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Mazdoor Kisan Shakti Sangathan

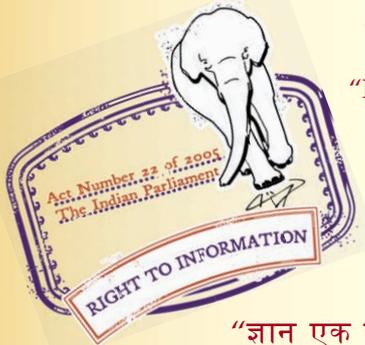
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“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 11513 (2011): HOT-ROLLED CARBON STEEL STRIP FOR COLD ROLLING PURPOSES – SPECIFICATION [MTD 4: Wrought Steel Products]



“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—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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इस्पात की पत्ती — विशिष्टि
(पहला पुनरीक्षण)

Indian Standard
HOT-ROLLED CARBON STEEL STRIP FOR COLD
ROLLING PURPOSES — SPECIFICATION
(*First Revision*)

ICS 77.140.50

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

FOREWORD

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

This standard was first published in 1985. While reviewing this standard, in the light of experience gained during these years, the Committee decided to revise it to bring in line with that present practices being followed by the Indian industry. In this revision the following changes have been made:

- a) Amendment Nos. 1, 2 and 3 have been incorporated.
- b) A new clause on references has been incorporated.
- c) Hot rolled steel strips having carbon content up to a maximum of 0.25 percent have been incorporated.
- d) Requirements of additional grades such as hard quality, extra deep drawing (stabilized interstitial free), micro-alloyed and high strength quality have been added.
- e) Clause on retest has been modified.
- f) International grades designation system has been adopted, simultaneously old designations have also been given.
- g) Requirements of dimensions and tolerances have been separated from the standard and adopted IS/ISO 16160 : 2005 'Continuously hot rolled steel sheet products — Dimensional and shape tolerance'.
- h) Designations such as CR0, CR1, CR2, CR3, CR4 and CR5 have been aligned with IS 513 : 2008 'Cold-reduced low carbon steel sheets and strips (*fifth revision*)', as these are intended for cold rolling purposes.
- j) Designations such as CR6 and CR7 are for low carbon high strength cold rolled steel sheets and coils for cold forming grades.

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.

It is intended to cover medium and high carbon steel strip under a separate standard.

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

HOT-ROLLED CARBON STEEL STRIP FOR COLD ROLLING PURPOSES — SPECIFICATION

(*First Revision*)

1 SCOPE

This standard covers the requirements for hot-rolled carbon steel strips having carbon content up to a maximum of 0.25 percent and intended for cold rolling.

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 (in various parts)	Method for chemical analysis of steel
1599:1985	Method for bend test (<i>second revision</i>)
1608:2005	Metallic materials — Tensile testing at ambient temperature (<i>third revision</i>)
1730:1989	Dimensions for steel plates, sheets and strips and flats for general engineering purposes (<i>second revision</i>)
8910:2010	General technical delivery requirements for steel and steel products
1956 (Part 4): 1975	Glossary of terms related to iron and steel: Part 4 Steel sheet and strip (<i>first revision</i>)
10175 (Part 1): 1993	Mechanical testing of metals — Modified Erichsen cupping test — Sheet and strip: Part 1 Thickness up to 2 mm (<i>first revision</i>)
IS/ISO 16160: 2005	Continuously hot-rolled steel sheet products — Dimensional and shape tolerances

3 SUPPLY OF MATERIAL

3.1 General requirements relating to the supply of

hot-rolled carbon steel sheets and strips shall conform to IS 8910.

3.2 Hot-rolled carbon steel strip shall be supplied in coil form either with mill edges or sheared (slit) edges as agreed to between the manufacturer and the purchaser.

3.3 The material shall be supplied on the chemical composition basis as given in Table 1.

NOTE — The hardness values of the material may be provided, if agreed to between the manufacturer and the purchaser.

4 DESIGNATIONS

There shall be eight designations of hot-rolled carbon steel strip as follows:

- a) CR0 — Hard quality;
- b) CR1 — Commercial quality;
- c) CR2 — Drawing quality;
- d) CR3 — Deep drawing quality;
- e) CR4 — Extra deep drawing aluminium killed (non aging);
- f) CR5 — Extra deep drawing (stabilized interstitial free);
- g) CR6 — Micro alloyed; and
- h) CR7 — High strength.

5 MANUFACTURE

5.1 Strip shall be made from steel manufactured by the open hearth, electric, duplex, basic oxygen or a combination of these processes. In case any other process is employed by the manufacturer, prior approval of the purchaser should be obtained.

