IS 14650 (1999): Carbon Steel Cast Billet Ingots, Billets, Blooms and Slabs for Re-Rolling Purposes [MTD 4: Wrought Steel Products]

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REAFFIRMED 2004 IS 14650 : 1999

भारतीय मानक

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Indian Standard

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

ICS 77.140

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

April 1999 Price Group 2

Wrought Steel Products Sectional Committee, MTD 4

FOREWORD

This Indian Standard 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.

With the establishment of various types of new steel re-rolling units in the country, a need was felt to formulate an Indian Standard for semi-finished steel for re-rolling into various steel products for which no semi-finished product standard is available at present. On the request of manufacturing as well user industry, the committee examined the issue and decided to formulate an Indian Standard for semi-finished steel which may be used for any steel product irrespective of its use.

In this standard, the requirements of carbon steel cast billet ingots, billets, blooms and slabs for re-rolling into different steel products conforming to various product standards are covered. The requirements of this standard are also applicable to billets, blooms and slabs produced by continuous casting process.

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 otf 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 ATION

AMENDMENT NO. 1 FEBRUARY 2009 TO IS 14650 : 1999 CARBON STEEL CAST BILLET INGOTS, BILLETS, BLOOMS AND SLABS FOR RE-ROLLING PURPOSES — SPECIFICATION

(*Page* 1, *clause* 1.1) — Substitute the following for the existing:

'This standard covers the requirement of carbon steel billets, blooms, slabs, cast billet ingots and semi-rolled steel products for rolling into different steel products conforming to applicable Indian Standards. The requirements of this standard shall also be applicable to billets (including round shape), blooms and slabs produced by continuous casting process.'

(*Page* 1, *clause* 3.1) — Substitute '200 mm × 200 mm' *for* '200 mm^2'.

(*Page* 1, *clause* 3.5) — Insert the following new subclause:

'**3.6 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.'

(MTD 4)

Reprography Unit, BIS, New Delhi, India

Indian Standard

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

1 SCOPE

1.1 This standard covers the requirements of carbon steel cast billet ingots, billets, blooms and slabs for rolling into different steel products conforming to applicable Indian Standards. The requirements of this standard shall also be applicable to billets, blooms and slabs produced by continuous casting process.

1.2 The requirements of this standard shall not be applicable for those steel products for which semi-finished material standards exist.

2 REFERENCES

The following Indian Standards contain provisions which through reference in this text, constitute provision 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	Methods of chemical analysis of pig iron, cast iron and plain carbon and low alloy steels
1956	Glossary of terms relating to iron and steel
8910 : 1978	General technical delivery requirements for steel and steel product
11371 : 1988	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 following definitions in addition to those given in the relevant part of IS 1956 shall apply.

3.1 Cast Billet Ingot

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 and not exceeding 125 mm × 125 mm in cross section with rounded corners 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 Microalloying Elements

Elements, such as niobium, vanadium and titanium, added singly or in combination to obtain higher strength levels combined with better formability, weldability and toughness as compared with non-alloyed steel produced to equivalent strength levels.

4 SUPPLY OF MATERIAL

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

5 MANUFACTURE

5.1 The steel shall be manufactured by any process of steel making at the discretion of the manufacturer. It may be followed by secondary refining.

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

6 CHEMICAL COMPOSITION

6.1 The chemical composition of steel shall conform to the ladle analysis requirements of the relevant finished product standard under which the blooms, billets slabs or cast billet ingots has been ordered.

6.1.1 The ladle analysis of steel shall be carried either by the method specified in the relevant parts of IS 228 or any other established instrumental/chemical method. In case of dispute, the procedure given in the relevant part of IS 228 shall be the referee method. However, where the method is not given in IS 228 or its relevant parts, the referee method shall be as agreed to between the purchaser and the manufacturer.

6.1.2 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.

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

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

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

$$\text{Carbon Equivalent} = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$$

6.1.6 When steel is required in copper-bearing quality, it shall be designated with a suffix Cu with the normal designation.

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

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 shall be as specified in the relevant finished product standard.

6.2.1 Variation shall not be applicable both over and under the specified limits in several determinations in one heat.

6.2.2 Check analysis shall not apply to rimming steel.

7 SAMPLING

At least one ladle analysis shall be taken from one 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 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.

