Designation: A 928/A 928M – 00

Standard Specification for Ferritic/Austenitic (Duplex) Stainless Steel Pipe Electric Fusion Welded with Addition of Filler Metal[1]

This standard is issued under the fixed designation A 928/A 928M; 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 specification covers electric-fusion-welded steel pipe suitable for corrosive service.

NOTE 1—The dimensionless designator NPS (nominal pipe size) has been substituted in this specification for traditional terms such as nominal diameter, size, and nominal size.

1.2 This specification covers nine grades of ferritic/austenitic steel as indicated in Table 1. The selection of the proper alloy and requirements for heat treatment shall be at the discretion of the purchaser, dependent on the service conditions to be encountered.

1.3 Five classes of pipe are covered as follows:

1.3.1 *Class 1*—Pipe shall be double welded by processes using filler metal in all passes and shall be radiographed completely.

1.3.2 *Class 2*—Pipe shall be double welded by processes using filler metal in all passes. No radiograph is required.

1.3.3 *Class 3*—Pipe shall be single welded by processes using filler metal in all passes and shall be radiographed completely.

1.3.4 *Class 4*—Same as Class 3, except that the weld pass exposed to the inside pipe surface may be made without the addition of filler metal (see 6.2.2.1 and 6.2.2.2).

1.3.5 *Class 5*—Pipe shall be double welded by processes using filler metal in all passes and shall be spot radiographed.

1.4 Supplementary requirements covering provisions ranging from additional testing to formalized procedures for manufacturing practice are provided. Supplementary Requirements S1 through S4 are included as options to be specified when desired.

1.5 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. The inch-pound units shall apply unless the M designation of the specification is specified in the order.

2. Referenced Documents

2.1 *ASTM Standards:*

A 240/A 240M Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels[2]

A 480/A 480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip[2]

A 941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys[3]

A 999/A 999M Specification for General Requirements for Alloy and Stainless Steel Pipe[3]

E 426 Practice for Electromagnetic (Eddy-Current) Examination of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar Alloys[4]

2.2 *ASME Boiler and Pressure Vessel Code:*[5]

Section III, Nuclear Vessels

Section VIII, Unfired Pressure Vessels

Section IX, Welding Qualifications

2.3 *AWS Specifications:*[6]

A 5.4 Corrosion-Resisting Chromium and Chromium-Nickel Steel Covered Welding Electrodes

A 5.9 Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Rods and Bare Electrodes

A 5.11 Nickel and Nickel-Alloy Covered Welding Electrodes

A 5.14 Nickel and Nickel-Alloy Bare Welding Rods and Electrodes

A 5.22 Flux Cored Corrosion-Resisting Chromium and Chromium-Nickel Steel Electrodes

[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 A01.10 on Stainless and Alloy Steel Tubular Products.

Current edition approved May 10, 2000. Published August 2000. Originally published as A 928/A 928M – 94. Last previous edition A 928/A 928M – 98.

[2] *Annual Book of ASTM Standards*, Vol 01.03.

[3] *Annual Book of ASTM Standards*, Vol 01.01.

[4] *Annual Book of ASTM Standards*, Vol 03.03.

[5] Available from American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017.

[6] Available from American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135.

TABLE 1 Pipe and Filler Metal Specifications

Grade	UNS Designation	ASTM Plate Specification No. and Grade	A5.4		A5.9		A5.11		A5.14		A5.22		A5.30	
			Class	UNS	Class	UNS	Class	UNS	Class	UNS	Class	UNS	Class	UNS
...	S31200	A 240 S31200	...	...	...	...	...	...	...	...	...	...	...	...
...	S31260	A 240 S31260	...	...	...	...	...	...	...	...	...	...	...	...
...	S31500	A 240 S31500	...	...	...	...	...	...	...	...	...	...	...	...
...	S31803	A 240 S31803	...	...	...	...	...	...	...	...	...	...	...	...
...	S32205	A 240 S32205	...	...	...	...	...	...	...	...	...	...	...	...
...	S32304	A 240 S32304	...	...	...	...	...	...	...	...	...	...	...	...
...	S32550	A 240 S32550	...	...	...	...	...	...	...	...	...	...	...	...
...	S32750	A 240 S32750	...	...	...	...	...	...	...	...	...	...	...	...
329	S32900	A 240 type 329	...	...	...	...	...	...	...	...	...	...	...	...
...	S32950	A 240 S32950	...	...	...	...	...	...	...	...	...	...	...	...
...	S32760	A 240 S32760	...	...	...	...	...	...	...	...	...	...	...	...
...	S32520	A 240 S32520	...	...	...	...	...	...	...	...	...	...	...	...

