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IS 2830 (2012): Carbon steel cast billet ingots, billets, blooms and slabs for re-rolling into steel for general structural purposes - Specification [MTD 4: Wrought Steel Products]



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(तीसरा पुनरीक्षण)

Indian Standard

CARBON STEEL CAST BILLET INGOTS, BILLETS,
BLOOMS AND SLABS FOR RE-ROLLING INTO
STEEL FOR GENERAL STRUCTURAL
PURPOSES — SPECIFICATION

(Third Revision)

ICS 77.080.20; 77.140.99

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FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wrought Steel Products Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1964 and revised in 1975 and 1992. While reviewing the standard in the light of merger of IS 1977 : 1996 'Low tensile structural steels' and IS 8500 : 1991 'Structural steel — Microalloyed (medium and high strength qualities) (*first revision*)' in the sixth revision of IS 2062 : 2006 'Hot rolled low, medium and high tensile structural steel', the Committee decided to revise it to bring the grades of IS 1786 : 2008 'High strength deformed steel bars and wires for concrete reinforcement (*fourth revision*)' in this standard.

In this revision, the following changes have been made:

- a) Amendment Nos. 1, 2 and 3 have been incorporated.
- b) Scope has been modified.
- c) Round shape billets have been incorporated in **3.2**.
- d) Number of grades have been increased to ten.
- e) Table 1 has been modified.
- f) Note 2 of Table 1 has been aligned with corresponding Note of IS 2062.
- g) CHMn25 grade has been added to cover steel grades given in IS 1786.
- h) Clause **6.1.1** has been modified.

The producers of structural steel have a systematic method of choosing the steel base composition and the proper size of cast billet ingot and continuously cast billet to satisfy the physical requirements in the finished product. The basis of doing such a selection of base composition and sizes of cast billet ingots; billet, blooms slabs (including continuously cast) are the carbon — manganese balance, the percentage of reduction, the finishing temperature range and finished section thickness.

No tensile properties for the billets, blooms and slabs have been specified in this standard as the tensile properties in a rolled material are not only dependent on the base chemistry, but also on the rolling conditions, particularly the finishing temperature and the end cooling condition obtained in the hot bed. It has, therefore, been felt not appropriate to lay down any guarantee for physical properties on supplies of semis made for rolling materials satisfying certain physical requirements. This standard is based on the manufacturing and trade practices followed in the country in this field.

For all the tests specified in this standard (chemical/physical/others), the method as specified in relevant ISO Standard may also be followed as an alternate method.'

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 NOVEMBER 2012
TO
IS 2830 : 2012 CARBON STEEL CAST BILLET
INGOTS, BILLETS, BLOOMS AND SLABS FOR
RE-ROLLING INTO STEEL FOR GENERAL
STRUCTURAL PURPOSES

(Third Revision)

[Foreword, Para 3, Sl No. (g)] — Substitute ‘C25 HMn’ for ‘CHMn25’.

(Page 1, clause 3.1, line 3) — Substitute ‘200 mm × 200 mm’ for ‘200 mm²’.

(Page 3, clause 12.2) — Substitute the following for the existing clause:

‘12.2 In case of billets, blooms and slabs (including continuously cast), the tolerances as given in Table 3 shall apply on the specified width across flat/thickness.’

[Page 4, Table 4, Sl No. (ix)] — Insert the following after Sl No. ix):

(1)	(2)	(3)	(4)	(5)	(6)
x)	C25 HMn	Blue	A with two dots	B with two dots	C with two dots

(MTD 4)

Indian Standard

CARBON STEEL CAST BILLET INGOTS, BILLETS, BLOOMS AND SLABS FOR RE-ROLLING INTO STEEL FOR GENERAL STRUCTURAL PURPOSES — SPECIFICATION

(*Third Revision*)

1 SCOPE

1.1 This standard covers the requirements of carbon steel cast billet ingots, billets, blooms, slabs and for re-rolling into medium and high tensile structural steel including steel for concrete reinforcement. The requirements of this standard shall also be applicable to billets, blooms and slabs produced by continuously cast process.