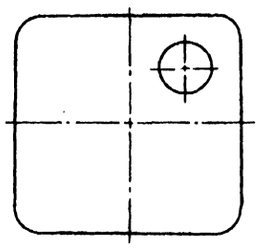

FIG. 1 LOCATION FOR TAKING DRILLING FOR CHECK ANALYSIS

9 DIMENSIONS

9.1 The size and shapes of cast billet ingots shall be subject to mutual agreement between the purchaser and the manufacturer.

9.1.1 The preferred size for width across flat of billets, blooms and slabs (including continuously cast) shall be 50, 63, 65, 71, 75, 80, 90, 100, 125, 150, 165 and 200 mm.

9.1.2 Widths other than those specified, may be supplied as per the mutual agreement between the manufacturer and the purchaser.

9.2 Length of billets, blooms, slabs shall be preferably from 3 and 13 metres. Other lengths can also be supplied subject to mutual agreement between the purchaser and the manufacturer.

10 TOLERANCES

10.1 In case of cast billet ingots, a tolerance of ±5 mm shall be permitted on the specified width across flat and a tolerance of ±150 on the specified length.

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

Product	*Width Across Flat*	*Thickness*	*Tolerances on Width/ Thickness*
	mm	mm	mm
(1)	(2)	(3)	(4)
Billets	Up to and including 75	—	±1.5
	Over 75	—	±3.0
Blooms	Up to and including 150	—	+4.5 −3.0

Product	*Width Across Flat*	*Thickness*	*Tolerances on Width/ Thickness*
	mm	mm	mm
(1)	(2)	(3)	(4)
	Over 150	—	+6.0 −3.0
Slabs	—	Up to and including 150	+3.0 −4.0
	—	Over 150	+3.0 −6.0
	Up to and including 300	—	+6.0 −3.0
	Over 300	—	+5.0 −10.0

10.3 A tolerance of ±150 mm shall be permitted on the specified length of billets, blooms, slabs and continuously cast billets, blooms and slabs.

11 FREEDOM FROM DEFECTS

11.1 Cast billet ingots shall be supplied reasonably free from harmful defects, such as segregation, piping, cracks, inclusions, blow-holes, etc.

11.2 Billets, blooms and slabs shall be free from all harmful defects, such as cracks, surface flaws; laminations and rough, jagged and imperfect edges.

11.3 Billets, blooms and slabs shall be reasonably free from all camber, off flat, out of square, round corners, ridges of gas cutting, tapers and pit of scarfing.

11.4 The following supplementary requirements of tolerance that are considered suitable for use with each material shall be applicable when mutually agreed to and specified in the order:

Defects (1)	*Product* (2)	*Tolerance* (3)
Camber (on lateral edge)	Slab	8 mm per metre of length subject to 50 mm, *Max*
Bend	Slab (off flat)	8 mm per metre of length subject to 50 mm, *Max*
	Bloom/Billet	5 mm per metre
Out of square	Slab	≤ 0.01 × width in mm
	Bloom/Billet Up to and including 150 mm	5 mm *Max* (measured as diagonal difference in cross section)
	Over 150 mm	7 mm *Max* (measured as diagonal difference in cross section)
Round corners	Rolled slab	Plain thickness at the extreme edge shall be ≥ 0.5 × thickness in mm
Ridges due to gas cutting	Slab	Less than or equal to uniform ridges spread over the entire cross section. A single ridge of 20 mm or limited number of ridges with more than 5 mm depth
Taper (width variation on the same surface)	Slab	6 mm, *Max*
Edge slanting (width variation on top and bottom surface at one location)	Slab	10 mm, *Max*
Convexity (difference in thickness from edge to curve)	Slab	6 mm, *Max*
Chamfering (length variation on top and bottom surface at one location)	Slab	10 mm, *Max*
Wedge (thickness variation at the edges along the cross section)	Slab	3 mm, *Max*
Scarfing pits	Slab/Bloom/Billet	Depth ≤ 0.05 × thickness Width ≥ 6 × depth in mm

12 OTHER TESTS

If mutually agreed to between the purchaser and the manufacturer, the macro examination (*see* IS 11371) and sulphur print tests (*see* IS 12037) may be carried out for cast billet ingots.

13 MARKING

13.1 Each cast billet ingot, billet, bloom and slab shall be legibly stamped or painted with the cast number; and the name or trade-mark of the manufacturer.

13.2 The ends of billets, blooms and slabs shall be painted with a suitable colour code.

13.3 BIS Certification Marking

The material may also be marked with the Standard Mark.

13.3.1 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 Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

14 ORDERING INFORMATION

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

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

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

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