



Designation: **A1017/A1017M – 11** **A1017/A1017M – 11 (Reapproved 2015)**

Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium- Molybdenum-Tungsten¹

This standard is issued under the fixed designation A1017/A1017M; 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^{*}Scope

1.1 This specification covers Chromium-Molybdenum-Tungsten alloy steel plates intended primarily for welded boilers and pressure vessels designed for elevated temperature service.

1.2 Plates are available under this specification in grades having different alloy contents as follows:

| Grade | Nominal Chromium Content, % | Nominal Molybdenum Content, % | Nominal Tungsten Content, % |
|-------|-----------------------------|-------------------------------|-----------------------------|
| 23 | 2.25 | 0.20 | 1.60 |
| 911 | 9.00 | 1.00 | 1.00 |
| 92 | 9.00 | 0.45 | 1.75 |
| 122 | 12.00 | 0.40 | 2.00 |

1.3 The maximum thickness of plates is limited only by the capacity of the composition to meet the specified mechanical requirements.

1.4 The specification is expressed in both inch-pound units and in SI units. However, unless the order specifies the applicable "M" specification designation (SI units), the material shall be furnished to inch-pound units.

1.5 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

[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

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 If the requirements of this specification are in conflict with the requirements of Specification **A20/A20M**, the requirements of this specification shall prevail.

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.

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² 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**



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TABLE 1 Chemical Requirements

NOTE 1—Where “. . .” appears in this table there is no requirement.

| Element | Composition % | | | |
|------------------|--------------------------|--------------|-----------|--------------|
| | Grade 23 | Grade 911 | Grade 122 | Grade 92 |
| Carbon | | | | |
| Heat Analysis | 0.04–0.10 | 0.09–0.13 | 0.07–0.14 | 0.07–0.13 |
| Product Analysis | 0.03–0.10 | 0.08–0.14 | 0.05–0.17 | 0.05–0.16 |
| Manganese | | | | |
| Heat Analysis | 0.10–0.60 | 0.30–0.60 | 0.70 max | 0.30–0.60 |
| Product Analysis | 0.09–0.66 | 0.25–0.66 | 0.77 max | 0.25–0.66 |
| Phosphorus, max. | | | | |
| Heat Analysis | 0.030 | 0.020 | 0.020 | 0.020 |
| Product Analysis | 0.030 | 0.025 | 0.025 | 0.025 |
| Sulfur, max. | | | | |
| Heat Analysis | 0.010 | 0.010 | 0.010 | 0.010 |
| Product Analysis | 0.012 | 0.012 | 0.012 | 0.012 |
| Silicon | | | | |
| Heat Analysis | 0.50 max | 0.10–0.50 | 0.50 max | 0.50 max |
| Product Analysis | 0.50 max | 0.08–0.56 | 0.56 max | 0.50 max |
| Chromium | | | | |
| Heat Analysis | 1.90–2.60 | 8.5–9.5 | 10.0–11.5 | 8.5–9.5 |
| Product Analysis | 1.78–2.72 | 8.4–9.7 | 9.9–11.6 | 8.4–9.6 |
| Molybdenum | | | | |
| Heat Analysis | 0.05–0.30 | 0.90–1.10 | 0.25–0.60 | 0.30–0.60 |
| Product Analysis | 0.04–0.35 | 0.85–1.15 | 0.20–0.65 | 0.25–0.65 |
| Nickel, max. | | | | |
| Heat Analysis | 0.40 | 0.40 | 0.50 | 0.40 |
| Product Analysis | 0.40 | 0.43 | 0.54 | 0.40 |
| Vanadium | | | | |
| Heat Analysis | 0.20–0.30 | 0.18–0.25 | 0.15–0.30 | 0.15–0.25 |
| Product Analysis | 0.18–0.33 | 0.16–0.27 | 0.13–0.32 | 0.13–0.27 |
| Columbium | | | | |
| Heat Analysis | 0.02–0.08 | 0.06–0.10 | 0.04–0.10 | 0.04–0.09 |
| Product Analysis | 0.02–0.10 | 0.05–0.11 | 0.03–0.11 | 0.03–0.10 |
| Boron | | | | |
| Heat Analysis | 0.0010–0.006 | 0.0003–0.006 | 0.005 max | 0.001–0.006 |
| Product Analysis | 0.0009–0.007 | 0.0002–0.007 | 0.006 max | 0.0009–0.007 |
| Product Analysis | 0.0009–0.007 | 0.0002–0.007 | 0.006 max | 0.0009–0.007 |
| Nitrogen | | | | |
| Heat Analysis | 0.015 max ^A | 0.04–0.09 | 0.04–0.10 | 0.030–0.070 |
| Product Analysis | 0.015 max ^A | 0.035–0.095 | 0.03–0.11 | 0.025–0.075 |
| Aluminum, max. | | | | |
| Heat Analysis | 0.03 ^B | 0.02 | 0.02 | 0.02 |
| Product Analysis | 0.04 ^B | 0.02 | 0.02 | 0.02 |
| Tungsten | | | | |
| Heat Analysis | 1.45–1.75 | 0.90–1.10 | 1.50–2.50 | 1.50–2.00 |
| Product Analysis | 1.40–1.80 | 0.85–1.15 | 1.40–2.60 | 1.40–2.0 |
| Copper | | | | |
| Heat Analysis | ... | ... | 0.30–1.70 | ... |
| Product Analysis | ... | ... | 0.20–1.80 | ... |
| Titanium, max | | | | |
| Heat Analysis | 0.005–0.060 ^A | 0.01 | 0.01 | 0.01 |
| Product Analysis | 0.005–0.060 ^A | 0.01 | 0.01 | 0.01 |
| Zirconium, max | | | | |
| Heat Analysis | ... | 0.01 | 0.01 | 0.01 |
| Product Analysis | ... | 0.01 | 0.01 | 0.01 |