**~~Designation:A724/A724M–04~~ Designation: A724/A724M – 09**

# 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 A724/A724M; 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]

A20/A20M 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 A20/A20M~~. These requirements outline the testing and retesting methods and procedures, permissible variations in dimensions and weight, quality and repair of defects, marking, loading, etc.~~

~~3.2Specification~~ . These requirements outline the testing and retesting methods and procedures, permitted variations in dimensions and weight, quality and 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~~also establishes the rules for the ordering information that should be complied with when purchasing material to this specification.~~

~~3.3In 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:~~

~~3.3.1Vacuum treatment,~~

~~3.3.2Additional or special tension testing,~~

~~3.3.3Impact testing, and~~

~~3.3.4Nondestructive examination.~~

~~3.4The purchaser is referred to the listed supplementary requirements in this specification and to the detailed requirements in Specification A20/A20M~~.

~~3.5If~~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 Process*—The steel shall be killed and shall conform to the fine austenitic grain size requirement of Specification A20/A20M.

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[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.

Current edition approved ~~July~~Oct. 1, ~~2004.~~2009. Published ~~July 2004.~~October 2009. Originally approved in 1975. Last previous edition approved in ~~1999~~2004 as ~~A724/A724M–99.~~A724/A724M – 04. DOI: 10.1520/A0724_A0724M-0~~4~~9.

[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.**

## 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.

## 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 1 Chemical Requirements**

NOTE 1—Where "…" appears in this table, there is no requirement.

| 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~~ |
| Phosphorus, max[A] | 0.025 | 0.025 | 0.025 |
| ~~Sulfur, max[A]~~ | ~~0.035~~ | ~~0.035~~ | ~~0.035~~ |
| Sulfur, max[A] | 0.025 | 0.025 | 0.025 |
| 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 <0.02 %.

[C] If boron is less than 0.001 %, the analysis report for the element may be stated as "<0.001."