1.2 Carbon steel cast billet ingots, billets, bloom and slabs (including continuously cast) may also be supplied in copper-bearing quality. In which case steel shall be designated with a suffix Cu.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
228 (All parts)	Methods of chemical analysis of steels
1956 (All parts)	Glossary of terms relating to iron and steel
8910 : 2010	General technical delivery requirements for steel and steel products (<i>first revision</i>)
11371 : 1985	Method for macroetch test of wrought steel products
12037 : 1987	Macrographic examination by sulphur print (Baumann method)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1956 and the following shall apply.

3.1 Cast Billet Ingots — For the purpose of this standard, cast billet ingot shall be defined as ingot, generally of cross-section not more than 200 mm² which can be rolled directly into merchant products. Cast billet ingot is also sometimes known as 'pencil ingot'.

3.2 Billet — A semi-finished product obtained by forging, rolling or continuously casting, usually square (not exceeding 125 mm × 125 mm in cross-section) with rounded corners or round (not exceeding 125 mm in diameter) and are intended for further processing into suitable finished product by forging or re-rolling.

3.3 Bloom — A semi-finished forged, rolled or continuously cast product. The cross-section is square or nearly rectangular (excluding slab) and the cross-section is generally more than 125 mm × 125 mm (or equivalent cross-sectional area).

3.4 Slab — A semi-finished rolled, forged or continuously cast product intended for re-rolling or forging. The cross-section is rectangular. The thickness does not exceed one-third of the width.

4 SUPPLY OF MATERIAL

General requirements relating to the supply of steel shall conform to IS 8910.

5 MANUFACTURE

5.1 Steel shall be manufactured by any process of steel making except the Bessemer process. It may be followed by secondary refining.

5.2 Steel shall be supplied semi-killed or killed. Rimming steel may also be supplied subject to a special agreement between the purchaser and the supplier.

6 CHEMICAL COMPOSITION

6.1 The ladle analysis of the steel, when carried out by the method specified in the relevant parts of IS 228 or any other established instrumental/chemical method,

shall be as given in Table 1. In case of dispute the procedure given in relevant parts of IS 228 shall be referee method.

Table 1 Chemical Composition
(Clause 6.1)

Sl No. (1)	Designation (2)	Carbon (3)	Manganese (4)
i)	C15	0.12-0.18	0.30-0.60
ii)	C18	0.15-0.21	0.30-0.60
iii)	C20	0.17-0.23	0.30-0.60
iv)	C15 MMn	0.12-0.18	0.60-1.00
v)	C18 MMn	0.15-0.21	0.60-1.00
vi)	C20 MMn	0.17-0.23	0.60-1.00
vii)	C15 HMn	0.12-0.18	1.00-1.80
viii)	C18 HMn	0.15-0.21	1.00-1.80
ix)	C20 HMn	0.17-0.23	1.00-1.80
x)	C25 HMn	0.30, <i>Max</i>	1.80, <i>Max</i>

NOTES

1 The carbon equivalent (CE) shall be subject to the mutual agreement between the purchaser and the manufacturer. The formula for determination of CE is given below:

$$\text{CE based on ladle analysis} = C + \frac{\text{Mn}}{6} + \frac{(\text{Cr} + \text{Mo} + \text{V})}{5} + \frac{(\text{Ni} + \text{Cu})}{15}$$

2 When the steel is killed by aluminium alone, the total aluminium content shall not be less than 0.02 percent. When the steel is killed by silicon alone, the silicon content shall not be less than 0.10 percent. When the steel is silicon-aluminium killed, the silicon content shall not be less than 0.03 percent and total aluminium content shall not be less than 0.01 percent.

3 When micro-alloying elements like Nb, V and Ti are used individually or in combination the total content shall not exceed 0.2 percent.

4 While placing order the steel should be designated by 'Designation (*see* Table 1), followed by grade (*see* 6.1.1). For example C15 A (steel designation C15 and grade A) or C20 HMn B (steel designation C20 HMn and Grade B). When steel is required in copper beating quality, it shall be designated with a suffix Cu, for example C15 ACu or C20 HMn BCu.

5 Some of the grades may be treated with rare earths for better formability.

6 Nitrogen content of the steel should not exceed 0.012 percent and shall be ensured by the manufacturer by occasional check analysis.

