



Standard Specification for Pressure Vessel Plates, Alloy Steel and High-Strength Low-Alloy Steel, Quenched-and-Tempered¹

This standard is issued under the fixed designation A734/A734M; 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 quenched-and-tempered alloy steel and high-strength low-alloy steel plates for piping components and welded pressure vessels.

1.2 Two types are covered, which provide two different chemical compositions with the same tensile requirements. Both types are quenched-and-tempered to enhance mechanical properties.

1.2.1 *Type A* is an alloy steel intended for use at low ambient temperatures of -80°F [-60°C] and higher.

1.2.2 *Type B* is a high-strength low-alloy steel intended for use at ambient temperatures of -20°F [-30°C] and higher.

1.3 The maximum thickness of plates is limited only by the capacity of the chemical composition and heat treatment to meet the specified mechanical property requirements. Individual manufacturers should be consulted on thickness limitations since current industry limitations have not been ascertained to date.

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:²

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 the requirements of Specification **A20/A20M**. These requirements outline the testing and retesting methods and procedures, permissible variations in dimensions and mass, quality, 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 If the requirements of this specification are in conflict with the requirements of Specification **A20/A20M**, the requirements of this specification shall prevail.

4. 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 The plates shall be heat treated by quenching and tempering. The austenitizing temperature shall be 1725°F [940°C] maximum. Tempering temperature shall be 1150 to 1300°F [620 to 705°C].

5.2 If the purchaser elects to perform the heat treatment, the material shall be accepted on the basis of mill tests made from test coupons heat treated in accordance with the purchase order requirements. If the test coupon heat treatment is not indicated on the purchase order, the manufacturer shall heat treat the test coupons under conditions he considers appropriate. The manufacturer shall inform the purchaser of the heat-treat procedure followed in treatment of the test coupon.

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.



TABLE 1 Chemical Requirements

Element	Type A		Type B	
	Heat Analysis, %	Product Analysis, %	Heat Analysis, %	Product Analysis, %
Carbon, max	0.12	0.14	0.17	0.19
Manganese	0.45–0.75	0.40–0.83	1.60 max	1.72 max
Phosphorus, max	0.025	0.025	0.025	0.025
Sulfur, max	0.015	0.015	0.015	0.015
Silicon, max	0.40	0.45	0.40	0.45
Copper, max ^A	...	...	0.35	0.38
Nickel	0.90–1.20	0.85–1.25	...	...
Chromium	0.90–1.20	0.84–1.26	0.25 max	0.29 max
Molybdenum	0.25–0.40	0.22–0.43	...	...
Aluminum, max	0.06	...	0.06	...
Vanadium, max	...	...	0.11	0.13
Nitrogen, max	...	...	0.030	0.030
Columbium	...	...	^B	...

^A When specified.^B Columbium may be present in the amount of 0.050 % maximum.

6. Chemical Requirements

6.1 The steel shall conform to the requirements as to chemical composition prescribed in **Table 1**.

7. Mechanical Requirements

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

7.1.1 For nominal plate thicknesses of ¾ in. [20 mm] and under, the 1½-in. [40-mm] wide rectangular specimen may be used for the tension test, and the elongation may be determined in a 2-in. [50-mm] gage length that includes the fracture and that shows the greatest elongation.

8. Retreatment

8.1 Quenched-and-tempered material that fails to meet the mechanical requirements may be re-heat treated. All required tests shall be repeated when material is resubmitted for inspection.

TABLE 2 Tensile Requirements

Yield strength min, ksi [MPa]	65 [450]
Tensile strength, ksi [MPa]	77–97 [530–670]
Elongation in 2 in. [50 mm], min, % ^A	20

^A See Specification **A20/A20M** for elongation adjustment.

9. Keywords

9.1 alloy steel plates; pressure containing parts; pressure vessel steels; steel plates; quenched and tempered; high-strength low-alloy steel

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**. 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 Tests (for Material 0.625 in. [16 mm] and over in Thickness),

- S8. Ultrasonic Examination in accordance with Specification **A435/A435M**,
- S11. Ultrasonic Examination in accordance with Specification **A577/A577M**,
- S12. Ultrasonic Examination in accordance with Specification **A578/A578M**,
- S24. Strain Age Test, and
- S25. Weldability.



SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A734/A734M – 87a (2007)) that may impact the use of this standard. (Approved May 1, 2012.)

- (1) **Table 1** was revised.
- (2) Section 5 was editorially revised and renumbered to Section **3**; Sections **4** and **5** were also renumbered.
- (3) Section **9** was added.

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