(Reaffirmed 1998)

भारतीय मानक

अतप्त बेल्लित अल्प कार्बन इस्पात की चद्दरें एवं पत्तियाँ — विशिष्टि

(चौथा पुनरीक्षण)

Indian Standard

COLD ROLLED LOW CARBON STEEL SHEETS AND STRIPS — SPECIFICATION

(Fourth Revision)

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 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 1954 and subsequently revised in 1963, 1973 and 1986. While reviewing the standard in the light of experience gained during these years, the committee decided to revise it to align with the present practices being followed by the Indian Industry.

In this revision the following changes have been made:

i) Mechanical and bend test requirements have been modified,

ii) Dimensions and dimensional tolerances have been modified, and

iii) Test for stabilization has been included.

While considering the revision a proposal came up for discussion to incorporate the values for the plastic anisotropy (r) and for strain hardening exponent (n) for guidance, as an additional useful parameters for the assessment of the utilization properties. However, the committee was of the opinion that sufficient proof of evidence and experience to confirm the reliability of the r and n values as parameters for certain utilization spheres of the product is still lacking. The inclusion of such a recommendation in the standard has, therefore, been deferred.

Steel sheets and strips conforming to this standard are of weldable quality and are suitable both for fusion welding and resistance welding.

Cold rolled steel sheets and strips are available in a variety of types and finishes. In order to assist the manufacturers, it is recommended to the purchaser to indicate on the enquiry or order the purpose for which the material is to be used. A drawing of the part in question would be useful.

In cases where the manufacturer guarantees that the 'steel sheets or strips are suitable to make a particular part or for a given purpose', the steel should not be subject to rejection if there are minor variations from the specified chemical composition and/or mechanical properties for that steel. In such cases the purchaser when ordering the steel shall add the words 'suitable for making the part'.

If mutually agreed to between the manufacturer and the purchaser, material may be supplied only on a guarantee of performance, in which case the rejection rate during processing and attributable to the quality of the material shall not exceed a mutually agreed limit.

In the formulation of this standard assistance has been derived from BS 1449 (Part 1) : 1983 'Steel plate, sheet and strip; Part 1 Specification for carbon and carbon-manganese plate, sheet and strip', issued by the British Standards Institution and DIN 1623 (Part 1) 'Steel flat products, cold rolled steel sheet and strip, technical delivery conditions, mild unalloyed steels for cold forming', issued by DIN, Germany.

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

COLD ROLLED LOW CARBON STEEL SHEETS AND STRIPS — SPECIFICATION

(Fourth Revision)

1 SCOPE

This standard covers the requirements of cold rolled low carbon steel sheets and strips for bending and drawing purpose and where the surface is of prime importance. It covers sheets and strips up to 4 mm thick both in coil form and cut lengths.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard:

IS No.	*Title*
228 :	Method for chemical analysis of steel (*second revision*)
1501 (Part 1) : 1984	Method for vickers hardness test for metallic material: Part 1 HV 5 to HV 100 (*second revision*)
1586 : 1988	Methods for rockwell hardness test for steel (*first revision*)
1599 : 1985	Method for bend test (*second revision*)
1608 : 1972	Method for tensile testing of steel products (*first revision*)
1663 : 1972	Method for tensile testing of steel sheet and strip of thickness 0·5 mm to 3 mm (*first revision*)
5072 : 1988	Method for rockwell superficial hardness test
8910 : 1978	General technical delivery requirements for steel and steel products
10175 : 1982	Modified erichson cupping test for metallic sheet and strip

3 CLASSIFICATION OF GRADES

Sheets and strips shall be classified in the following grades:

O — Ordinary quality,

D — Drawing quality,

DD — Deep drawing quality, and

EDD — Extra deep drawing quality.

4 SUPPLY OF MATERIAL

4.1 General requirements relating to the supply of cold rolled low carbon steel sheets and strips shall conform to IS 8910 : 1978.

