Designation: A 737/A 737M – 99 (Reapproved 2004)

Standard Specification for Pressure Vessel Plates, High-Strength, Low-Alloy Steel[1]

This standard is issued under the fixed designation A 737/A 737M; 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 high-strength low-alloy steel plates for service in welded pressure vessels and piping components.

1.2 This material is particularly intended for piping and pressure vessel applications where high strength and improved toughness are required.

1.3 Two grades, designated B and C, are covered by this specification. Grade B provides a minimum yield strength of 50 ksi [345 MPa]. Grade C provides a minimum yield strength of 60 ksi [415 MPa].

1.4 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.

1.5 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 noncomformance with the specification.

2. Referenced Documents

2.1 *ASTM Standards:*

A 20/A 20M Specification for General Requirements for Steel Plates for Pressure Vessels[3]

A 435/A 435M Specification for Straight-Beam Ultrasonic Examination of Steel Plates[3]

A 577/A 577M Specification for Ultrasonic Angle-Beam Examination of Steel Plates[3]

A 578/A 578M Specification for Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications[3]

3. General Requirements and Ordering Information

3.1 Material supplied to this 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 mass, quality, repair of defects, marking, loading, etc.

3.2 Specification A 20/A 20M also establishes the rules for compliance to the ordering information when purchasing material to this specification.

3.3 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.

4. Manufacture

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

5. Heat Treatment

5.1 The material shall be normalized by heating to a suitable temperature which produces an austenitic structure, but not exceeding 1700°F [925°C], holding a sufficient time to attain uniform heat throughout the material, and cooling in air.

5.2 If approved by the purchaser, cooling rates faster than air cooling are permitted for improvement of strength or toughness, provided the plates are subsequently tempered in the temperature range from 1100 to 1300°F [595 to 705°C].

5.3 If the purchaser elects to perform the required 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 requirements are not indicated on the purchase order, the manufacturer shall heat treat the test coupons under conditions he considers appropriate. The manufacturer shall

[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] For ASME Boiler and Pressure Vessel Code applications see related Specification SA-737 in Section II of that code.

[3] *Annual Book of ASTM Standards*, Vol 01.04.

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inform the purchaser of the heat-treatment procedure followed in heat treating the test coupon at the mill.

6. Chemical Requirements

6.1 The steel shall conform to the requirements as to chemical composition prescribed in Table 1 unless otherwise modified in accordance with Supplementary Requirement S17, Vacuum Carbon-Deoxidized Steel, in Specification A 20/A 20M.

TABLE 1 Chemical Requirements

Element	Composition, %			
	Grade B		Grade C	
	Heat	Product	Heat	Product
Carbon, max	0.20	0.22	0.22	0.24
Manganese	1.15–1.50[A]	1.07–1.62[A]	1.15–1.50	1.07–1.62
Phosphorus, max	0.035	0.035	0.035	0.035
Sulfur, max	0.030	0.035	0.030	0.035
Silicon	0.15–0.50	0.10–0.55	0.15–0.50	0.10–0.55
Vanadium	. . .	. . .	0.04–0.11	0.03–0.12
Columbium, max	0.05	0.05	[B]	. . .
Nitrogen, max	. . .	. . .	0.03	0.03

[A] The maximum manganese may be increased to 1.60 % on heat analysis and 1.72 % on product analysis, provided that the carbon content on heat analysis does not exceed 0.18 %.

[B] Columbium may be present in the amount of 0.05 maximum.

7. Mechanical Requirements

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

7.1.1 For nominal plate thicknesses of ¾ in. [20 mm] and under, when requirements for elongation in 2 in. [50 mm] are to be determined, 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.

TABLE 2 Tensile Requirements

	Grade B	Grade C
Yield strength, min, ksi [MPa]	50 [345]	60 [415]
Tensile strength, ksi [MPa]	70–90 [485–620]	80–100 [550–690]
Elongation in 8 in. [200 mm], min, %[A]	18	18
Elongation in 2 in. [50 mm], min, %[A]	23	23

[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 Tests,

S8. Ultrasonic Examination in accordance with Specification A 435/A 435M,

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

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

S17. Vacuum Carbon-Deoxidized Steel.

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