SPECIFICATION FOR PRESSURE VESSEL PLATES, CARBON STEEL, HIGH-STRENGTH MANGANESE

SA-455/SA-455M

(Identical with ASTM Specification A455/A455M-12a(2017).)

Standard Specification for Pressure Vessel Plates, Carbon Steel, High-Strength Manganese

1. Scope

1.1 This specification covers high-tensile strength carbon-manganese steel plates intended for welded pressure vessels.

1.2 This steel is usually made to a semi-killed or capped deoxidation practice; however, at the purchaser's or the steel producer's option, the steel may be made silicon-killed or aluminum-killed.

1.3 The maximum thickness of plates furnished under this specification shall be ¾ in. [20 mm].

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 A20/A20M 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:*

A20/A20M 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, 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. Heat Treatment

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

5. Chemical Composition

5.1 The steel shall conform to the chemical requirements given in Table 1.

6. Mechanical Properties

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

7. Keywords

7.1 carbon steel; high-strength steel plate for pressure purposes; welded pressure vessels

TABLE 1 Chemical Requirements

Elements	Composition, %
Carbon, max[A,B]	0.33
Manganese:[C]	
Heat analysis	0.85–1.20
Product analysis	0.79–1.30
Phosphorus, max[A]	0.025
Sulfur, max[A]	0.025
Silicon:[D]	
Heat analysis	0.10 max
Product analysis	0.13 max

[A] Applies to both heat and product analyses.
[B] When the silicon is higher than 0.10 %, the carbon maximum shall be 0.28 %.
[C] For each reduction of 0.01 percentage point below the specified maximum for carbon, and increase of 0.06 percentage point above the specified maximum for manganese is permitted, up to a maximum of 1.50 % by heat analysis and 1.60 % by product analysis.
[D] At the purchaser's or the producer's option, silicon may be 0.40 % max on heat analysis, 0.45 % max on product analysis.

TABLE 2 Tensile Requirements

	Thickness		
	Up to 0.375 in. [9.5 mm]	Over 0.375 to 0.580 in. [15 mm]	Over 0.580 to 0.750 in. [20 mm]
Tensile strength, ksi [MPa]	75–95 [515–655]	73–93 [505–640]	70–90 [485–620]
Yield strength, min, ksi [MPa]	38 [260]	37 [255]	35 [240]
Elongation in 8 in. [200 mm], min, %[A]	15	15	15
Elongation in 2 in. [50 mm], min, %[A]	22	22	22

[A] See Specification A20/A20M for elongation adjustments.

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.

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

INTENTIONALLY LEFT BLANK