Designation: A612/A612M – 12 (Reapproved 2019)

Standard Specification for Pressure Vessel Plates, Carbon Steel, High Strength, for Moderate and Lower Temperature Service[1]

This standard is issued under the fixed designation A612/A612M; 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 killed carbon-manganese-silicon steel plates intended for welded pressure vessels in service at moderate and lower temperatures.

1.2 The maximum thickness of plates supplied under this specification is 1 in. [25 mm].

1.3 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.

1.4 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.

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:*[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 product 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 where 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.

[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-612/SA-612M 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.

TABLE 1 Chemical Requirements

Elements	Composition, %
Carbon, max:[A]	
Heat analysis	0.25
Product analysis	0.29
Manganese[A]	
Heat analysis	1.00–1.50
Product analysis	0.92–1.62
Phosphorus, max[B]	0.025
Sulfur, max[B]	0.025
Silicon	
Heat analysis	0.15–0.50
Product analysis	0.13–0.55
Copper, max:[C]	
Heat analysis	0.35
Product analysis	0.38
Nickel, max:[C]	
Heat analysis	0.25
Product analysis	0.28
Chromium, max:[C]	
Heat analysis	0.25
Product analysis	0.29
Molybdenum, max:[C]	
Heat analysis	0.08
Product analysis	0.09
Vanadium, max:[C]	
Heat analysis	0.08
Product analysis	0.09

[A] For each reduction of 0.01 percentage point below the specified carbon maximum, an increase of 0.06 percentage point manganese above the specified maximum is permitted up to a maximum of 1.65 % for heat analysis (1.70 % for product analysis).
[B] Applies to both heat and product analyses.
[C] When analysis shows that the amount of an element is 0.02 % or lower, the value may be reported as ≤0.02 %.

TABLE 2 Tensile Requirements

	Thickness	
	0.5 in [12.5 mm] and Under	Over 0.5 in. to 1 in. [Over 12.5 to 25 mm]
Tensile strength, ksi [MPa]	83–105 [570–725]	81–101 [560–695]
Yield strength, min,[A] ksi [MPa]	50 [345]	50 [345]
Elongation in 8 in. [200 mm], min, %[B]	16	16
Elongation in 2 in. [50 mm], min, %[B]	22	22

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

5. Heat Treatment

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

6. Chemical Composition

6.1 The steel shall conform to the requirements as to chemical composition 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.

8. Keywords

8.1 carbon steel; steel plates for pressure vessels; lower temperature service; high strength steel plates

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 are included in Specification A20/A20M. Those that are considered suitable for use with this specification are listed by title.

S1. Vacuum Treatment,
S2. Product Analysis,
S3. Simulated Post-Weld Heat Treatment of 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.