4.2 Sheets and strips may be supplied either with mill or trimmed edges.

4.3 Sheets and strips of O grade may be supplied in any of the following tempers. Sheets and strips of D, DD, EDD grade shall be supplied in annealed and skin passed condition:

Temper Designation	*Temper*	*Processing*
H	Hard	Produced by heavy cold rolling
1/2H	Half hard	Produced by cold rolling followed by annealing and further cold rolling to give strip of intermediate hardness
1/4H	Quarter hard	
SP	Skin passed	Produced by light cold rolling after annealing
A	Annealed	Produced by a final annealing process

4.3.1 For specific applications, sheets and strips may also be supplied in any other temper subject to agreement between the supplier and the purchaser.

4.4 Non-ageing Characteristics

4.4.1 The manufacturer shall guarantee the absence of stretcher strains on being cold worked in the case of non-ageing quality D and DD grade material for a period of 6 months from the date of despatch.

4.4.2 EDD grade sheets and strips shall be supplied only in non-ageing quality with a non-ageing guarantee for 6 months from the date of despatch.

4.4.3 A stability test as per Annex A may be carried out to assess the non-ageing characteristics of skin passed stabilized steels with mutual agreement between the manufacturer and the purchaser.

4.4.3.1 The steel shall be considered stabilized if the percentage increase in load does not exceed 6 when tested as per Annex A.

5 MANUFACTURE

5.1 The method of manufacture of the steel for sheets and strips shall be left at the discretion of the manufacturer.

5.2 Sheets and strips shall be supplied rimmed, semi-killed or killed as agreed between the purchaser and the manufacturer. However, EDD grade shall be supplied only in fully aluminium killed, or in a fully stabilized condition.

6 CHEMICAL COMPOSITION

6.1 Ladle Analysis

The ladle analysis of steel, when carried out either by the methods specified in relevant part of IS 228 or any other established instrumental/chemical method, shall be as given in Table 1. In case of any dispute, the procedure given in relevant parts of IS 228 shall be the referee method.

6.2 Product Analysis

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

Table 1 Chemical Composition

Grade	Constituent, Percent, *Max*			
	Carbon	Manganese	Sulphur	Phosphorus
(1)	(2)	(3)	(4)	(5)
Ordinary (O)	0·15	0·60	0·055	0·055
Drawing (D)	0·12	0·50	0·040	0·040
Deep drawing (DD)	0·10	0·45	0·035	0·035
Extra deep drawing (EDD)	0·08	0·40	0·030	0·030

NOTES

1 Restricted chemistry for EDD grade may be mutually agreed between the purchaser and the supplier.

2 When the steel is killed by aluminium alone, the total aluminium content should not be less than 0·02 percent when steel is silicon killed, the silicon content shall not be less than 0·1 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.

3 The nitrogen content of the steel shall not be more than 0·007 percent. For aluminium killed or aluminium silicon killed, the nitrogen content shall not exceed 0·012 percent. This shall be ensured by the manufacturer by occasional check analysis.

4 The material may be supplied in the copper bearing quality in which case the copper shall be between 0·20 and 0·35 percent on ladle analysis. In case of product analysis, the copper content shall be between 0·17 and 0·38 percent.

5 The steel can be made with micro-alloying elements like niobium, vanadium, titanium and boron either individually or in combination, on mutual agreement, in which case the total micro-alloying elements should not exceed 0·2 percent in ladle analysis. However, in case of boron, the limit shall be 0·006 percent.

Table 2 Permissible Variation for Product Analysis

(*Clause* 6.2)

Constituent	Variation Over Specified Limit, Percent, *Max*
Carbon	0·02
Manganese	0·03
Sulphur	0·005
Phosphorus	0·005

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

7 MECHANICAL AND PHYSICAL PROPERTIES

7.1 Tensile Test

7.1.1 Tensile test shall be carried out only if specified by the purchaser.

7.1.2 When specified, the tensile test shall be carried out in accordance with IS 1663 : 1972 or IS 1608 : 1972 as applicable, and the values of tensile strength, yield stress and percentage elongation shall conform to the requirements specified in Table 3.

