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Standard Specification for Steel Castings, High Strength, for Structural Purposes¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers carbon steel, alloy steel, and martensitic stainless steel castings that are to be subjected to higher mechanical stresses than those covered in Specification A 27/A 27M.

1.2 Several grades of steel castings are covered, having the chemical composition and mechanical properties prescribed in Tables 1 and 2.

1.3 The values stated in 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:²

A 27/A 27M Specification for Steel Castings, Carbon, for General Application

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 781/A 781M Specification for Castings, Steel and Alloy, Common Requirements, for General Industrial Use

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

3. General Conditions for Delivery

3.1 Material furnished to this specification shall conform to the requirements of Specification A 781/A 781M, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A 781/A 781M constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A 781/A 781M, this specification shall prevail.

4. Ordering Information

4.1 The inquiry and order should include or indicate the following:

4.1.1 A description of the casting by pattern number or drawing (dimensional tolerances shall be included on the casting drawing),

4.1.2 Grade of steel,

4.1.3 Options in the specification, and

4.1.4 The supplementary requirements desired, including the standards of acceptance.

5. Heat Treatment

5.1 All castings shall be heat treated either by full annealing, normalizing, normalizing and tempering, or quenching and tempering. Unless otherwise specified in the inquiry, contract, or order, the castings may be heat treated by any of these heat treatments or combination of these heat treatments at the option of the manufacturer.

5.2 Heat treatment shall be performed after the castings have been allowed to cool below the transformation range.

6. Temperature Control

6.1 Furnace temperatures for heat-treating shall be regulated by the use of pyrometers.

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 A01.18 on Castings.

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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.

TABLE 1 Chemical Requirements

Grade (UNS No.)	Composition, %	
	Sulfur, max	Phosphorus, max
80-40 [550-275] (D50400)	0.06	0.05
80-50 [550-345] (D50500)	0.06	0.05
90-60 [620-415] (D50600)	0.06	0.05
105-85 [725-585] (D50850)	0.06	0.05
115-95 [795-655] (D50950)	0.06	0.05
130-115 [895-795] (D51150)	0.06	0.05
135-125 [930-860] (D51250)	0.06	0.05
150-135 [1035-930] (D51350)	0.06	0.05
160-145 [1105-1000] (D51450)	0.06	0.05
165-150 [1140-1035] (D51500)	0.020	0.020
165-150L [1140-1035L] (D51501)	0.020	0.020
210-180 [1450-1240] (D51800)	0.020	0.020
210-180L [1450-1240L] (D51801)	0.020	0.020
260-210 [1795-1450] (D52100)	0.020	0.020
260-210L [1795-1450L] (D52101)	0.020	0.020

TABLE 2 Tensile Requirements

Grade	Tensile strength min, ksi [MPa]	Yield point min, ksi [MPa]	Elongation in 2 in. or 50 mm, min, % ^A	Reduction of Area, min, %
80-40 [550-275]	80 [550]	40 [275]	18	30
80-50 [550-345]	80 [550]	50 [345]	22	35
90-60 [620-415]	90 [620]	60 [415]	20	40
105-85 [725-585]	105 [725]	85 [585]	17	35
115-95 [795-655]	115 [795]	95 [655]	14	30
130-115 [895-795]	130 [895]	115 [795]	11	25
135-125 [930-860]	135 [930]	125 [860]	9	22
150-135 [1035-930]	150 [1035]	135 [930]	7	18
160-145 [1105-1000]	160 [1105]	145 [1000]	6	12
165-150 [1140-1035]	165 [1140]	150 [1035]	5	20
165-150L [1140-1035L] ^B	165 [1140]	150 [1035]	5	20
210-180 [1450-1240]	210 [1450]	180 [1240]	4	15
210-180L [1450-1240L] ^B	210 [1450]	180 [1240]	4	15
260-210 [1795-1450]	260 [1795]	210 [1450]	3	6
260-210L [1795-1450L] ^B	260 [1795]	210 [1450]	3	6

^A When ICI test bars are used in tensile testing as provided for in this specification, the gage length to reduced section diameter ratio shall be 4 to 1.

^B These grades must be Charpy impact tested as prescribed in Section 9, and with minimum values as shown in Table 3.

<https://standards.iteh.ai/catalog/standards/sist/d6da58-8c80-4fe4-8ccd-c7dc451db1e4/astm-a148-a148m-08>

7. Chemical Composition

7.1 The steel shall conform to sulfur and phosphorus requirements as prescribed in Table 1.

7.2 The content of carbon, manganese, silicon, and alloying elements may, by agreement, be prescribed by the purchaser. If not specified, the content may be selected by the manufacturer to obtain the required mechanical properties.

7.3 When the analysis of carbon, manganese, silicon, or any intentionally added alloying element is specifically requested in the contract or order, it shall be made by the manufacturer and reported to the purchaser. The results of these analyses shall not be used as a basis for rejection except by prior agreement.

8. Tensile Requirements

8.1 One tension test shall be made from each heat and shall conform to the tensile requirements specified in Table 2.

8.2 The test coupons and specimens shall conform to requirements specified in Section 11.

8.3 Tension test coupons shall be machined to the form and dimension shown in Fig. 4 of Test Methods and Definitions A 370 and tested in accordance with those test methods with the ends machined to fit the grips on the tensile testing machine to be used. Suggested types of ends for standard round tension test specimens are shown in Fig. 5 of Test Methods and Definitions A 370.

8.4 To determine conformance with the tension test requirements, an observed value or calculated value shall be rounded off in accordance with Practice E 29 to the nearest 500 psi [5 MPa] for yield point and tensile strength and to the nearest 1 % for elongation and reduction of area.

9. Charpy Impact Requirements

9.1 This section is applicable only to grades 165-150L [1140-1035L], 210-180L [1450-1240L], and 260-210L [1795-1450L].

NOTE 1—Other grades may be ordered to Charpy impact test requirements in accordance with Supplementary Requirement S9 of Specification A 781/A 781M.