Designation: A225/A225M – 12

Standard Specification for Pressure Vessel Plates, Alloy Steel, Manganese-Vanadium-Nickel[1]

This standard is issued under the fixed designation A225/A225M; 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 manganese-vanadium-nickel alloy steel plates intended primarily for welded layered pressure vessels.

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

Grade	Tensile Strength, ksi [MPa]
C	105–135 [725–930]
D	
3 in. [75 mm] and under	80–105 [550–725]
Over 3 in. [75 mm]	75–100 [515–690]

1.3 The maximum thickness of plates is limited only by the capacity of the chemical composition to meet the specified mechanical property requirements; however, current mill practice normally limits Grade C to 0.58 in. [15 mm] maximum and Grade D to 6 in. [150 mm] maximum.

1.4 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]

A20/A20M Specification for General Requirements for Steel Plates for Pressure Vessels

A435/A435M Specification for Straight-Beam Ultrasonic Examination of Steel Plates

A577/A577M Specification for Ultrasonic Angle-Beam Examination of Steel Plates

A578/A578M Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications

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, permitted variations in dimensions, and mass, quality and repair of defects, marking, loading, and ordering information.

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

3.3 Coils are excluded from qualification to this specification until they are processed into finished plates. 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.

NOTE 1—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 plates from coil are described in Specification A20/A20M.

3.4 If the requirements of this specification are in conflict with the requirements of Specification A20/A20M, the requirements of this specification shall prevail.

4. Materials and Manufacture

4.1 *Steelmaking Practice*—The steel shall be killed and shall conform to the fine austenitic grain size requirement of Specification A20/A20M.

5. Heat Treatment

5.1 Grade D plates of all thicknesses and Grade C plates of thicknesses over 2 in. [50 mm] shall be normalized.

[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-225/SA-225M 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* 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**

5.2 Grade C plates 2 in. [50 mm] and under in thickness are usually supplied in the as-rolled condition. The plates may be ordered normalized or stress-relieved, or both.

6. Chemical Composition

6.1 The steel shall conform to the chemical requirements given in Table 1, unless otherwise modified in accordance with Supplementary Requirement S17, Vacuum Carbon-Deoxidized Steel, in Specification A20/A20M.

7. Mechanical Properties

7.1 *Tension Test*—The plates, as represented by the tension test specimens, shall conform to the requirements given in Table 2.

7.2 For plates with a nominal thickness of ¾ in. [20 mm] and under, the 1½-in. [40-mm] wide rectangular specimen may be used and the elongation determined in a 2-in. [50-mm] gage length that includes the fracture and that shows the greatest elongation.

8. Keywords

8.1 alloy steel plates; manganese-vanadium-nickel steel plate; plate for pressure vessels; pressure containing parts

TABLE 1 Chemical Requirements

Elements	Composition, %	
	Grade C	Grade D
Carbon, max[A]	0.25	0.20
Manganese, max:		
Heat analysis	1.60	1.70
Product analysis	1.72	1.84
Phosphorus, max[A]	0.025	0.025
Sulfur, max[A]	0.025	0.025
Silicon:		
Heat analysis	0.15–0.40	0.10–0.50
Product analysis	0.13–0.45	0.08–0.56
Vanadium:		
Heat analysis	0.13–0.18	0.10–0.18
Product analysis	0.11–0.20	0.08–0.20
Nickel:		
Heat analysis	0.40–0.70	0.40–0.70
Product analysis	0.37–0.73	0.37–0.73

[A] Applies to both heat and product analyses.

TABLE 2 Tensile Requirements

	Grade C		Grade D	
	ksi	[MPa]	ksi	[MPa]
Tensile strength:				
All thicknesses	105–135	[725–930]		
3 in. [75 mm] and under			80–105	[550–725]
Over 3 in. [75 mm]			75–100	[515–690]
Yield strength, min:[A]				
All thicknesses	70	[485]		
3 in. [75 mm] and under			60	[415]
Over 3 in. [75 mm]			55	[380]
Elongation in 8 in. [200 mm], min, %[B]				...
Elongation in 2 in. [50 mm], min, %[B]		20		19
Elongation in 5D, min, %[B]				17

[A] Determined by either the 0.2 % offset method or the 0.5 % extension-under-load method.
[B] See Specification A20/A20M for elongation adjustment.

SUPPLEMENTARY REQUIREMENTS

Supplementary requirements shall not apply unless specified in the purchase order.

A list of standardized supplementary requirements for use at the option of the purchaser is included in Specification A20/A20M. Those that are considered suitable for use with this specification are listed below by title.

S1. Vacuum Treatment,

S2. Product Analysis,

S3. Simulated Post-Weld Heat Treatment of Mechanical Test Coupons,

S4.1 Additional Tension Test,

S5. Charpy V-Notch Impact Test,

S6. Drop Weight Test (for Material 0.625 in. [16 mm] and over in Thickness),

S7. High-Temperature Tension Test,

S8. Ultrasonic Examination in accordance with Specification A435/A435M,

S9. Magnetic Particle Examination,

S11. Ultrasonic Examination in accordance with Specification A577/A577M,

S12. Ultrasonic Examination in accordance with Specification A578/A578M, and

S17. Vacuum Carbon-Deoxidized Steel.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A225/A225M – 03 (2007)) that may impact the use of this standard. (Approved May 1, 2012.)

(1) Table 1 was revised.

(2) Section 3 was editorially revised.

(3) Section 8 was added.