

APPROVED AS
AMERICAN STANDARD
BY THE AMERICAN STANDARDS ASSOCIATION
ASA NO.: G9.1-1933

Standard Specifications for
CARBON-STEEL AND ALLOY-STEEL BLOOMS, BILLETS,
AND SLABS FOR FORGINGS¹



A.S.T.M. Designation: A 17 - 29

ADOPTED, 1913; REVISED, 1918, 1921, 1929.

This Standard of the American Society for Testing Materials is issued under the fixed designation A 17; the final number indicates the year of original adoption as standard or, in the case of revision, the year of last revision.

Scope

1. (a) These specifications cover carbon-steel and alloy-steel billets.² Eight types of steel are covered, one type of carbon steel and seven types of alloy steels, classification by type being made according to the chemical composition, other than carbon.

(b) Each type of steel is subdivided into grades according to the carbon content. There are eight grades of carbon steel and seven grades of each type of alloy steel.

(c) The billets are further divided into two classes, designated classes I and II. Class I is the standard for all types and grades; class II is a special class applicable to grades Nos. 4 to 8, inclusive, in type A, and to grades Nos. 14 to 17, inclusive, in all other types. Class II differs from class I in the method of sampling for chemical analysis and in the chemical requirements.

Basis of Purchase

2. Billets shall be purchased as semi-finished, rolled or forged material.

Process

3. The steel shall be made by either or both of the following processes: open-hearth or electric-furnace.

Discard

4. A sufficient discard shall be made from each ingot to secure freedom from injurious piping and undue segregation.

Reduction from Ingot

5. Unless otherwise specified, the billets shall be made from ingots of at least three times the cross-sectional area of the billet.

Chemical Composition

6. The steel shall conform to the following requirements as to chemical composition for type and grade:

(a) *Type*.—The types of steel shall be as indicated in Table I.

(b) *Grade*.—The carbon ranges for the various grades shall be as follows:

¹ Under the standardization procedure of the Society, these specifications are under the jurisdiction of the A.S.T.M. Committee A-1 on Steel.

² The term "billet" as used in these specifications includes blooms, billets, and slabs.

Carbon Steel Type A		Alloy Steels Types B to H, incl.	
Grade	Carbon, per cent	Grade	Carbon, per cent
No. 1.....	0.05 to 0.15	No. 11.....	0.10 to 0.20
No. 2.....	0.15 to 0.25	No. 12.....	0.15 to 0.25
No. 3.....	0.20 to 0.30	No. 13.....	0.20 to 0.30
No. 4.....	0.25 to 0.40	No. 14.....	0.25 to 0.38
No. 5.....	0.30 to 0.45	No. 15.....	0.30 to 0.43
No. 6.....	0.35 to 0.50	No. 16.....	0.35 to 0.50
No. 7.....	0.40 to 0.55	No. 17.....	0.45 to 0.60
No. 8.....	0.45 to 0.60		

NOTE.—When the steel is to be used for case-hardening purposes, the manganese should be specified not to exceed 0.50 per cent. When the minimum carbon specified is 0.35 per cent or over, the manganese range may be specified 0.30 to 0.60 per cent.

Ladle Analysis

7. An analysis of each melt of steel

taken with a $\frac{5}{8}$ -in. drill, parallel to the axis of the ingot as cast, at any point midway between the center and the surface of the billet. The chemical composition thus determined shall conform to the requirements specified in Section 6.

(b) *Class II.*—For billets of class II, the purchaser or his representative may select one top-cut billet from which to make an analysis to represent each melt. Two sets of drillings shall be taken from the top face of this billet at points on the same diagonal of the billet. The drillings shall be taken with a $\frac{5}{8}$ -in. drill parallel to the axis of the ingot as

TABLE I.—CHEMICAL REQUIREMENTS.

