Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

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]

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartrhari—Nitisatakam
“Knowledge is such a treasure which cannot be stolen”

“पुराने को छोड़ नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”
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
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:

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

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 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,
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:

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

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 1 Chemical Composition

(Clause 6.1)

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Designation</th>
<th>Ladle Analysis, Percent</th>
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<tr>
<td>(1)</td>
<td>(2)</td>
<td>C</td>
</tr>
<tr>
<td>i)</td>
<td>C8</td>
<td>0.15, \text{Max}</td>
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<tr>
<td>ii)</td>
<td>C15</td>
<td>0.12-0.18</td>
</tr>
<tr>
<td>iii)</td>
<td>C22</td>
<td>0.25, \text{Max}</td>
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</tbody>
</table>

**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.

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 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 reheating 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,
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>
<thead>
<tr>
<th>Table 3 Tolerances on Width</th>
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<tbody>
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<td>SI No.</td>
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</table>

IS 2831 : 2012
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 trademark 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

<table>
<thead>
<tr>
<th>Organization</th>
<th>Representative(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tata Steel Ltd, Jamshedpur</td>
<td>Dr. D. Bhattacharjee (Chairman)</td>
</tr>
<tr>
<td>All India Induction Furnace Association, New Delhi</td>
<td>Shri Indranil Chakraborty (Alternate I)</td>
</tr>
<tr>
<td>Bharat Heavy Electricals Ltd, Ranipur</td>
<td>Dr. A. N. Bhagat (Alternate II)</td>
</tr>
<tr>
<td>Central Boilers Board, New Delhi</td>
<td>Shri L. N. Goswami</td>
</tr>
<tr>
<td>Central Public Works Department, New Delhi</td>
<td>Shri J. P. Meena</td>
</tr>
<tr>
<td>DGS &amp; D, Bhilai Nagar/Delhi</td>
<td>Shri B. C. Choudhary (Alternate)</td>
</tr>
<tr>
<td>Escorts Knowledge Management Centre, Faridabad</td>
<td>Shri T. S. G. Narayanan</td>
</tr>
<tr>
<td>Essar Steels Ltd, Hazira</td>
<td>Shri S. K. Jain (Alternate)</td>
</tr>
<tr>
<td>Institute of Steel Development and Growth, Kolkata</td>
<td>Chief Engineer (NDR)</td>
</tr>
<tr>
<td>Jindal South West Ltd, Vasind</td>
<td>Superintending Engineer (NDR)</td>
</tr>
<tr>
<td>M. N. Dastur &amp; Co Ltd, Kolkata/Delhi</td>
<td>Director (QA)</td>
</tr>
<tr>
<td>Ministry of Defence (DGOFB), Kolkata</td>
<td>Shri Alap Nayar</td>
</tr>
<tr>
<td>Ministry of Defence (DGQA), Ichapur</td>
<td>Dr. A. K. Das</td>
</tr>
<tr>
<td>Ministry of Railways (RDSO), Lucknow</td>
<td>Shri R. K. Balasubramaniam (Alternate)</td>
</tr>
<tr>
<td>Ministry of Steel (Government of India), New Delhi</td>
<td>Shri Jayanta Kumar Saha</td>
</tr>
<tr>
<td>Ministry of Steel Development and Growth, Kolkata</td>
<td>Shri M. K. Maheshwari</td>
</tr>
<tr>
<td>Ministry of Steel (Government of India), New Delhi</td>
<td>Shri Pratap Chakraborty</td>
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<td>Power Grid Corporation of India Ltd, Gurgaon</td>
<td>Shri S. Bhattacharya (Alternate)</td>
</tr>
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<td>Rashtriya Ispat Nigam Ltd (VSP), Vishakhapatnam</td>
<td>Shri P. S. Bandhopadhyay</td>
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<td>Shri A. C. R. Das</td>
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<td>Shri P. K. Sen</td>
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<td>Shri P. Srinivas (Alternate)</td>
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Organization

SAIL, Bhilai Steel Plant, Bhilai
SAIL, Bokaro Steel Plant, Bokaro
SAIL, Central Marketing Organization, Kolkata
SAIL, Research & Development Centre for Iron & Steel, Ranchi
SAIL, Rourkela Steel Plant, Rourkela
Steel Re-rolling Mills Association of India, Mandi Gobindgarh
Tata Motors Limited, Pune
Tata Blue Scope Steel Ltd, Pune
TCE Consulting Engineers, Jamshedpur
BIS Directorate General

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SHRI P. K. DATTA (Alternate)

SHRI P. C. JHA
SHRI B. V. S. PANDIT (Alternate)

SHRI B. K. JHA
SHRI ATUL SAXENA (Alternate)

SHRI C. MUTHUSWAMY
SHRI S. MUKHOPADHYAYA (Alternate)

SHRI B. M. BERIWALA
SHRI H. D. KHERA (Alternate)

SHRI B. R. GALEGALI
SHRI U. B. PATHAK (Alternate)

SHRI RAJESH MAHESHWARI

DR. M. D. MAHESHWARI

SHRI P. GHOSH, Scientist ‘F’ and Head (MTD)
[Representing Director General (Ex-officio)]

Member Secretary

SHRI DEEPAK JAIN
Scientist ‘E’ (MTD), BIS
Bureau of Indian Standards

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This Indian Standard has been developed from Doc No.: MTD 4 (5096).

Amendments Issued Since Publication

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Published by BIS, New Delhi