7 Details of elements other than those specified may be supplied, if agreed at the time of enquiry.

8 Steel may be ordered with restricted sulphur and phosphorous subject to mutual agreement.

9 For grade C25 HMn, sulphur and phosphorus shall be 0.060, *Max* each. However, combined sulphur and phosphorus shall not exceed 0.11 percent. Other requirements shall be as per the relevant finished product standard.

10 In order to get the desired properties, the chemical composition may be mutually agreed to between the manufacturer and the purchaser within the stipulation of IS 2830.

6.1.1 All types of steel in Table 1 (except C25 HMn) may be supplied in three grades, namely A, B and C

having following sulphur, phosphorus content (on ladle analysis):

Grade (1)	Sulphur <i>Max</i> (2)	Phosphorous <i>Max</i> (3)
A	0.050	0.050
B	0.045	0.045
C	0.040	0.040

6.2 When steel is required in copper bearing quality, copper content shall be between 0.20 and 0.35 percent.

6.3 Check Analysis

Check analysis shall be carried out on the finished product from the standard position. Permissible variations in the case of check analysis from the limits of ladle analysis specified in Table 1 and 6.1.1 shall be as given in Table 2.

Table 2 Permissible Variation Over the Ladle Analysis for Check Analysis

Sl No. (1)	Constituent (2)	Variation Over the Specified Maximum or Under the Minimum Limits, Percent <i>Max</i> (3)
i)	Carbon	0.02
ii)	Manganese	0.03
iii)	Sulphur	0.005
iv)	Phosphorous	0.005
v)	Copper	0.03

NOTES

1 Variation shall not be applicable both over and under the specified limit in several determinations in a heat.

2 Check analysis shall not apply to rimming quality.

7 SAMPLING

At least one ladle analysis shall be taken per cast.

8 SELECTION OF TEST SAMPLE FOR CHECK ANALYSIS

8.1 In the case of cast billet ingots, if required, the samples for product analysis shall be prepared by forging/rolling down to 30 mm round section.

8.1.1 Drilling shall be taken from the sample (*see* 8.1) representing two-thirds, one-half and one-third of height from bottom of the ingot separately.

8.2 In case of billets, blooms and slabs (including continuously cast) the sample for check analysis shall be taken from the location as shown in Fig. 1.

9 FREEDOM FROM DEFECTS

9.1 The billets, blooms and slabs (including

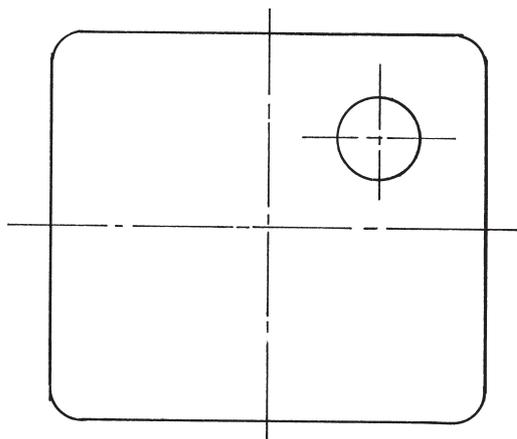


FIG. 1 LOCATION FOR TAKING DRILLING FOR CHECK ANALYSIS

continuously cast) shall be well and cleanly rolled to the dimensions specified. The finished billets, bloom and slabs shall be free from all harmful defects, such as cracks, surface flaws; laminations and rough, jagged and imperfect edges.

9.2 Cast billet ingots shall either be supplied free from harmful defects, such as, segregation, piping, cracks, inclusions and blow-holes by appropriate top and bottom discard and dressing or supplied with suitable surface dressing only, without top and bottom discard, if mutually agreed to between the purchaser and the manufacturer.

10 TESTS

10.1 If mutually agreed to between the purchaser and the manufacturer, the following tests may be carried out from the samples prepared under **8.1**:

- a) Macro-examination (*see* IS 11371); and
- b) Sulphur print tests (*see* IS 12037).

10.2 Bend

In the case of slabs and continuously cast slabs the bend shall not exceed 8 mm/m of slab length subject to a maximum of 40 mm. In the case of billets, blooms and continuously cast billets and blooms the bend shall not exceed 5 mm/m.

10.3 Camber

In the case of slabs and continuously cast slabs the camber shall not exceed 8 mm/m of slab length subject to a maximum of 40 mm. In the case of billets, blooms and continuously cast billets and blooms the camber shall not exceed 3 mm/m.

11 DIMENSIONS

11.1 The sizes of cast billet ingots shall be subject to

mutual agreement between the purchaser and the manufacturer.

11.1.1 The sizes of cast billet ingots other than those specified may be supplied by agreement between the purchaser and the manufacturer.

11.2 The billets, blooms and slabs (including continuously cast) shall be reasonably square.

11.2.1 The preferred size for width across flat of billets, blooms and slabs (including continuously cast) shall be 50, 63, 75, 80, 85, 90, 100, 110, 125, 150, 165, 200, 250 and 320 mm.

11.2.2 Width other than those specified in Table 3, may be supplied as per agreement between the purchaser and the manufacturer.

11.3 Length of billets, blooms and slabs (including continuously cast) shall be supplied in lengths between 3 m and 13 m as specified by the purchaser.

12 TOLERANCES

12.1 In case of cast billet ingots, a tolerance of ± 5 mm shall be permitted on the specified width across flat.

12.2 In case of billets, blooms and slabs (including continuously cast), the following tolerances shall apply.

12.3 A tolerance of ± 150 mm shall be permitted on the specified length of cast billet ingots, billets, blooms and slabs (including continuously cast).

13 MARKING

13.1 Unless agreed otherwise, the material shall be marked as given in **13.2** and **13.3**.

13.2 Each cast billet ingot, billets, blooms and slabs (including continuously cast) shall be legibly stamped or painted with the cast number; and the name or trademark of the manufacturer.

13.3 The ends of cast billet ingots, billets, blooms and slabs (including continuously cast) shall be suitably painted as per agreement between the purchaser and the manufacturer. For designations C 15, C 18 and C 20 the colour coding shall be as given in Table 4.

13.4 BIS Certification Marking

The material may also be marked with the Standard Mark.

13.4.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Table 3 Tolerances on Width
(Clause 11.2.2)

SI No. (1)	Product (2)	Width Across Flat mm (3)	Thickness mm (4)	Thickness on Width/Thickness mm (5)
i)	Billets	a) Up to and including 75	—	±1.5
		b) Over 75	—	±3.0
ii)	Blooms	a) Up to and including 150	—	+4.0 -3.0
		b) Over 150	—	+ 6.0 -3.0
iii)	Slabs	—	a) Up to and including 150	+3.0 -4.0
		—	b) Over 150	+3.0 -6.0
		a) Up to and including 300	—	+3.0 -6.0
		b) Over 300	—	+5.0 -10.0
		—	—	—
		—	—	—

14 ORDERING INFORMATION

While placing an order for the cast billet ingots and billets, blooms and slabs (including continuously cast) covered by this standard, the purchaser should specify clearly the following:

a) Steel grade;

- b) Size of cast billet ingot, billet, bloom and slab (including continuously cast);
- c) Size and dimensions of end product;
- d) End use;
- e) Tests and test report required; and
- f) Special requirements, if any.

Table 4 Colour Coding
(Clause 13.3)

SI No. (1)	Designation (2)	Colour (3)	Grade		
			A (4)	B (5)	C (6)
i)	C 15	Grey	A	B	C
ii)	C 18	Green	A	B	C
iii)	C 20	Orange	A	B	C
iv)	C 15 MMn	Grey	A with one dot	B with one dot	C with one dot
v)	C 18 MMn	Green	A with one dot	B with one dot	C with one dot
vi)	C 20 MMn	Orange	A with one dot	B with one dot	C with one dot
vii)	C 15 HMn	Grey	A with two dots	B with two dots	C with two dots
viii)	C 18 HMn	Green	A with two dots	B with two dots	C with two dots
ix)	C 20 HMn	Orange	A with two dots	B with two dots	C with two dots

ANNEX A*(Foreword)***COMMITTEE COMPOSITION****Wrought Steel Products Sectional Committee, MTD 4**

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This Indian Standard has been developed from Doc No.: MTD 4 (5095).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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