



Designation: A 645/A 645M – 99a

Standard Specification for Pressure Vessel Plates, Five Percent Nickel Alloy Steel, Specially Heat Treated¹

This standard is issued under the fixed designation A 645/A 645M; 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 specification² covers austenitized, quenched, tempered, and reversion-annealed 5 % nickel alloy steel plates intended primarily for welded pressure vessels for service at low or cryogenic temperatures.

1.2 The maximum thickness of plates which can be supplied under this specification is limited only by the capacity of the material to meet the specified requirements.

1.3 This material is susceptible to magnetization. Use of magnets in handling after heat treatment should be avoided if residual magnetism would be detrimental to subsequent fabrication or service.

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/A 20M Specification for General Requirements for Steel Plates for Pressure Vessels³

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *reversion annealing*—heating to an optimum temperature above the Ac₁, followed by quenching or air cooling to develop maximum toughness. This operation is performed subsequent to temperizing.

3.1.2 *temperizing*—heating to an optimum temperature and quenching to develop a microstructure containing some re-

tained austenite and characterized by a lamellar pattern of alternate acicular grains of martensite and ferrite. This operation is performed subsequent to an initial austenitizing and quenching.

4. General Requirements and Ordering Information

4.1 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 weight, quality and repair of defects, marking, loading, etc.

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

4.3 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:

- 4.3.1 Vacuum treatment,
- 4.3.2 Additional or special tension testing,
- 4.3.3 Impact testing, and
- 4.3.4 Nondestructive examination.

4.4 The purchaser is referred to the listed supplementary requirements in this specification and to the detailed requirements in Specification A 20/A 20M.

4.5 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.

5. Materials and Manufacture

5.1 *Steelmaking Practice*—The steel shall be killed and shall conform to the fine austenitic grain size requirements of Specification A 20/A 20M.

6. Heat Treatment

6.1 All plates shall be heat treated in accordance with 6.2. Shell plates and other parts, including heads and reinforcing pads, which are heated above 1125°F [605°C] for forming, shall be heat treated after forming,

6.2 Procedure and Sequence:

6.2.1 Hardening:

¹ 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 for Boilers and Pressure Vessels.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-645 in Section II of that Code.

³ *Annual Book of ASTM Standards*, Vol 01.04.