

Designation: A 515/A 515M - 92<sup>ε1</sup>

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## Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service<sup>1</sup>

This standard is issued under the fixed designation A 515/A 515M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This specification has been approved for use by agencies of the Department of Defense to replace Federal Specification QQ-S-691C. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.*

<sup>ε1</sup> NOTE—Paragraph 1.2 was corrected editorially in April 1996.

### 1. Scope

1.1 This specification<sup>2</sup> covers carbon-silicon steel plates primarily for intermediate- and higher-temperature service in welded boilers and other pressure vessels.

1.2 Material under this specification is available in three grades having different strength levels as follows:

Grade U.S. [SI]	Tensile Strength, ksi [MPa]
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 this specification as follows:

Grade U.S. [SI]	Maximum Thickness, in. [mm]
60 [415]	8 [200]
65 [450]	8 [200]
70 [485]	8 [200]

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 Document

#### 2.1 ASTM Standard:

A 20/A 20M Specification for General Requirements for Steel Plates for Pressure Vessels<sup>3</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A-1 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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<sup>2</sup> For ASME Boiler and Pressure Vessel Code applications, see related Specification SA-515/SA-515M in Section II of that Code.

<sup>3</sup> Annual Book of ASTM Standards, Vol 01.04.

### 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 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 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 Practice*—The steel shall be killed and made to a coarse austenitic grain size practice.

### 5. Heat Treatment

5.1 Plates 2 in. [50 mm] 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 2 in. [50 mm] in thickness shall be normalized.

### 6. Chemical Requirements

6.1 The steel shall conform to the chemical requirements shown 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 material as represented by the tension-test specimens shall conform to the requirements shown in Table 2.

 A 515/A 515M

**TABLE 1 Chemical Requirements**

Elements	Composition, %		
	Grade 60 [Grade 415]	Grade 65 [Grade 450]	Grade 70 [Grade 485]
Carbon, max <sup>^</sup> :			
1 in. [25 mm] and under	0.24	0.28	0.31
Over 1 to 2 in. [25 to 50 mm], incl	0.27	0.31	0.33
Over 2 to 4 in. [50 to 100 mm], incl	0.29	0.33	0.35
Over 4 to 8 in. [100 to 200 mm], incl	0.31	0.33	0.35
Over 8 in. [200 mm]	0.31	0.33	0.35
Manganese, max:			
Heat analysis	0.90	0.90	1.20
Product analysis	0.98	0.98	1.30
Phosphorus, max <sup>^</sup>	0.035	0.035	0.035
Sulfur, max <sup>^</sup>	0.035	0.035	0.035
Silicon:			
Heat analysis	0.15-0.40	0.15-0.40	0.15-0.40
Product analysis	0.13-0.45	0.13-0.45	0.13-0.45

<sup>^</sup> Applies to both heat and product analyses.

**TABLE 2 Tensile Requirements**

	Grade		
	60 [415]	65 [450]	70 [485]
Tensile strength, ksi [MPa]	60-80 [415-550]	65-85 [450-585]	70-90 [485-620]
Yield strength, min, ksi [MPa]	32 [220]	35 [240]	38 [260]
Elongation in 8 in. [200 mm], min, %	21 <sup>^</sup>	19 <sup>^</sup>	17 <sup>^</sup>
Elongation in 2 in. [50 mm], min, %	25 <sup>^</sup>	23 <sup>^</sup>	21 <sup>^</sup>

<sup>^</sup> See Specification A 20/A 20M.

**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 Specification A 20/A 20M. Those which are considered suitable for use with this specification are listed below by title.

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| <ul style="list-style-type: none"> <li>S1. Vacuum Treatment,</li> <li>S2. Product Analysis,</li> <li>S3. Simulated Post-Weld Heat Treatment of Mechanical Test Coupons,</li> <li>S4.1 Additional Tension Test,</li> <li>S5. Charpy V-Notch Impact Test,</li> <li>S6. Drop-Weight Test,</li> <li>S7. High-Temperature Tension Test,</li> </ul> | <ul style="list-style-type: none"> <li>S8. Ultrasonic Examination in accordance with Specification A 435/A 435M,</li> <li>S9. Magnetic Particle Examination,</li> <li>S11. Ultrasonic Examination in accordance with Specification A 577/A 577M,</li> <li>S12. Ultrasonic Examination in accordance with Specification A 578/A 578M,</li> <li>S14. Bend Test, and</li> <li>S17. Vacuum Carbon-Deoxidized Steel.</li> </ul> |
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**ADDITIONAL SUPPLEMENTARY REQUIREMENTS**

Also listed below is an additional optional supplementary requirement suitable for this specification:

**S61. Austenitic Grain Size**

S61.1 The material shall have a carburized austenitic grain size of I to 5.

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