A 5.30 Consumable Weld Inserts for Gas Tungsten Arc Welding

3. Terminology

3.1 *Definitions:*

3.1.1 The definitions in Specification A 999/A 999M and Terminology A 941 are applicable to this specification.

4. Ordering Information

4.1 Orders for material under this specification should include the following, as required, to describe the desired material adequately:

4.1.1 Quantity (feet, metres, or number of lengths),

4.1.2 Name of material (electric-fusion-welded pipe),

4.1.3 Grade (see Table 1),

4.1.4 Class (see 1.3),

4.1.5 Size (outside diameter and nominal wall thickness),

4.1.6 Length (specific or random),

4.1.7 End finish (section on ends of Specification A 999/A 999M),

4.1.8 Authorization for repair of plate defects by welding and subsequent heat treatment without prior approval, if such is intended (see 13.3),

4.1.9 Specification designation,

4.1.10 Special requirements,

4.1.11 Statement invoking requirements of 13.4, if such is intended,

4.1.12 Circumferential weld permissibility (see Section 17),

4.1.13 Supplementary Requirements (S1 through S4),

4.1.14 Applicable ASME Code, if known,

4.1.15 For ASME Code Section III applications, the service classification intended, and

4.1.16 Certification requirements (see section on certification of Specification A 999/A 999M).

5. General Requirements

5.1 Material furnished to this specification shall conform to the applicable requirements of the current edition of Specification A 999/A 999M unless otherwise provided herein.

6. Materials and Manufacture

6.1 *Materials*—The steel plate material shall conform to the requirements of one of the grades of Specification A 240/A 240M, listed in Table 1.

6.2 *Welding*:

6.2.1 The joints shall be full penetration double-welded or single-welded but joints using fusion welding processes as defined under Definitions, ASME Boiler and Pressure Vessel Code, Section IX. This specification makes no provision for any difference in weld quality requirements, regardless of the weld joint type used (single or double) in making the weld. Where backing rings or strips are used, the ring or strip material shall be of the same P-Number (Table QW-422 of Section IX) as the plate being joined. Backing rings or strips shall be removed completely after welding, prior to any required radiography, and the exposed weld surface shall be examined visually for conformance to the requirements of 6.2.3. Welds made by procedures using backing strips or rings that remain in place are prohibited. Welding procedures and welding operators shall be qualified in accordance with the ASME Boiler and Pressure Vessel Code, Section IX.

6.2.2 Except as provided in 6.2.2.1 and 6.2.2.2, welds shall be made in their entirety by processes involving the deposition of filler metal.

6.2.2.1 For Class 4 pipe using multiple passes, the root-pass may be made without the addition of filler metal.

6.2.2.2 For Class 4 pipe, the weld surface exposed inside the pipe may result from a single pass made from the inside of the pipe without the addition of filler metal.

6.2.2.3 All single-welded pipe shall be radiographed completely.

6.2.3 The weld surface on either side of the weld may be flush with the base plate or may have a reasonably uniform crown, not to exceed ⅛ in. [3 mm]. Any weld reinforcement may be removed at the manufacturer's option or by agreement between the manufacturer and the purchaser. The contour of the reinforcement should be reasonably smooth and free of irregularities. The deposited metal shall be fused uniformly into the plate surface. No concavity of contour is permitted unless the resulting thickness of weld metal is equal to or greater than the minimum thickness of the adjacent base metal.

6.2.4 Weld defects shall be repaired by removal to sound metal and rewelding. Subsequent heat treatment and examination (that is, visual, radiographic, and dye penetrant) shall be as required on the original welds.

6.3 *Heat Treatment*: