भारतीय मानक

उच्च कार्बनयुक्त छड़ों के उत्पादन हेतु इस्पात के ढलवाँ बिलेट इनगाट्स, बिलेट और ब्लूम–विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

STEEL CAST BILLET IGNOTS, BILLETS AND BLOOMS FOR PRODUCTION OF HIGH CARBON STEEL WIRE RODS — SPECIFICATION

(First Revision)

ICS 77.080.20; 77.140.60

BUREAU OF INDIAN STANDARDS
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Price Group 2

FOREWORD

This Indian Standard (First 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 1978. The steel ingots, blooms and billets are the raw material for the production of high carbon steel wire rods which is manufactured in large quantity in the country. Since the standard for these wire rods IS 7904 : 1995 'High carbon steel wire rods — Specification (*first revision*)' has already been revised, a need was felt to review this standard to ensure that the high carbon steel wire rod industry receive the requisite quality of raw material.

In this revision, the following changes have been made:

a) The title of the standard has been changed to 'Steel cast billet ingots, billets and blooms for the production of high carbon steel wire rods — Specification'.

b) A new clause on references has been incorporated.

c) The clauses on chemical composition and tolerances have been modified.

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

STEEL CAST BILLET IGNOTS, BILLETS AND BLOOMS FOR PRODUCTION OF HIGH CARBON STEEL WIRE RODS — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers the requirements of carbon steel cast billet ingots, billets and blooms for the production of high carbon steel wire rods. The requirements of this standard shall also be applicable to billets and blooms produced by continuously cast process.

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 (in Parts)	Methods of chemical analysis of steel
1956 (in Parts)	Glossary of terms relating to iron and steel
4163 : 1982	Method for determination of inclusion content in steel by microscopic method (*first revision*)
7904 : 1995	High carbon steel wire rods (*first revision*)
8910 : 1978	General technical delivery requirements for steel and steel products
11371 : 1985	Method for macroetch test for 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 parts 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 square 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 casting. 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).

4 GRADES

Steel for high carbon steel wire rods shall be of five grades, namely, grade *X*, *E*, *F*, *G* and *H* as specified in Table 1 according to their chemical composition.

5 SUPPLY OF MATERIAL

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

6 MANUFACTURE

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

7 CHEMICAL COMPOSITION

7.1 Ladle Analysis

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 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.

Table 1 Chemical Composition
(*Clauses* 4, 7.1 *and* 7.2)

Constituent	Range	Ladle Analysis, Percent				
		Grades				
		X	*E*	*F*	*G*	*H*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Carbon	0.35-1.00	5*	5*	5*	5*	5*
Manganese	0.30-0.90	20*	20*	20*	30*	30*
Silicon	0.10-0.35	15*	15*	15*	20*	25*
Sulphur, *Max*	-	0.020	0.030	0.030	0.040	0.040
Phosphorus, *Max*	-	0.025	0.030	0.030	0.040	0.040
Copper, *Max*	-	0.06	0.12	0.15	0.15	0.20
Nickel, *Max*	-	0.05	0.10	0.10	0.12	0.15
Chromium, *Max*	-	0.05	0.10	0.12	0.15	0.15

*Acceptable within point range.

NOTES

1 Nitrogen content of steel shall not exceed 0.01 percent for grades *X*, *E* and *F*.

2 Stricter composition may be mutually agreed between the purchaser and the manufacturer.

3 P+S For Grade *E*=0.055, Percent, *Max*
For Grade *G*=0.070, Percent, *Max*

4 Cu+Ni+Cr For Grade *E*=0.25, Percent, *Max*
For Grade *F*=0.30, Percent, *Max*
For Grade *G*=0.35, Percent, *Max*
For Grade *H*=0.40, Percent, *Max*

7.2 Product Analysis

The product analysis shall be carried out on the finished product from the standard position. Permissible limits of variation in case of product analysis from the limits specified in Table 1 shall be as given in Table 2.

8 SAMPLING

At least one ladle sample analysis shall be taken per cast.

Table 2 Permissible Variation for Product Analysis
(*Clause* 7.2)

Constituent	Variation Over the Specified Maximum or Under the Minimum Limits, Percent, *Max*
(1)	(2)
Carbon	0.02
Manganese	0.03
Silicon	0.03
Sulphur	0.005
Phosphorus	0.005
Copper, for grade *X*	0.003
Copper, for other grades	0.01
Nickel, for grade *X*	0.003
Nickel, for other grades	0.01
Chromium, for grade *X*	0.003
Chromium, for other grades	0.01

NOTE — Variation shall not be applicable both over and under the specified limits in several determination in a heat.

9 SELECTION OF TEST SAMPLE FOR CHECK ANALYSIS

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

9.1.1 Drilling shall be taken from the sample (*see* **9.1**) representing two-thirds, one-half and one-third of height from bottom of the ingot separately.

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

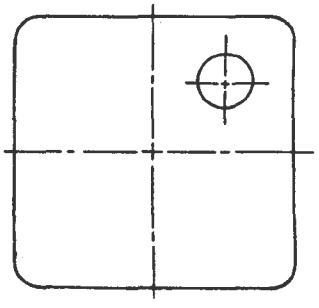

FIG. 1 LOCATION FOR TAKING DRILLING FOR CHECK ANALYSIS

10 FREEDOM FROM DEFECTS

10.1 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.

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

11 TESTS

11.1 If mutually agreed to between the purchaser and the manufacturer, the following tests may be carried out from the samples prepared, under **9.1**:

a) Macro examination (*see* IS 11371),
b) Inclusion content (*see* IS 4163), and
c) Sulphur print tests (*see* IS 12037).

11.2 Bend

In the case of billets, blooms and continuously cast billets and blooms, the bend shall not exceed 5 mm/m.

11.3 Camber

In the case of billets, blooms and continuously cast billets and blooms, the camber shall not exceed 3 mm/m.

12 DIMENSIONS

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

12.2 The billets and blooms (including continuously cast) shall be reasonably square.

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

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

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

13 TOLERANCES

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

13.2 Tolerances on width, in case of billets and blooms (including continuously cast), shall be as given in Table 3.

Table 3 Tolerances on Width

Product	Width Across Flat	Tolerances on Width/Thickness
	mm	mm
(1)	(2)	(3)
Billets	Up to and including 75	±1.5
	Over 75	±3.0
Blooms	Up to and including 150	+4.0 −3.0
	Over 150	+6.0 −3.0

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

14 MARKING

14.1 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.

14.2 BIS Standard Mark

The material may also be marked with the Standard Mark.

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

15 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 and bloom (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.

Bureau of Indian Standards

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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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