximum thickness of plates under this specification, for reasons of internal soundness, is limited to a maximum thickness of 2 in. [50 mm] for all grades.

NOTE 1—For killed carbon steels only refer to the following ASTM specifications: ~~A299/A299M Pressure Vessel Plates, Carbon Steel, Manganese-Silicon; A515/A515M Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service; A516/A516M Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service.~~

~~1.4 For plates produced from coil, the additional requirements, including additional testing requirements and the reporting of additional test results, of Specification A20/A20M apply.³~~

~~A 299/A 299M Pressure Vessel Plates, Carbon Steel, Manganese-Silicon.~~

~~A 515/A 515M Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service~~

~~A 516/A 516M Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service.~~

~~1.4 For plates produced from coil and furnished without heat treatment or with stress relieving only, the additional requirements, including additional testing requirements and the reporting of additional test results, of Specification A 20/A 20M apply.~~

1.5 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

2. Referenced Documents

2.1 *ASTM Standards:*³

A 20/A 20M Specification for General Requirements for Steel Plates for Pressure Vessels

3. General Requirements and Ordering Information

~~3.1 Material supplied to this material specification shall conform to Specification A20/A20M. These requirements outline the testing and retesting methods and procedures, permissible variations in dimensions and mass, quality and repair of defects, marking, loading, etc.~~

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 A01.11 on Steel Plates for Boilers and Pressure Vessels.

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² For ASME Boiler and Pressure Vessel Code applications, see related Specification SA-285/SA-285M in Section II of that Code.

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*, Vol 01-04, 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.

3.2 Specification A20/A20M also establishes the rules for the ordering information that should be complied with when purchasing material to this specification.

3.3 In addition to the basic requirements of this specification, certain supplementary requirements are available when additional control testing or examination is required to meet end use requirements.

3.4 The purchaser is referred to the listed supplementary requirements in this specification and to the detailed requirements in Specification A20/A20M.

3.5 Coiled product is excluded from qualification to this specification until it is decoiled, leveled, and cut to length. Plate produced from coil means plate that has been cut to individual lengths from a coiled product and is furnished without heat treatment. The processor decoils, levels, cuts to length, and marks the product. Except as allowed by Section 6 in Specification A20/A20M, the processor is responsible for performing and certifying all tests, examinations, repairs, inspections, and operations not intended to affect the properties of the material. For plate produced from coils, the results of the tests performed shall be reported for each qualifying coil. See Note 2. General Requirements and Ordering Information

3.1 Plates supplied to this product specification shall conform to Specification A 20/A 20M, which outlines the testing and retesting methods and procedures, permissible variations in dimensions and mass, quality and repair of defects, marking, loading, etc.

3.2 Specification A 20/A 20M also establishes the rules for ordering information that should be complied with when purchasing plates to this specification.

3.3 In addition to the basic requirements of this specification, certain supplementary requirements are available where additional control, testing, or examination is required to meet end use requirements.

3.4 The purchaser is referred to the listed supplementary requirements in this specification and to the detailed requirements in Specification A 20/A 20M.

3.5 Coils are excluded from qualification to this specification until they are processed into finished plate. Plates produced from coil means plates that have been cut to individual lengths from coil. The processor directly controls, or is responsible for, the operations involved in the processing of coils into finished plates. Such operations include decoiling, leveling, cutting to length, testing, inspection, conditioning, heat treatment (if applicable), packaging, marking, loading for shipment, and certification.

TABLE 1 Chemical Requirements

Elements	Composition, %		
	Grade A	Grade B	Grade C
Carbon, max ^A	0.17	0.22	0.28
Manganese, max			
Manganese, max:			
Heat analysis	0.90	0.90	0.90
Product analysis	0.98	0.98	0.98
Phosphorus, max ^A	0.035	0.035	0.035
Sulfur, max ^A	0.035	0.035	0.035

^A Applies to both heat and product analyses.

TABLE 2 Tensile Requirements

	Grade A		Grade B		Grade C		
	ksi	[MPa]	ksi	[MPa]	ksi	[MPa]	
Tensile strength	45–65	24	[310–450]	50–70	27	[345–485]	55–75
Yield strength, min ^A			[165]			[185]	
Tensile strength	45–65		[310–450]	50–70		[345–485]	55–75
Yield strength, min ^A	24		30	27		[380–515]	30
Elongation in 8 in. or [200 mm], min, % ^B		27		25		23	
Elongation in 2 in. or [50 mm], min, % ^B		27		25		23	
		30		28		27	
Elongation in 2 in. or [50 mm], min, % ^B		30		28		27	

^A Determined by either the 0.2 % offset method or the 0.5 % extension-under-load method.

^B See Specification A 20/A 20M/A-20M for elongation adjustment.

NOTE 2—Additional requirements regarding plate produced from coil are described in Specification A20/A20M.

3.6 If the requirements of this specification are in conflict with the requirements of Specification A20/A20M, the requirements of this specification shall prevail. 2—For plates produced from coil and furnished without heat treatment or with stress relieving only, three test results are reported for each qualifying coil. Additional requirements regarding plate produced from coil are described in Specification A 20/A 20M.

3.6 If the requirements of this specification are in conflict with the requirements of Specification A 20/A 20M, the requirements of this specification shall prevail.

4. Heat Treatment

4.1 Plates are normally supplied in the as-rolled condition. The plates may be ordered normalized or stress relieved, or both.