Designation: A 662/A 662M – 03 (Reapproved 2007)

Standard Specification for Pressure Vessel Plates, Carbon-Manganese-Silicon Steel, for Moderate and Lower Temperature Service[1]

This standard is issued under the fixed designation A 662/A 662M; 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 plates intended primarily for service in welded pressure vessels where improved low temperature notch toughness is important.

1.2 The maximum thickness of plates is limited only by the capacity of the composition to meet the specified mechanical property requirements; however, current practice normally limits the maximum thickness of plates furnished under this specification to 2 in. [50 mm].

1.3 Grades A, B, and C comply substantially with the requirements of ISO Pressure Vessel Steels P9, P15, and P18, respectively.

1.4 For plates produced from coil and furnished without heat treatment or with stress relieving only, the additional requirements, including additional testing requirements and the reporting of additional test results, of Specification A 20/A 20M apply.

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 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

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

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

A 578/A 578M Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications

3. General Requirements and Ordering Information

3.1 Plates supplied to this product specification shall conform to Specification A 20/A 20M, which outlines the testing and retesting methods and procedures, permissible variations in dimensions and mass, quality, and repair of defects, marking, loading, etc.

3.2 Specification A 20/A 20M also establishes the rules for ordering information that should be complied with when purchasing plates to this specification.

3.3 In addition to the basic requirements of this specification certain supplementary requirements are available where additional control, testing, or examination is required to meet the end use requirements.

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 Coils are excluded from qualification to this specification until they are processed into finished plates. Plates produced from coil means plates that have been cut to individual lengths from coil. The processor directly controls, or is responsible for, the operations involved in the processing of coils into finished plates. Such operations include decoiling, leveling, cutting to length, testing, inspection, conditioning, heat treatment (if applicable), packaging, marking, loading for shipment, and certification.

NOTE 1—For plates produced from coil and furnished without heat treatment or with stress relieving only, three test results are reported for each qualifying coil. Additional requirements regarding plates from coil are described in Specification A 20/A 20M.

[1] This specification is under the jurisdiction of 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-662/SA-662M 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.

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TABLE 1 Chemical Requirements

Element	Composition, %					
	Grade A		Grade B		Grade C	
	Heat Analysis	Product Analysis	Heat Analysis	Product Analysis	Heat Analysis	Product Analysis
Carbon, max	0.14	0.17	0.19	0.22	0.20	0.24
Manganese	0.90–1.35	0.84–1.46	0.85–1.50	0.79–1.62	1.00–1.60	0.92–1.72
Phosphorus, max	0.035	0.035	0.035	0.035	0.035	0.035
Sulfur, max	0.035	0.035	0.035	0.035	0.035	0.035
Silicon	0.15–0.40	0.13–0.45	0.15–0.40	0.13–0.45	0.15–0.50	0.13–0.55

TABLE 2 Tensile Properties

	Grade A	Grade B	Grade C
Tensile strength, ksi [MPa]	58–78 [400–540]	65–85 [450–585]	70–90 [485–620]
Yield strength,[A] min, ksi [MPa]	40 [275]	40 [275]	43 [295]
Elongation in 8 in. [200 mm], min, %[B]	20	20	18
Elongation in 2 in. [50 mm], min, %[B]	23	23	22

[A] Determined by either the 0.2 % offset method or the 0.5 % extension-under-load method.
[B] See Specification A 20/A 20M for elongation adjustments.

3.6 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 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 All plates of Grade A and plates of Grades B and C over 1½ in. [40 mm] in thickness shall be normalized.

5.2 Plates of Grades B and C, 1½ in. [40 mm] and under in thickness, are normally supplied in the as-rolled condition. The plates may be ordered normalized or stress relieved, or both.

6. Chemical Requirements

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

7. Mechanical Requirements

7.1 *Tension Test Requirements*—The plates, as represented by the tension test specimens, shall conform to the requirements given in Table 2.

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. Those that are considered suitable for use with this specification are listed below by title.

S1. Vacuum Treatment,

S2. Product Analysis,

S3. Simulated Post-Weld Heat Treatment of Mechanical Test Coupons,

S4.1 Additional Tension Test,

S5. Charpy V-Notch Impact Test (see Appendix X1),

S6. Drop Weight Test (for Material 0.625 in. [16 mm] and over in Thickness),

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

S9. Magnetic Particle Examination,

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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APPENDIX

(Nonmandatory Information)

X1. NOTCH TOUGHNESS

X1.1 When Charpy V-notch testing is required, the minimum values listed in Table X1.1 will be guaranteed onnormalized material for the temperature specified by the purchaser.

TABLE X1.1 Charpy V-Notch Requirements[A]

Testing Temperature, °F [°C]	Grade A		Grades B and C	
	Longitudinal Specimens, ft·lbf [J]	Transverse Specimens, ft·lbf [J]	Longitudinal Specimens, ft·lbf [J]	Transverse Specimens, ft·lbf [J]
–75 [–60]	20 [27]	15 [20]	15 [20]	...
–60 [–50]	30 [41]	18 [24]	20 [27]	...
–50 [–45]	35 [47]	19 [26]	22 [30]	15 [20]
–40 [–40]	40 [54]	20 [27]	25 [34]	20 [27]
–25 [–32]	45 [61]	25 [34]	30 [41]	20 [27]
0 [18]	55 [75]	30 [41]	35 [47]	25 [34]
32 [0]	70 [95]	35 [47]	40 [54]	25 [34]
75 [25]	75 [102]	40 [54]	50 [68]	30 [41]

[A] The above values apply to the average of three full size specimens. Values for subsize specimens are denoted as listed in Specification A 20/A 20M.

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