5.1.1 CR0 and CR1 grade sheets and strips may be supplied rimmed, semi-killed, killed or as agreed to between the purchaser and the manufacturer. However, other grades shall be supplied only in fully killed condition. CR4 and CR5 grade sheets and strips shall be supplied only in fully aluminium killed condition.

5.1.2 Steels which are fully aluminium killed shall be capable of withstanding a stabilization or ageing test when cold rolled annealed and skin passed.

Table 1 Chemical Composition
(Clauses 3.3 and 6.1)

Sl No.	Designation	Grade	Name	Constituent, Percent, Max				
				Carbon	Manganese	Sulphur	Phosphorus	MA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	CR0	H	Hard	0.25	1.70	0.045	0.050	—
ii)	CR1	O	Commercial	0.15	0.60	0.040	0.040	—
iii)	CR2	D	Drawing	0.12	0.50	0.035	0.035	—
iv)	CR3	DD	Deep drawing	0.10	0.45	0.030	0.030	—
v)	CR4	EDD	Extra deep drawing aluminium killed (non-ageing)	0.08	0.40	0.025	0.025	—
vi)	CR5	IF	Extra deep drawing (stabilized interstitial free)	0.06	0.25	0.020	0.020	0.15
vii)	CR6	MA	Micro-alloyed	0.16	1.6	0.025	0.025	0.20
viii)	CR7	HS	High strength	0.12	1.4	0.025	0.025	0.15

NOTES

1 Steels of these grades can be supplied with the addition of MA (micro-alloying) elements like boron, titanium, niobium and vanadium. The micro-alloying elements shall not exceed 0.008 percent in case of boron and 0.20 percent in case of other elements.

2 The nitrogen content of the steel shall not be more than 0.007 percent. For aluminium killed or silicon-aluminium killed, the nitrogen content shall not exceed 0.012 percent. This shall be ensured by the manufacturer by occasional check analysis.

3 Micro-alloyed grade shall be supplied in fully aluminium killed condition or aluminium with stabilizing elements.

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

5 When copper bearing steel is required the copper content shall be between 0.20 and 0.35 percent. In case of product analysis, the copper content shall be between 0.17 and 0.38 percent.

6 Restricted chemistry may be mutually agreed to between the purchaser and the supplier.

6 CHEMICAL COMPOSITION

6.1 Ladle analysis of the material, when 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 the relevant part of IS 228 shall be the referee method.

6.2 Products Analysis

Permissible variation in case of product analysis from the limits specified in Table 1 shall be as given in Table 2.

NOTE — Product analysis shall not be applicable to rimming steel.

Table 2 Permissible Variation for Product Analysis

Sl No.	Constituent	Permissible Variations Over Specified Limit, Percent, Max
(1)	(2)	(3)
i)	Carbon	0.02
ii)	Manganese	0.03
iii)	Sulphur	0.005
iv)	Phosphorus	0.005
v)	Silicon	0.03
vi)	Microalloy	0.02

7 RETEST

If a test does not give the specified results, two additional tests shall be carried out at random on the same lot. Both retests shall conform to the requirements of this standard; otherwise, the lot shall be rejected.

8 FREEDOM FROM DEFECTS

The steel shall be free from amounts of segregation, laminations, surface flaws and other defects which are detrimental to subsequent processing and ultimate use. The degree or amount of surface defects in a coil may be expected to be more than in cut lengths because of the impossibility of rejecting the portions of a coil. This shall be taken into account by the purchaser in his assessment of the material. An excessive amount of defects may be the cause for rejection.

9 DIMENSIONS AND TOLERANCES

9.1 Dimensions of steel sheet and strip shall conform to the dimensions specified in IS 1730.

9.2 Unless otherwise agreed the thickness tolerances shall be as per IS/ISO 16160.

9.3 Crown

Crown is the difference in strip thickness from centre to edge.

$$\text{Crown} = t_c - (t_1 + t_2)/2$$

where

t_c = thickness at centre of the strip width; and
 t_1 and t_2 = thicknesses measured at 40 mm inside of the 2 edges.

The crown of the hot-rolled mill edge steel strip meant for cold rolling shall be as follows:

For width up to and including 500 mm	: -0 +0.10 mm
For width above 500 mm	: -0 +0.15 mm

9.3.1 The difference in thickness across width at the two edges of slit strip shall not exceed the limits given below:

Nominal Thickness, mm		Tolerance on Thickness Over Two Edges, mm
From	Up to and Including	
–	3	0.06
3	8	0.08

9.4 Permissible Width Variations

The permissible tolerance on the nominal width of hot-rolled strip shall conform to the requirements specified in IS/ISO 16160.

9.5 Edge Camber

The edge camber tolerance shall be as indicated below:

Nominal Width		Measured Length	Camber	
mm	mm		mm	mm
From	Up to and Including	2 500	Mill Edge	Slit Edge
10	40		2 500	20
40	600	2 500	10	10
600	2 000	2 500	25	15

9.6 Any special tolerances to suit specific requirements, shall be mutually agreed to between the manufacturer and the customer.

