



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 A 734/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:

A 20/A20M Specification for General Requirements for Steel Plates for Pressure Vessels²

A 435/A435M Specification for Straight-Beam Ultrasonic Examination of Steel Plates²

A 577/A577M Specification for Ultrasonic Angle-Beam Examination of Steel Plates²

A 578/A578M Specification for Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications²

3. Manufacture

3.1 *Steelmaking Practice:*

3.1.1 The steel shall be killed and shall conform to the fine austenitic grain size requirement of Specification A 20/A 20M.

4. Heat Treatment

4.1 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].

4.2 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.

5. General Requirements and Basis of Purchase

5.1 Material supplied to this material specification shall conform to the requirements of Specification A 20/A 20M. These requirements outline the testing and retesting methods and procedures, permissible variations in dimensions and weight, quality, repair of defects, marking, loading, etc.

5.2 Specification A 20/A 20M also establishes the rules for compliance to the basis of purchase when purchasing material to this specification.

5.3 Certain supplementary requirements considered suitable for use with this specification are listed at the end of the specification. These include some of the standardized supplementary requirements listed in Specification A 20/A 20M as well as additional ones unique to this specification.

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 for Boilers and Pressure Vessels.

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² *Annual Book of ASTM Standards*, Vol 01.04.

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	0.035	0.036	0.035	0.036
Sulfur, max	0.015	0.016	0.015	0.016
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 3/4 in. [20 mm] and under, the 1 1/2-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 A 20/A 20M 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 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 Tests, and
- S8. Ultrasonic Examination in accordance with Specification A435/A 435M,

- S11. Ultrasonic Examination in accordance with Specification A 577/A 577M,
- S12. Ultrasonic Examination in accordance with Specification A 578/A 578M,
- S24. Strain Age Test, and
- S25. Weldability.

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