Table 3 Mechanical Properties at Room Temperature in as Delivered Condition for Annealed/Skin Passed Sheets and Strips (Cut Lengths and Coils)

(*Clauses* 7.1.2 *and* 7.3)

Grade	Tensile Strength MPa	Yield Stress MPa, *Max*	Elongation Percent on Gauge Length $5{\cdot}65\sqrt{So}$ *Min*	Hardness (*Max*)	
				HRB	HR (30T)
(1)	(2)	(3)	(4)	(5)	(6)
Ordinary (O)	—	—	—	See Table 4	
Drawing (D)	270-410	280	23	65	60
Deep drawing (DD)	270-370	250	26	57	55
Extra deep drawing (EDD)	270-350	220	32	50	50

NOTES

1 1 MPa = 1 N/mm² = 1 MN/m² = 0·102 0 kgf/mm².

2 Equivalent vickers hardness values are allowed on agreement between the interested parties at the time of ordering. The hardness of sheet thinner than 0·6 mm shall be measured exclusively in compliance with the HR30T scale.

7.1.3 Tensile test values apply to transverse specimen in case of sheets/strips. Strips having a width of 250 mm and below shall be tested longitudinally.

7.1.4 The yield strength values apply to the 0·2 percent of proof stress if the yield strength is not clearly distinctive, otherwise the values apply to lower yield strength.

7.2 Cupping Test

7.2.1 Cupping test shall be applicable only for sheets, strips and coils of D, and DD and EDD grades having thickness from 0·5 mm up to 2·00 mm.

7.2.2 Cupping test shall be carried out in accordance with IS 10175 : 1982, and the minimum Erichson cupping test values shall be as given in Fig. 1.

NOTE — The shape of the cup fracture may be as mutually agreed between the purchaser and the supplier.

7.3 Hardness Test

Cold rolled sheets and strips shall conform to the hardness requirements specified in Tables 3 and 4, when tested in accordance with IS 5072 : 1988, IS 1586 : 1988 and IS 1501 (Part 1) : 1987 as applicable. However, by way of departure from these standards, a visible deformation on the back side of the specimen is permitted. The values determined in this way shall be identified by using symbols HRBm and HR30Tm, so as to differentiate these from the hardness

