Designation: A 724/A 724M – 04

Standard Specification for Pressure Vessel Plates, Carbon-Manganese-Silicon Steel, Quenched and Tempered, for Welded Pressure Vessels[1]

This standard is issued under the fixed designation A 724/A 724M; 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 three grades of carbon-manganese-silicon steel, designated Grades A, B, and C. Grade C may be produced with a boron addition. The plates are quenched and tempered and are intended for welded-layered pressure vessels.

1.2 The maximum thickness of plates supplied under this specification is limited only by the capability of the chemical composition to meet the specified mechanical requirements. However, current practice normally limits the maximum thickness to ⅞ in. [22 mm] for Grades A and B, and to 2 in. [50 mm] for Grade C.

1.3 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:* [3]

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

3. General Requirements and Ordering Information

3.1 Material 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 weight, 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. These include:

3.3.1 Vacuum treatment,

3.3.2 Additional or special tension testing,

3.3.3 Impact testing, and

3.3.4 Nondestructive examination.

3.4 The purchaser is referred to the listed supplementary requirements in this specification and to the detailed requirements in Specification A 20/A 20M.

3.5 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 Process*—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 All plates shall be quenched from a temperature in the range from 1600 to 1700°F [870 to 925°C]. Grades A and B shall then be tempered at not less than 1100°F [595°C], and Grade C shall then be tempered at not less than 1150°F [620°C]. The tempering soaking time shall be not less than ½ h.

[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-724/SA-724M 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.

***A Summary of Changes section appears at the end of this standard.**

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TABLE 1 Chemical Requirements

Element	Composition, %		
	Grade A	Grade B	Grade C
Carbon, max:			
Heat analysis	0.18	0.20	0.22
Product analysis	0.22	0.24	0.26
Manganese:			
Heat analysis	1.00–1.60	1.00–1.60	1.10–1.60
Product analysis	0.92–1.72	0.92–1.72	1.02–1.72
Phosphorus, max[A]	0.035	0.035	0.035
Sulfur, max[A]	0.035	0.035	0.035
Silicon, max:			
Heat analysis	0.55	0.50	0.20–0.60
Product analysis	0.60	0.55	0.18–0.65
Copper, max:[B]			
Heat analysis	0.35	0.35	0.35
Product analysis	0.38	0.38	0.38
Nickel, max:[B]			
Heat analysis	0.25	0.25	0.25
Product analysis	0.28	0.28	0.28
Chromium, max:[B]			
Heat analysis	0.25	0.25	0.25
Product analysis	0.29	0.29	0.29
Molybdenum, max:[B]			
Heat analysis	0.08	0.08	0.08
Product analysis	0.09	0.09	0.09
Vanadium, max:[B]			
Heat analysis	0.08	0.08	0.08
Product analysis	0.09	0.09	0.09
Boron, max	. . .	. . .	0.005[C]

[A] Applies to both heat and product analyses.
[B] When analysis shows that the amount of an element is 0.02 % or lower, the value may be reported as |Lb0.02 %.
[C] If boron is less than 0.001 %, the analysis report for the element may be stated as "<0.001."

6. Chemical Composition

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

7. Mechanical Properties

7.1 *Tension Test Requirements*:

7.1.1 The material as represented by the tension test specimens shall conform to the requirements given in Table 2.

7.1.2 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 shows the greatest elongation.

TABLE 2 Tensile Requirements

	Grades A and C ksi [MPa]	Grade B ksi [MPa]
Tensile strength	90–110 [620–760]	95–115 [655–795]
Yield strength, min	70 [485]	75 [515]
Elongation in 2 in. [50 mm], min, %[AB]	19	17

[A] See Specification A 20/A 20M for elongation adjustment.
[B] See 7.1.2.

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 is included in Specification A 20/A 20M. Several of those that are considered suitable for use with this specification are listed 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,
S7. High-Temperature Tension Test,
S8. Ultrasonic Examination,
S9. Magnetic Particle Examination, and

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 724/A 724M – 99) that may impact the use of this standard.

(1) Title was revised.

(2) Section 7.1.2 was revised.

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