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Standard Specification for Steel Castings, Austenitic Manganese[1]

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1. Scope

1.1 This specification covers Hadfield austenitic manganese steel castings and alloy modifications.

1.2 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 781/A781M Specification for Castings, Steel and Alloy, Common Requirements for General Industrial Use[2]

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 Orders for material under this specification should include the following information in proper sequence.

4.1.1 Quantity,

4.1.2 Specification, grade,

4.1.3 Whether any portion of the casting is to be chilled, and whether this is to be spot or full-face chilling,

4.1.4 Special heat-treatment requirements, and

4.1.5 Supplementary requirements.

5. Heat Treatment

5.1 The castings shall be suitably heat treated to achieve toughness and ductility. This heat treatment shall consist of uniformly heating the castings to a temperature applicable for grade of steel produced, at least 1800°F [1000°C], and holding until the temperature is uniform throughout and quenching in an applicable medium, normally water.

5.2 By agreement between the purchaser and the manufacturer, castings may be furnished in a condition other than described in 5.1.

6. Chemical Composition

6.1 The steel shall conform to the requirements as to chemical composition prescribed in Table 1.

6.2 Contamination of the drillings by drill chips must be avoided. Flat drills of the best highspeed steels, or drills of some of the newer tool materials, will generally be satisfactory for drilling manganese steel. Manganese steel may be drilled best after it has been annealed for several hours at from 900 to 1100°F [500 to 600°C].

7. Repair by Welding

7.1 Defects shall be welded using a procedure and welders capable of producing sound welds. The weld deposit shall be austenitic steel in general, but welds on wearing surfaces shall consist of austenitic-manganese steel.

7.2 Weld repairs shall be inspected to the same quality standards as are used to inspect the castings.

8. Keywords

8.1 austenitic manganese steel; manganese steel; steel castings

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[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 A01.18 on Castings.

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[2] *Annual Book of ASTM Standards*, Vol 01.02.

TABLE 1 Chemical Requirements

Grade[A]	Composition, %						
	Carbon	Manganese	Chromium	Molybdenum	Nickel	Silicon	Phosphorus
A[B]	1.05–1.35	11.0 min	...	...	...	1.00 max	0.07 max
B-1	0.9 –1.05	11.5–14.0	...	...	...	1.00 max	0.07 max
B-2	1.05–1.2	11.5–14.0	...	...	...	1.00 max	0.07 max
B-3	1.12–1.28	11.5–14.0	...	...	...	1.00 max	0.07 max
B-4	1.2 –1.35	11.5–14.0	...	...	...	1.00 max	0.07 max
C	1.05–1.35	11.5–14.0	1.5–2.5	...	...	1.00 max	0.07 max
D	0.7 –1.3	11.5–14.0	...	...	3.0–4.0	1.00 max	0.07 max
E-1	0.7 –1.3	11.5–14.0	...	0.9–1.2	...	1.00 max	0.07 max
E-2	1.05–1.45	11.5–14.0	...	1.8–2.1	...	1.00 max	0.07 max
F (J91340)	1.05–1.35	6.0–8.0	...	0.9–1.2	...	1.00 max	0.07 max

[A]Section size precludes the use of all grades and the producer should be consulted as to grades practically obtainable for a particular design required. Final selection shall be by mutual agreement between manufacturer and purchaser.
[B]Unless otherwise specified, Grade A will be supplied.

SUPPLEMENTARY REQUIREMENTS

A list of standardized supplementary requirements for use at the option of the purchaser is described in Specification A 781/A 781M. Those which are considered suitable for use with this specification are listed below by title only. Additional supplementary requirements suitable for use with this specification at the option of the purchaser are described below. One or more of the supplementary requirements indicated below may be included in the purchaser's order or contract. When so included, a supplementary the same force as if it were in the body of the specification. Supplementary requirements details not fully described shall be agreed upon between the purchaser and the supplier, but shall not negate any of the requirements in the body of the specification.

S6. Certification

S8. Marking

S50. Bend Test

S50.1 The test specimen shall withstand cold bending through 150° around a pin 1 in. [25.4 mm] in diameter without breaking into two pieces. (Surface cracks after bending are not considered as failure if the sample remains in one piece.) The specimen may be bent by any method preferred by the manufacturer. When the bend test is specified, one such test shall be made from each heat of steel.

NOTE —The bend test has become essentially obsolete as a result of improved technology. Furthermore, it is not recommended as a suitable test for the special alloy grades.

S50.2 The bend specimen shall be poured in separatemolds from the same heat of steel as the castings. They shall be ½ by ¾in. [13 by 19 mm] in cross section and 12 in. [300 mm] in length, and shall be heat treated and tested without being machined or ground, except when necessary to remove surface irregularities or decarburization.

S50.3 Bend specimens shall be heat treated in the same manner as the castings they represent, with due regard for the metal section. At the discretion of the manufacturer and unless otherwise specified by the purchaser, specimens may be heat treated separately or with the castings they represent.

S50.4 If any specimen fails as the result of flaws, it may be discarded and another specimen tested from the same heat. If the results of the bend tests for any heat do not conform to the requirements specified, the manufacturer may reheat treat and retest additional specimens from the same heat, but not more than twice. In the case of reheat treating and retesting, two bend tests from each heat shall be required.