10 CALCULATION OF WEIGHT

The mass of the material shall be calculated on the basis that steel weighs 7.85 g/cm³.

11 DELIVERY

11.1 The material shall be supplied in coil form in hot-rolled condition. The mass of the coil shall be as agreed to between the contracting parties.

11.2 The material shall be firmly strapped to prevent damage during transit.

12 MARKING

12.1 Each pack shall carry a metal tag/label bearing the cast number and the manufacturer's name or trade-mark or shall be legibly marked at top.

12.2 BIS Certification Marking

The material may also be marked with the Standard Mark.

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

ANNEXA

(Foreword)

COMMITTEE COMPOSITION

Wrought Steel Products Sectional Committee, MTD 4

<i>Organization</i>	<i>Representative(s)</i>
Tata Steel Ltd, Jamshedpur	DR D. BHATTACHARJEE (Chairman) SHRI INDRANIL CHAKRABORTY (<i>Alternate I</i>) DR A. N. BHAGAT (<i>Alternate II</i>)
All India Induction Furnace Association, New Delhi	SHRI L. N. GOSWAMI
Bharat Heavy Electricals Ltd, Tiruchirapalli	SHRI V. RAJASEKHARAN
Central Boilers Board, New Delhi	REPRESENTATIVE
Central Public Works Department, New Delhi	CHIEF ENGINEER (NDR)
DGS&D, Bhilai Nagar/Delhi	REPRESENTATIVE
Escorts Knowledge Management Centre, Faridabad	SHRI ALOK NAYAR
Essar Steels Ltd, Hazira	DR A. K. DAS SHRI R. K. BALASUBRAMANIAM (<i>Alternate</i>)
Institute 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 SUBHABRATA SENGUPTA SHRI V. K. TYAGI (<i>Alternate</i>)
Ministry of Defence (DGOFB), Kolkata	SHRI P. S. BANDHOPADHYAY SHRI T. BASU (<i>Alternate</i>)
Ministry of Defence (DGQA), Ichapur	SHRI S. K. KHILNANEY SHRI P. MEENA (<i>Alternate</i>)
Ministry of Railways (RDSO), Lucknow	SHRI RADHEY SHAM SHRI V. D. MEHARKURE (<i>Alternate</i>)
Ministry of Steel (Government of India), New Delhi	SHRI A. C. R. DAS SHRI B. D. GHOSH (<i>Alternate</i>)
Power Grid Corporation of India Ltd, Gurgaon	SHRI K. N. M. RAO SHRI M. K. SETHI (<i>Alternate</i>)
Rashtriya Ispat Nigam Ltd (VSP), Vishkhapatnam	SHRI P. K. SEN SHRI P. SRINIVAS (<i>Alternate</i>)
SAIL, Bhilai Steel Plant, Bhilai	SHRI S. BHATTACHARYA SHRI P. K. DATTA (<i>Alternate</i>)
SAIL, Bokaro Steel Plant, Bokaro	DR M. M. S. SODHI SHRI P. S. REDDY (<i>Alternate</i>)
SAIL, Central Marketing Organization, Kolkata	SHRI P. C. JHA SHRI B. V. S. PANDIT (<i>Alternate</i>)
SAIL, Research & Development Center for Iron & Steel, Ranchi	DR B. K. JHA SHRI ATUL SAXENA (<i>Alternate</i>)
SAIL, Rourkela Steel Plant, Rourkela	SHRI C. MUTHUSWAMY SHRI S. MUKHOPADHYAYA (<i>Alternate</i>)
Steel Re-rolling Mills Association of India, Mandi Gobindgarh	SHRI B. M. BERIWALA COL SURINDER SINGH (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
Tata Motors Limited, Pune	SHRI B. R. GALGALI SHRI U. B. PATHAK (<i>Alternate</i>)
Tata Blue Scope Steel Ltd, Pune	SHRI RAJESH MAHESHWARI SHRI SANJAY SARASWAT (<i>Alternate</i>)
TCE Consulting Engineers, Jamshedpur	DR M. D. MAHESHWARI
BIS Directorate General	DR (SHRIMATI) SNEH BHATLA, Scientist 'F' and Head (MTD) [Representing Director General (<i>Ex-officio</i>)]

Member Secretary

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

Flat Steel Products Subcommittee, MTD 4 : 3

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Federation of Engineering Industries of India, New Delhi	SHRI H. L. BHARDWAJ SHRI H. L. BANSAL (<i>Alternate</i>)
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This Indian Standard has been developed from Doc No.: MTD 4 (4938).

Amendments Issued Since Publication

Amendment No.	Date of Issue	Text Affected

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