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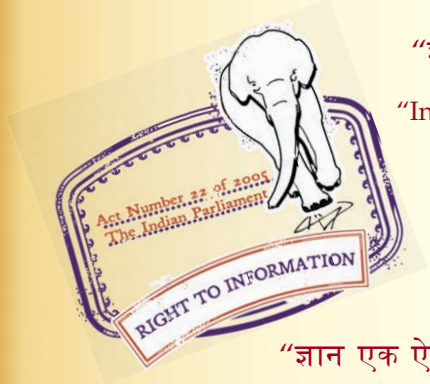
IS 2831 (2012): Carbon Steel Cast Billet Ignots, Billets, Blooms and Slabs For Re-rolling into Structural Steel (Ordinary Quality)- [MTD 4: Wrought Steel Products]



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"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

संरचना इस्पात (साधारण गुणता) के पुनर्वेल्लन हेतू कार्बन ढलवाँ इस्पात इंगट, बिलेट, ब्लूम एवं स्लैब — विशिष्टि

(चौथा पुनरीक्षण)

Indian Standard

CARBON STEEL CAST BILLET INGOTS, BILLETS, BLOOMS AND SLABS FOR RE-ROLLING INTO STRUCTURAL STEEL (ORDINARY QUALITY) — SPECIFICATION

(Fourth Revision)

ICS 77.080.20; 77.140.99

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

April 2012 **Price Group 3**

Wrought Steel Products Sectional Committee, MTD 4

FOREWORD

This Indian Standard (Fourth 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 1962 and revised in 1968, 1975 and 2001. While reviewing the standard in the light of merger of IS 1977 : 1996 'Low tensile structural steels (*third 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 retain the grades of low tensile structural steel and steel for concrete reinforcement for non-critical applications in this standard. This standard will facilitate small re-rollers to procure standardized raw material.

In the revision, the following changes have been made:

a) Scope has been modified.
b) Number of grades have been reduced to 3.
c) Table 1 and Table 2 have been modified.
d) Amendment Nos. 1 and 2 have been incorporated.
e) Round shape billets have been incorporated in **3.2**.
f) C22 grade with high sulphur and phosphorus has been added to cover steel produced by induction furnace units.

The producers of structural steel have a systematic method of choosing the steel base composition to satisfy physical requirements in the finished products. The basis of doing such a selection is the carbon manganese balance. For the guidance of purchasers, three broad ranges of chemical composition have been included in this standard to cater for their requirements. Any closer or wider ranges of chemical composition may be supplied subject to mutual agreement between the purchaser and the manufacturer.

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 being 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.

Indian Standard

CARBON STEEL CAST BILLET INGOTS, BILLETS, BLOOMS AND SLABS FOR RE-ROLLING INTO STRUCTURAL STEEL (ORDINARY QUALITY) — SPECIFICATION

(Fourth Revision)

1 SCOPE

This standard covers the requirement of carbon steel cast billet ingots, billets, blooms, slabs and semi-rolled steel products for re-rolling into low tensile structural steel (ordinary quality). The requirements of this standard shall also be applicable to billets (including round shape), blooms and slabs produced by continuous casting process.

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:

IS No.	*Title*
228 (All parts)	Methods of chemical analysis of steel
1956 (All parts)	Glossary of terms relating to iron and steel
8910 : 2010	General technical delivery requirements for steel and steel products (*first revision)*
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 mm^2 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 is 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.

3.5 Semi-rolled Steel Products — Partially processed material from ingot/bloom/billet/slab/round, etc, but in a form which is fit for further processing. The dimension and tolerances for this product shall be as per mutual agreement between the purchaser and the manufacturer.

4 SUPPLY OF MATERIAL

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

5 MANUFACTURER

5.1 The process used in making steel is left to the discretion of the manufacturer. It may be followed by secondary refining, if required.

5.2 Steel shall be semi-killed or killed. Rimming steel may also be supplied only by mutual agreement between the purchaser and the manufacturer.

6 CHEMICAL COMPOSITION

6.1 The ladle analysis of the steel shall be carried out either 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 IS 228 and its relevant Parts shall be the referee method. However, where the method is not given in IS 228 and its relevant Parts,

Table 1 Chemical Composition
(*Clause* 6.1)

Sl No.	Designation	Ladle Analysis, Percent			
		C	Mn	S	P
(1)	(2)	(3)	(4)	(5)	(6)
i)	C8	0.15, *Max*	0.30-0.60	0.055, *Max*	0.055, *Max*
ii)	C15	0.12-0.18	0.30-0.60	0.055, *Max*	0.055, *Max*
iii)	C22	0.25, *Max*	1.25, *Max*	0.060, *Max*	0.075, *Max*

NOTES

1 When the steel is aluminium killed, 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.

2 Micro-alloying may be allowed subject to mutual agreement between the purchaser and the manufacturer. Micro-alloying elements like Nb, V or Ti, when used individually or in combination, the total content shall not exceed 0.20 percent.

3 While placing order the steel should be designated by 'designation' [*see* col (2)].

4 Copper may be present between 0.20 and 0.35 percent as mutually agreed to between the purchaser and the manufacturer. The copper bearing quality steel shall be designated with a suffix Cu, for example, C15Cu.

5 Nitrogen content of steel shall not exceed 0.012 percent which shall be ensured by the manufacturer by occasional check analysis.

6 For grade C22, other requirements shall be as per relevant finished product standard.

7 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 2831.

the referee method shall be as agreed to between the purchaser and the manufacturer.

6.1.1 If the carbon equivalent is specified, it shall be based on the ladle analysis and shall be calculated by the following formula:

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

6.2 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.	Constituent	Variation Over the Specified Maximum or Under the Minimum Limits, Percent
		Max
(1)	(2)	(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 he sample (*see* **8.1**) representing two-thirds, one-half and one-third of height from bottom of the cast billet 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 rolled as well as continuously cast billets, blooms and slabs shall be cleanly rolled/cast into mutually agreed/preferred dimensions specified in the standard. The semi-rolled products may have variable dimensions, the limits of which may be as per mutual agreement between the purchaser and the manufacturer. The billets, blooms, slabs and semi-rolled products shall be reasonably free from all such harmful defects which are generally not removed during further re-heating and rolling into the finished products.

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,

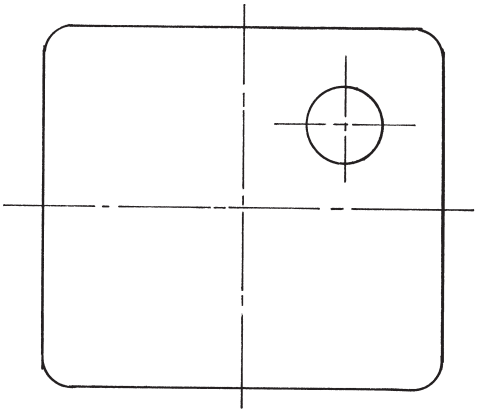

FIG. 1 LOCATION FOR TAKING DRILLING FOR CHECK ANALYSIS

if mutually agreed to between the purchaser and the manufacturer.

9.3 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 50 mm. In the case of billets, blooms and continuously cast billets and blooms the bend shall not exceed 5 mm/m. In case the blooms/billets/slabs/ semi-rolled products are intended for further re-rolling after cutting down to shorter lengths, the above limits shall not be applicable for the standard length products.

9.4 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 50 mm. In the case of billets, blooms and continuously cast billets and blooms the camber shall not exceed 3 mm/m. In case the blooms/billets/slabs/ semi-rolled products are intended for further re-rolling after cutting down to shorter lengths, the above limits shall not be applicable for the standard length products.

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).

11 DIMENSIONS

11.1 The sizes and shapes of cast billet ingots shall be subject to mutual 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 with 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, 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. However, the length restrictions shall not be applicable for cast billet ingots.

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), shall be as given in Table 3.

Table 3 Tolerances on Width

Sl No.	Product	Width Across Flat mm	Thickness mm	Thickness on Width/Thickness mm
(1)	(2)	(3)	(4)	(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

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 otherwise agreed to between the purchaser and the manufacturer, the ends of cast billet ingot, billet and bloom (including continuously cast) shall be painted with a suitable colour and legibly stamped or painted with the cast number; and the name or trade-mark of the manufacturer.

13.2 BIS Certification Marking

The material may be marked with the Standard Mark.

13.2.1 The use of the Standard Mark is governed by the provisions of *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.

14 INFORMATION TO BE GIVEN BY THE PURCHASER

The purchaser shall specify the following at the time of placing an order:

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

ANNEX A
(*Foreword*)

COMMITTEE COMPOSITION

Wrought Steel Products Sectional Committee, MTD 4

Organization	*Representative(s)*
Tata Steel Ltd, Jamshedpur	Dr D. Bhattachrjee (***Chairman***) Shri Indranil Chakraborty (*Alternate* I) Dr A. N. Bhagat (*Alternate* II)
All India Induction Furnace Association, New Delhi	Shri L. N. Goswami
Bharat Heavy Electricals Ltd, Ranipur	Shri J. P Meena Shri B. Choudhary (*Alternate*)
Central Boilers Board, New Delhi	Shri T. S. G. Narayannen Shri S. K. Jain (*Alternate*)
Central Public Works Department, New Delhi	Chief Engineer (NDR) Superintending Engineer (NDR)
DGS & D, Bhilai Nagar/Delhi	Director (QA)
Escorts Knowledge Management Centre, Faridabad	Shri Alok Nayar
Essar Steels Ltd, Hazira	Dr A. K. Das Shri R. K. Balasubramaniam (*Alternate*)
Instiute of Steel Development and Growth, Kolkata	Shri Jayanta Kumar Saha
Jindal South West Ltd, Vasind	Shri M. K. Maheshwari
M. N. Dastur & Co Ltd, Kolkata/Delhi	Shri Pratha Bhattachrya Shri S. Bhaattachrya (*Alternate*)
Ministry of Defence (DGOFB), Kolkata	Shri P. S. Bandhopadhyay Shri T. Basu (*Alternate*)
Ministry of Defence (DGQA), Ichapur	Shri Pinaki Chakraborthy Shri L. P. Varte (*Alternate*)
Ministry of Railways (RDSO), Lucknow	Shri Radhey Sham Shri V. D. Meharkure (*Alternate*)
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Power Grid Corporation of India Ltd, Gurgaon	Shri K. N. M. Rao Shri M. K. Sethi (*Alternate*)
Rashtriya Ispat Nigam Ltd (VSP), Vishakhapatnam	Shri P. K. Sen Shri P. Srinivas (*Alternate*)

Organization	*Representative(s)*
SAIL, Bhilai Steel Plant, Bhilai	SHRI S. BHATTACHARYA SHRI P. K. DATTA (*Alternate*)
SAIL, Bokaro Steel Plant, Bokaro	REPRESENTATIVE
SAIL, Central Marketing Organization, Kolkata	SHRI P. C. JHA SHRI B. V. S. PANDIT (*Alternate*)
SAIL, Research & Development Centre for Iron & Steel, Ranchi	DR B. K. JHA SHRI ATUL SAXENA (*Alternate*)
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TCE Consulting Engineers, Jamshedpur	DR M. D. MAHESHWARI
BIS Directorate General	SHRI P. GHOSH, Scientist 'F' and Head (MTD) [Representing Director General (*Ex-officio*)]

Member Secretary
SHRI DEEPAK JAIN
Scientist 'E' (MTD), BIS

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.org.in

Regional Offices: *Telephones*

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 — 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi, KOLKATA 700054 — 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022 — 60 3843, 60 9285

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 — 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093 — 2832 9295, 2832 7858, 2832 7891, 2832 7892

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