



Designation: A369/A369M – 24

Standard Specification for Carbon and Ferritic Alloy Steel Forged and Bored Pipe for High-Temperature Service¹

This standard is issued under the fixed designation A369/A369M; 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 heavy-wall carbon and alloy steel pipe (**Note 1**) made from turned and bored forgings and is intended for high-temperature service. Pipe ordered under this specification shall be suitable for bending and other forming operations and for fusion welding. Selection will depend on design, service conditions, mechanical properties and high-temperature characteristics.

NOTE 1—The use of the word “pipe” throughout the several sections of this specification is used in the broad sense and intended to mean pipe headers, or leads.

NOTE 2—The dimensionless designator NPS (nominal pipe size) has been substituted in this standard for such traditional terms as “nominal diameter,” “size,” and “nominal size.”

1.2 Several grades of ferritic steels are covered. Their compositions are given in **Table 1**.

1.3 Supplementary requirements (S1 to S7) of an optional nature are provided. Supplementary requirements S1 to S5 call for additional tests to be made, and when desired shall be so stated in the order, together with the number of such tests required as applicable.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. 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. The inch-pound units shall apply unless the “M” designation of this specification is specified in the order.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recom-*

mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*³

A999/A999M Specification for General Requirements for Alloy and Stainless Steel Pipe

E290 Test Methods for Bend Testing of Material for Ductility

E381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings

2.2 *ASME Boiler and Pressure Vessel Code:*⁴
Section IX

2.3 *ASME Standard:*⁴

B 46.1 Surface Texture

2.4 *AWS Specifications:*⁵

A5.5/A5.5M Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding

A5.23/A5.23M Specification for Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding

A5.28/A5.28M Specification for Low-Alloy Steel Electrodes for Gas Shielded Arc Welding

A5.29/A5.29M Low-Alloy Steel Electrodes for Flux Cored Arc Welding

3. Ordering Information

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

3.1.1 Quantity (feet, centimetres, or number of lengths),

3.1.2 Name of material (forged and bored pipe),

3.1.3 Grade (**Table 1**),

3.1.4 Size (inside diameter and minimum wall thickness),

³ 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.

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁵ Available from American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126, <http://www.aws.org>.

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.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-369 in Section II of that Code.

*A Summary of Changes section appears at the end of this standard



TABLE 1 Chemical Requirements

Grade	Composition, %			
	FPA	FPB	FP1	FP2
Carbon	0.25 max	0.30 max	0.10–0.20	0.10–0.20
Manganese	0.27–0.93	0.29–1.06	0.30–0.80	0.30–0.61
Phosphorus, max	0.035	0.035	0.025	0.025
Sulfur, max	0.035	0.035	0.025	0.025
Silicon	0.10 min	0.10 min	0.10–0.50	0.10–0.30
Chromium	...	...	...	0.50–0.81
Molybdenum	...	...	0.44–0.65	0.44–0.65
Grade	FP5	FP9	FP11	FP12
	FP5	FP9	FP11	FP12
Carbon	0.15 max	0.15 max	0.05–0.15	0.05–0.15
Manganese	0.30–0.60	0.30–0.60	0.30–0.60	0.30–0.61
Phosphorus, max	0.025	0.030	0.025	0.025
Sulfur, max	0.025	0.030	0.025	0.025
Silicon	0.50 max	0.50–1.00	0.50–1.00	0.50 max
Chromium	4.00–6.00	8.00–10.00	1.00–1.50	0.80–1.25
Molybdenum	0.45–0.65	0.90–1.10	0.44–0.65	0.44–0.65
Grade	FP21	FP22	FP91	FP92
	FP21	FP22	Type 1	Type 2
Carbon				
Heat	0.05–0.15	0.05–0.15	0.08–0.12	0.08–0.12
Product	...	...	...	0.07–0.13
Manganese	0.30–0.60	0.30–0.60	0.30–0.60	0.30–0.50 ^A
Phosphorus, max	0.025	0.025	0.025	0.020 ^A
Sulfur, max	0.025	0.025	0.025	0.005 ^A
Silicon	0.50 max	0.50 max	0.20–0.50	0.20–0.40 ^A
Chromium	2.65–3.35	1.90–2.60	8.00–9.50	8.0–9.50 ^A
Molybdenum				
Heat	0.80–1.06	0.87–1.13	0.85–1.05	0.85–1.05
Product	...	...	...	0.80–1.05
			Ni 0.40 max	Others: 0.20 max ^A
			Heat 0.18–0.25	V
			Product ...	Nb ^C
			Heat 0.06–0.10	0.06–0.10
			Product ...	0.05–0.11
			N 0.03–0.07	0.035–0.070 ^A
			Al 0.02 max	0.020 max ^A
			Ti 0.01 max	0.01 max ^A
			Zr 0.01 max	0.01 max ^A
			Sn ...	0.010 max ^A
			Sb ...	0.003 max ^A
			B ...	0.001 max ^A
			Cu ...	0.10 max ^A
			W ...	0.05 max ^A
			As ...	0.010 max ^A
			N/Al ...	≥ 4.0
Grade	FP115	FP115		
	Heat	Product		
Carbon	0.08–0.13	0.07–0.14		
Manganese	0.20–0.50	0.20–0.50		
Phosphorous, max	0.020 max	0.020 max		
Sulfur, max	0.005 max	0.005 max		
Silicon	0.15–0.45	0.15–0.45		
Chromium	10.0–11.0	10.0–11.0		
Molybdenum	0.40–0.60	0.37–0.63		
	W 0.05 max	W 0.05 max		
	V 0.18–0.25	V 0.16–0.27		
	Nb ^C 0.02–0.06	Nb ^C 0.02–0.07		
	N 0.030–0.070	N 0.030–0.070		
	Ni 0.25 max	Ni 0.25 max		
	Al 0.02 max	Al 0.02 max		
	Ti 0.01 max	Ti 0.01 max		
	Zr 0.01 max	Zr 0.01 max		
	B 0.001 max	B 0.001 max		
	Cu 0.10 max	Cu 0.10 max		
	As 0.010 max	As 0.010 max		
	Sn 0.010 max	Sn 0.010 max		
	Sb 0.003 max	Sb 0.003 max		
	N/Al ratio 4.0 min			
	CNB ^B 10.5 max			

^AApplies to both heat and product analyses.^BChromium-Nickel Balance is defined as CNB = (Cr + 6Si + 4Mo + 1.5W + 11V + 5Nb + 9Ti + 12Al) – (40C + 30N + 4Ni + 2Mn + 1Cu).^CThe terms Niobium (Nb) and Columbium (Cb) are alternate names for the same element.