

SPECIFICATION FOR PRESSURE VESSEL PLATES, CARBON-MANGANESE-SILICON STEEL, FOR MODERATE AND LOWER TEMPERATURE SERVICE



SA-662/SA-662M



(Identical with ASTM Specification A662/A662M-17.)

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

1. Scope

1.1 This specification 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.

1.3 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 A20/A20M apply.

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.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:

A20/A20M Specification for General Requirements for Steel Plates for Pressure Vessels

A435/A435M Specification for Straight-Beam Ultrasonic Examination of Steel Plates

A577/A577M Specification for Ultrasonic Angle-Beam Examination of Steel Plates

A578/A578M Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications

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, permitted variations in dimensions, and mass, 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.

3.3 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 A20/A20M.

3.4 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 Practice*—The steel shall be killed and shall conform to the fine austenitic grain size requirement of Specification A20/A20M.

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 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| Sulfur, max | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| 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 A20/A20M for elongation adjustments.

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 A20/A20M.

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.

8. Keywords

8.1 carbon steel; carbon steel plate; pressure containing parts; pressure vessel steels; steel plates for pressure vessels

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 A20/A20M. 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 A435/A435M,
 S9. Magnetic Particle Examination,
 S11. Ultrasonic Examination in accordance with Specification A577/A577M,
 S12. Ultrasonic Examination in accordance with Specification A578/A578M, and
 S17. Vacuum Carbon-Deoxidized Steel.

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 on normalized 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 subsized specimens are denoted as listed in Specification A20/A20M.