



## Standard Specification for Carbon and Alloy Steel Pipe, Electric-Fusion-Welded for High-Pressure Service at High Temperatures<sup>1</sup>

This standard is issued under the fixed designation A 691; 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<sup>2</sup> covers carbon and alloy steel pipe, electric-fusion-welded with filler metal added, fabricated from pressure-vessel-quality plate of several analyses and strength levels and suitable for high-pressure service at high temperatures. Heat treatment may or may not be required to attain the desired mechanical properties or to comply with applicable code requirements. Supplementary requirements are provided for use when additional testing or examination is desired.

1.2 The specification nominally covers pipe 16 in. (405 mm) in outside diameter and larger with wall thicknesses up to 3 in. (75 mm) inclusive. Pipe having other dimensions may be furnished provided it complies with all other requirements of this specification.

1.3 Several grades and classes of pipe are provided.

1.3.1 *Grade* designates the type of plate used as listed in Table 1.

1.3.2 *Class* designates the type of heat treatment performed in the manufacture of the pipe, whether the weld is radiographically examined, and whether the pipe has been pressure tested as listed in 1.3.3.

1.3.3 Class designations are as follows (Note 1):

| Class | Heat Treatment on Pipe             | Radiography,<br>see Section | Pressure Test,<br>see Section |
|-------|------------------------------------|-----------------------------|-------------------------------|
| 10    | none                               | none                        | none                          |
| 11    | none                               | 9                           | none                          |
| 12    | none                               | 9                           | 8.3                           |
| 13    | none                               | none                        | 8.3                           |
| 20    | stress relieved, see 5.3.1         | none                        | none                          |
| 21    | stress relieved, see 5.3.1         | 9                           | none                          |
| 22    | stress relieved, see 5.3.1         | 9                           | 8.3                           |
| 23    | stress relieved, see 5.3.1         | none                        | 8.3                           |
| 30    | normalized, see 5.3.2              | none                        | none                          |
| 31    | normalized, see 5.3.2              | 9                           | none                          |
| 32    | normalized, see 5.3.2              | 9                           | 8.3                           |
| 33    | normalized, see 5.3.2              | none                        | 8.3                           |
| 40    | normalized and tempered, see 5.3.3 | none                        | none                          |
| 41    | normalized and tempered, see 5.3.3 | 9                           | none                          |
| 42    | normalized and tempered, see 5.3.3 | 9                           | 8.3                           |
| 43    | normalized and tempered, see 5.3.3 | none                        | 8.3                           |

<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 A01.09 on Carbon Steel Tubular Products.

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<sup>2</sup> For ASME Boiler and Pressure Vessel Code applications, see related Specification SA-691 in Section II of that Code.

| Class | Heat Treatment on Pipe           | Radiography,<br>see Section | Pressure Test,<br>see Section |
|-------|----------------------------------|-----------------------------|-------------------------------|
| 50    | quenched and tempered, see 5.3.4 | none                        | none                          |
| 51    | quenched and tempered, see 5.3.4 | 9                           | none                          |
| 52    | quenched and tempered, see 5.3.4 | 9                           | 8.3                           |
| 53    | quenched and tempered, see 5.3.4 | none                        | 8.3                           |

NOTE 1—Selection of materials should be made with attention to temperature of service. For such guidance, Specification A 20/A 20M may be consulted.

1.4 Optional requirements of a supplementary nature are provided, calling for additional tests and control of repair welding, when desired.

1.5 The values stated in inch-pound units are to be regarded as the standard.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

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

A 204/A 204M Specification for Pressure Vessel Plates, Alloy Steel, Molybdenum<sup>3</sup>

A 299/A 299M Specification for Pressure Vessel Plates, Carbon Steel, Manganese-Silicon<sup>3</sup>

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products<sup>4</sup>

A 387/A 387M Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum<sup>3</sup>

A 435/A 435M Specification for Straight-Beam Ultrasonic Examination of Steel Plates<sup>3</sup>

A 530/A 530M Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe<sup>5</sup>

A 537/A 537M Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel<sup>3</sup>

E 165 Practice for Liquid Penetrant Inspection Method<sup>6</sup>

E 350 Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron<sup>7</sup>

E 709 Practice for Magnetic Particle Examination<sup>6</sup>

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

<sup>4</sup> Annual Book of ASTM Standards, Vol 01.03.

<sup>5</sup> Annual Book of ASTM Standards, Vol 01.01.

<sup>6</sup> Annual Book of ASTM Standards, Vol 03.03.

<sup>7</sup> Annual Book of ASTM Standards, Vol 03.05.