	Carbon Steel	Alloy Steel						
	Type A	Type B	Type C	Type D	Type E	Type F	Type G	Type H
	Carbon Steel	Nickel Steel	Chromium-Nickel Steel				Chromium Steel	Chromium Vanadium Steel
			1.00 to 1.50 per cent Ni	1.50 to 2.00 per cent Ni	2.75 to 3.25 per cent Ni	3.00 min., per cent Ni		
Manganese, per cent...	0.50 to 0.80	0.50 to 0.80	0.50 to 0.80	0.30 to 0.60	0.45 to 0.75	0.30 to 0.60	0.30 to 0.60	0.50 to 0.80
Phosphorus, max., per cent.....	0.045	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Sulfur, max., per cent.....	0.050	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Nickel, per cent.....	.....	3.00 min.	1.00 to 1.50	1.50 to 2.00	2.75 to 3.25	3.00 min.	.....	.....
Chromium, per cent.....	.....	.....	0.45 to 0.75	0.90 to 1.25	0.60 to 0.95	1.00 min.	0.60 to 0.90	0.80 to 1.10
Vanadium, min., per cent.....	.....	.....	.....	.....	.....	.....	.....	0.15

shall be made by the manufacturer to determine the percentages of the elements specified in Section 6. This analysis shall be made from a test ingot taken during the pouring of the melt. Drillings for analysis shall be taken not less than $\frac{1}{4}$ in. beneath the surface of the test ingot. The chemical composition thus determined shall be reported to the purchaser or his representative, and shall conform to the requirements specified in Section 6.

Check Analysis

8. (a) *Class I.*—For billets of class I, an analysis may be made by the purchaser from one billet representing each melt. Drillings for analysis shall be

cast. The distance from the center of the billet to the drilling points shall be respectively 15 and 80 per cent of the length of the half diagonal of the billet. From the drillings taken at the 80 per cent point a complete analysis may be made. The chemical composition thus determined shall conform to the requirements specified in Section 6. From the drillings taken at the 15 per cent point a carbon determination may be made. The difference between the carbon content of the drillings from the 15 per cent point and that of the drillings from the 80 per cent point, expressed as a percentage of the latter, shall not exceed the following values:

Billets 15 in. or under in thickness. . . . 15 per cent
 Billets over 15 in. in thickness. 20 per cent

If the analyses of the drillings do not conform to the above requirements, additional drillings may be taken in a similar manner after making a further top discard from the material from each ingot, of at least 10 per cent of the original ingot weight. The results of this analysis shall conform to the above carbon content requirements, otherwise, the melt represented shall be rejected.

Chipping

9. (a) Billets may be chipped to remove surface defects, provided that the depth of chipping does not exceed $\frac{1}{16}$ in. for each inch of dimension concerned, up to a maximum depth of $\frac{3}{4}$ in., and provided that the width of the chipping is at least four times its greatest depth; except that in the case of slabs where the width is at least twice the thickness, the depth of chipping on the wide surfaces may not exceed $\frac{3}{32}$ in. for each inch of dimension concerned, up to a maximum depth of $\frac{3}{4}$ in.

(b) In special cases, particularly large alloy-steel billets where it is necessary and is not injurious, greater depth of chipping may be permitted by agreement between the manufacturer and the purchaser.

Finish

10. The billets shall be free from injurious defects and shall have a workmanlike finish.

Marking

11. (a) The melt number shall be legibly stamped on each billet 6 in. or over in thickness, and on billets of smaller section when so specified.

(b) For billets of class I, the top end of all top-cut billets 6 in. or over in thickness shall be legibly hot-stamped with the letter "T" and marked with paint.

(c) For billets of class II, the top ends of the top, second, third, and following cut billets from each ingot shall be legibly hot-stamped with the letters "A," "B," "C," etc., to show the position of the billet in the ingot, and marked with paint.

Inspection

12. The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works that concern the manufacture of the material ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications. All tests (except check analysis) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection

13. (a) Unless otherwise specified, any rejections based on tests made in accordance with Section 8 shall be reported to the manufacturer within five working days from the receipt of samples by the purchaser.

(b) Material that shows injurious defects subsequent to its acceptance at the manufacturer's works will be rejected, and the manufacturer shall be notified.

Rehearing

14. Samples tested in accordance with Section 8 that represent rejected material shall be preserved for two weeks from the date of the test report. In case of dissatisfaction with the results of the tests, the manufacturer may make claim for a rehearing within that time.