Designation: A 782/A 782M – 06

Standard Specification for Pressure-Vessel Plates, Quenched-and-Tempered, Manganese-Chromium-Molybdenum-Silicon Zirconium Alloy Steel[1]

This standard is issued under the fixed designation A 782/A 782M; 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 high-strength quenched and tempered alloy steel plates intended for use in fusion welded pressure vessels.

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

Class	Yield Strength, min, ksi [MPa]	Tensile Strength, min, ksi [MPa]
1	80 [550]	97 [670]
2	90 [620]	107 [740]
3	100 [690]	115 [795]

1.3 The thickness of plates under this specification is limited to a maximum of 2 in. [50 mm].

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 is to be used independently of the other without combining values from the two systems.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

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

A 435/A 435M Specification for Straight-Beam Ultrasonic Examination of Steel Plates

A 577/A 577M Specification for Ultrasonic Angle-Beam Examination of Steel Plates

A 578/A 578M Specification for Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications

3. General Requirements and Ordering Information

3.1 Plates supplied to this material specification shall conform to Specification A 20/A 20M. These requirements outline 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 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. The purchaser is referred to the listed supplementary requirements in this specification and to the detailed requirements in Specification A 20/A 20M.

3.4 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. Manufacture

4.1 *Steelmaking Practice*—The steel shall be killed and conform to the fine austenitic grain size requirement of Specification A 20/A 20M.

5. Heat Treatment

5.1 All plates shall be heat treated by the material manufacturer by heating to not less than 1650°F [900°C], quenching in water or oil and tempering at not less than 1150°F [620°C] for not less than ½ h.

6. Chemical Requirements

6.1 The steel shall conform to the chemical requirements shown in Table 1.

7. Mechanical Requirements

7.1 *Tension Tests*:

[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 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.**

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TABLE 1 Chemical Requirements

Element	Composition, %
Carbon, max:	
Heat analysis	0.20
Product analysis	0.22
Manganese:	
Heat analysis	0.70–1.20
Product analysis	0.62–1.30
Phosphorus, max[A]	0.035
Sulfur, max[A]	0.035
Silicon:	
Heat analysis	0.40–0.80
Product analysis	0.34–0.86
Chromium:	
Heat analysis	0.50–1.00
Product analysis	0.46–1.06
Molybdenum:	
Heat analysis	0.20–0.60
Product analysis	0.17–0.64
Zirconium:	
Heat analysis	0.04–0.12
Product analysis	0.03–0.16

[A]Applies to both heat and product analyses.

7.1.1 *Requirements*—The material as represented by the tension-test specimens shall conform to the requirements shown in Table 2.

7.1.2 *Test Methods*:

7.1.2.1 For material ¾ in. [20 mm] and under in thickness, the test specimen shall be the 1½-in. [40-mm] wide rectangular test specimen.

TABLE 2 Tensile Requirements

	Class 1	Class 2	Class 3
Tensile strength, ksi	97–119	107–129	115–136
[MPa]	[670–820]	[740–890]	[795–940]
Yield strength, min, ksi	80	90	100
[MPa]	[550]	[620]	[690]
Elongation in 2 in. [50 mm], min, %[A]	18	17	16

[A]See Specification A 20/A 20M for elongation adjustments.

7.1.2.2 For material over ¾ in. either the full thickness rectangular test specimen or the ½-in. [12.5-mm] round test specimen may be used.

7.1.2.3 When the 1½-in. [40-mm] wide rectangular test specimen is used, the elongation is measured in a 2-in. or [50-mm] gage length which includes the fracture.

7.2 *Impact Properties Requirements*:

7.2.1 Transverse Charpy V-notch impact test specimens shall have a lateral expansion opposite the notch of not less than 0.015 in. [0.38 mm].

7.2.2 The test temperature shall be agreed upon between the manufacturer and the purchaser, but shall not be higher than 32°F [0°C].

8. Keywords

8.1 alloy steel; alloy steel plate; pressure-containing parts; pressure vessel steel; steel plates; steel plates for pressure vessel applications

SUPPLEMENTARY REQUIREMENTS

Supplementary requirements shall not apply unless specified in the order.

A list of standardized supplementary requirements for use at the option of the purchaser are included in Specification A 20/A 20M. Several of those considered suitable for use with this specification are listed below by title. Other tests may be performed by agreement between the supplier and the purchaser.

S1. Vacuum Treatment,

S2. Product Analysis,

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

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 A 435/A 435M,

S9. Magnetic Particle Examination,

S11. Ultrasonic Examination in accordance with Specification A 577/A 577M, and

S12. Ultrasonic Examination in accordance with Specification A 578/A 578M.

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SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 782/A 782M – 90 (2001)) that may impact the use of this standard.

(1) Supplementary Requirement S14, Bend Test, was removed.
(2) Keywords were added.
(3) Editorial changes were made throughout.

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