

Standard Specification for Pressure vessel plates, carbon steel, for moderate- and lower-temperature service (1)

This standard is issued under the fixed designation A 516/a 516m; the number immediately following the designation indicate the year of original adoption or, in the case 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 reapproval.

This specification has been approved for use by agencies of the Department of Defense to replace Federal Specification QQ-S-691C and for listing in the DoD Index of Specifications and Standards.

1. Scope

1.1. This specification (2) covers carbon steel plates intended primarily for service in welded pressure vessels where improved notch toughness is important.

1.2. Plates under this specification are available in four grades having different strength levels as follows:

Grade U. S. [SI]	Tensile Strength, Ksi [MPa]
55[380]	55-75[380-515]
60[415]	60-80[415-550]
65[450]	65-85[450-585]
70[485]	70-90[485-620]

1.3. 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 specification as follows.

Grade U. S. [SI]	maximum Thickness, in [mm]
55[380]	12[305]
60[415]	8[205]
65[450]	8[205]
70[485]	8[205]

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.

2. Referenced Documents

2.1 ASTM Standards:

A 20/ A20M Specification 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 material specification shall conform to specification A 20/ A 20M. These requirements outline 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 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. 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 specification are in conflict with 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. Plates 1.50 in. [40mm] and under in thickness are normally supplied in the as-rolled condition. The plates may be ordered normalized or stress relieved or both.

5.2. Plates over 1.50 in. [40 mm] in the thickness shall be normalized.

5.3. When notch-toughness tests are required on plates 1 ½ in. [40 mm] and under in thickness, the plates shall be normalized unless otherwise specified by the purchaser.

5.4. If approved by the purchaser, cooling rates faster than those obtained by cooling in air are permissible for improvement of toughness provided the plates are subsequently tempered in the temperature range 1100 to 1300 °F [595 to 705 °C]

Composicion química acero A516

	C					Mn		P max	S max	Si max
	t < 12.5m m	12.5m m < t =50mm	50mm < t =100m m	100m m < t = 200m m	t > 200m m	t < 12.5m m	t > 12.5m m			
A516 Grado 55	0.18	0.2	0.22	0.24	0.26	0.6-0.9	0.55- 0.98	0.03 5	0.03 5	0.15 -0.4
A516 Grado 60	0.21	0.23	0.25	0.27	0.27	0.6-0.9	0.85- 1.2	0.03 5	0.03 5	0.15 -0.4
A516 Grado 65	0.24	0.26	0.28	0.29	0.29	0.85- 1.2	0.85- 1.2	0.03 5	0.03 5	0.15 -0.4
A516 Grado 70	0.27	0.28	0.3	0.31	0.31	0.85- 1.2	0.85- 1.2	0.03 5	0.03 5	0.15 -0.4

Propiedades mecánicas acero A516

a la tracción (ksi)	Resistencia a la tracción (MPa)	Fluencia (ksi)	Fluencia (MPa)	Elongación en 200mm (%)	Elongación en 50mm (%)	
A516 Grado 55	55-75	380-515	30	205	23	27
A516 Grado 60	60-80	415-550	32	220	21	25
A516 Grade 65	65-85	450-585	35	240	19	23
A516 Grado 70	70-90	485-620	38	260	17	21

6. Chemical Requirements

The steel shall conform to chemical requirements in Table 1. I unless otherwise modified in accordance with Complementary Requirements S17, Vacuum Carbon- Steel, in specification A 20/20M

7. Mechanical Requirements

7.1 Tension test requirements – the material as represented by the tension-test specimens shall conform to the requirements shown in Table 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 are included in ASTM Specification A 20/A 20M. Several of those considered suitable for use with this specification are listed below by title. Other test 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
- S4.1 Additional Tension Test.
- S.5. Charpy V-Notch Impact Test,
- S6. Drop Weight Test,
- S7. High-Temperature Tension Test,
- S8. Ultrasonic Examination in accordance with Specification A 435/A 435M,
- S9. Magnetic Particle Examination,
- S11. Ultrasonic Examination in accordance with Specification A 577/577M
- S12. Ultrasonic Examination in accordance with Specification A 578/A 578M
- S14. Bend Test, and
- S17. Vacuum Carbon-Deoxidized Steel.

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