



Standard Specification for Ferrocolumbium¹

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1. Scope

1.1 This specification covers three grades of ferrocolumbium, designated Low-Alloy Steel Grade, Alloy and Stainless Steel Grade, and High-Purity Grade.

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

2. Referenced Documents

2.1 *ASTM Standards:*

E 11 Specification for Wire-Cloth Sieves for Testing Purposes²

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications²

E 31 Methods for Chemical Analysis of Ferroalloys³

E 32 Practices for Sampling Ferroalloys and Steel Additives for Determination of Chemical Composition³

3. Ordering Information

3.1 Order for material to this specification shall include the following information:

3.1.1 Quantity,

3.1.2 Name of material,

3.1.3 ASTM designation and year of issue,

3.1.4 Grade (Section 1),

3.1.5 Size, if appropriate (Section 5), and

3.1.6 Special requirements for packing, inspection, analysis reports, etc., as appropriate.

NOTE 1—A typical ordering description is as follows: 100 000 lb ferrocolumbium, ASTM A 550, Low-Alloy Steel Grade, 2 in. (51 mm) by Down, packed in sealed containers.

3.2 Although ferrocolumbium is purchased by total net weight, the customary basis of payment is on the contained weight of columbium.

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 A 01.18 on Castings.

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² *Annual Book of ASTM Standards*, Vol 14.02.

³ *Annual Book of ASTM Standards*, Vol 03.05.

4. Chemical Composition

4.1 The various grades shall conform to the requirements as to chemical composition specified in Table 1 and Table 2.

4.2 *Chemical Analysis*—The chemical analysis of the material shall be made in accordance with Methods E 31. Where no method is given in Methods E 31 for the analysis for a particular element, the analysis shall be made in accordance with a procedure agreed upon by the manufacturer and purchaser.

5. Sizing

5.1 Ferrocolumbium is available in these sizes: 2 in. (50.8 mm) by down, ½ in. (12.7 mm) by down, ¼ in. (6.35 mm) by down, 8 mesh (2.38 mm) by down and 20 mesh (0.841 mm) by down. Other sizes may be specified as agreed upon. The size shall be specified in the order.

5.2 Size tolerances as given in Table 3 shall apply.

6. Sampling

6.1 The material shall be sampled in accordance with Practices E 32.

6.2 Other methods of sampling which have been agreed upon by manufacturer and purchaser may be used. In case of discrepancy, Practices E 32 shall be used for referee.

7. Inspection

7.1 The manufacturer shall afford the inspector representing the purchaser all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification.

8. Rejection

8.1 Any claims or rejections based upon check analysis shall be made to the manufacturer within 45 days from the receipt of the material by the purchasers.

9. Packaging and Package Marking

9.1 *Packaging:*

9.1.1 Ferrocolumbium shall be packed so that it will be protected from loss or damage during shipment.

TABLE 1 Chemical Requirements^A

NOTE—An analysis report on each lot is required.

Element	Composition, %		
	Low-Alloy Steel Grade	Alloy and Stainless Steel Grade	High-Purity Grade
Columbium ^B	60.0–70.0	60.0–70.0	60.0–70.0
Tantalum, max	5.0	2.0	0.50 ^C
Carbon, max	0.5	0.3	0.10
Manganese, max	3.0	2.0	0.50
Silicon, max	4.0	2.5	0.40
Aluminum, max	3.0 ^D	2.0 ^D	2.0 ^E
Tin, max	0.25	0.15	0.02
Phosphorus, max	0.10	0.05	0.02
Sulfur, max	0.10	0.05	0.02

^ATo determine conformance with this specification, the reported analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of Recommended Practice E 29.

^BTo determine the columbium content of any shipment, columbium shall be reported to the nearest 0.1 %, applying the same rounding procedure as prescribed in Footnote A.

^COr 0.25 % maximum as agreed between purchaser and seller.

^DOr 1.50 % maximum as agreed between purchaser and seller.

^EOr 1.0 maximum as agreed between purchaser and seller.

9.1.2 When shipment is required to be in containers under the provisions of Section 3, the containers shall be sound and capable of protecting the material from loss or damage during shipment and handling.

9.2 Marking:

9.2.1 When the shipment is made in bulk, it shall be accompanied by appropriate identification showing the material, the grade designation, the ASTM designation, the size, the lot number and the name, brand, or trademark of the manufacturer.

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TABLE 2 Supplementary Chemical Requirements

NOTE—These are maximum limits allowable unless otherwise stated.^A

Element	Composition, %		
	Low-Alloy Steel Grade	Alloy and Stainless Steel Grade	High-Purity Grade
Chromium	1.00	1.00	0.10
Tungsten	1.00	0.5	0.05
Titanium	1.00	1.0	0.10
Lead	0.25	0.01	0.01
Cobalt	0.25	0.05	0.05

^AThe composition of the ferrocolumbian shall be within these limits; however, an analysis of each lot is not required. Upon request, the manufacturer shall supply the results of an analysis for these elements on terms previously agreed upon by the manufacturer and purchaser.

TABLE 3 Standard Sizes and Tolerances

Standard Size	Tolerance ^A	Friability Rating
2 in. by down	10 % max retained on 2-in. (50-mm) sieve 10 % max passing No. 8 (2.36-mm) sieve	4
½ in. by down	10 % max retained on ½-in. (12.5-mm) sieve	4
¼ in. by down	10 % max retained on ¼-in. (6.3-mm) sieve	4
8 mesh by down	10 % max retained on No. 8 (2.36-mm) sieve	4
20 mesh by down	10 % max retained on No. 20 (850-µm) sieve	4

^ASpecifications of sieve sizes used to define tolerances herein are as listed in Specification E 11.

9.2.2 When the shipment is made in containers, each container shall be marked or a label or tag attached. The marking shall show the material, the grade designation, the ASTM designation, the size, the lot number, gross, tare and net weight, and the name, brand, or trademark of the manufacturer.

10. Keywords

10.1 columbium; ferrocolumbium; tantalum