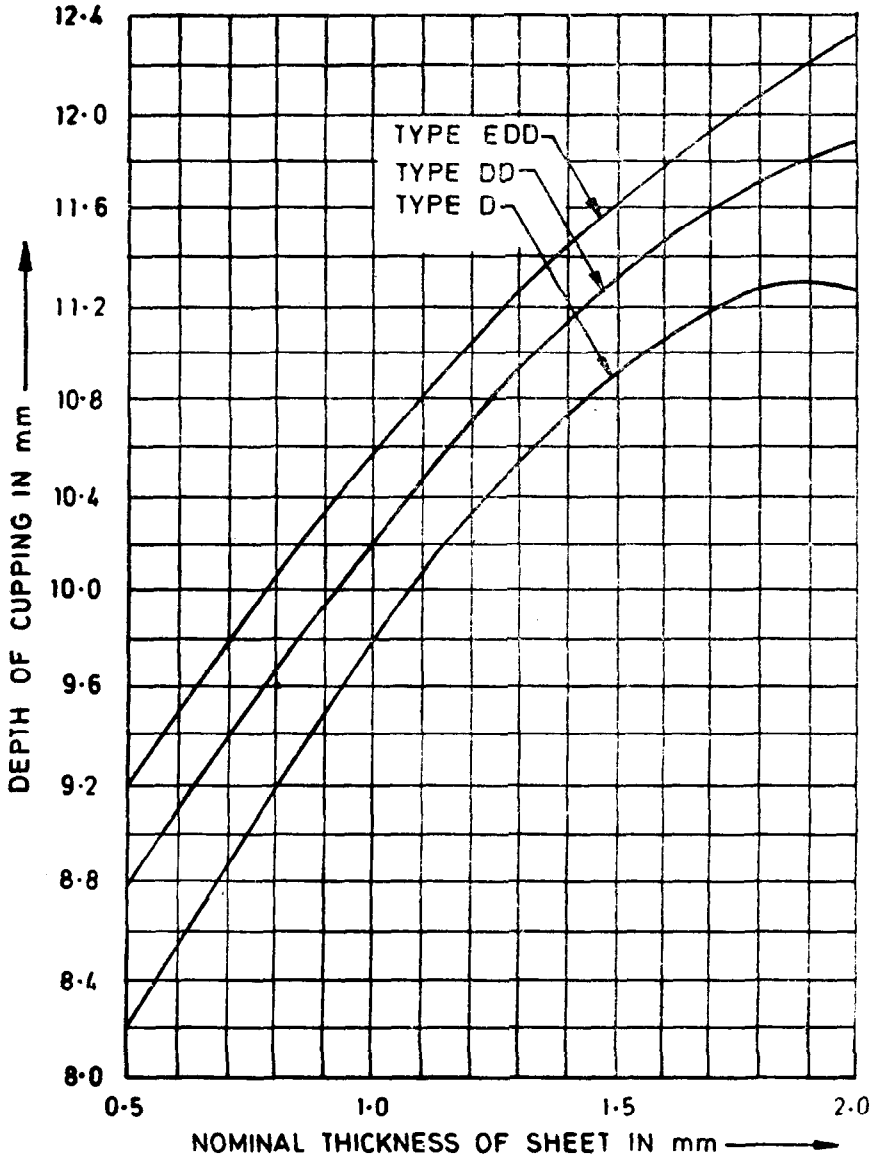


FIG. 1 MINIMUM ERICHSON VALUES

values determined on thicker products (which are not allowed to exhibit a visible deformation on the back side of the specimen).

Table 4 Hardness of Different Tempers at Room Temperature for 'O' Grade

(*Clause* 7.3)

Temper		Hardness HRB	
		Min	*Max*
(1)		(2)	(3)
Hard	(H)	85	—
Half hard	(1/2 H)	75	85
Quarter hard	(1/4 H)	60	75
Skin passed	(SP)	—	70
Annealed (dead soft)	(A)	—	60

NOTES

1 For tempers other than those mentioned in this Table, the values shall be as agreed between the contracting parties.

2 Equivalent vickers hardness values are allowed on agreement between the interested parties at the time of ordering. The hardners of sheet thinner than 0·6 mm shall be measured exclusively in compliance with the HR30T scale.

7.4 Bend Test

7.4.1 Bend test shall be carried out in accordance with IS 1599 : 1985.

7.4.2 The angle of bend and the internal diameter of the bend for the different grades of material shall be as given in Tables 5A and 5B. The axis of the bend shall be in the direction of rolling. The test pieces shall be deemed to have passed the test if the outer convex surface is free from cracks.

7.5 Retest

Should any of the test pieces first selected fail to pass any of the test specified in **7.1** to **7.4** two further samples shall be selected from the same lot for testing in respect of each failure. If any of the two additional samples fail to meet the requirement, the material represented by the test sample shall be deemed as not conforming to this standard.

Table 5A Bend Test for Sheets/Strips in Cut Lengths and Coils in Annealed and Skin Pass Condition

(*Clause* 7.4.2)

Steel Grade	Angle of Bend	Internal Diameter of Bend
(1)	(2)	(3)
O	180°	t
D	180°	Close
DD	180°	Close
EDD	180°	Close

Where t is the thickness of test piece.

Table 5B Bend Test for Sheets/Strips of 'O' Grade

(*Clause* 7.4.2)

Temper		Angle of Bend	Internal Diameter of Bend
(1)		(2)	(3)
Hard	(H)	—	—
Half hard	(1/2H)	180°	3 t
Quarter hard	(1/4H)	180°	2 t
Skin passed	(SP)	180°	t
Annealed (dead soft)	(A)	180°	t

Where t is the thickness of test piece.

8 SURFACE FINISH

8.1 Surface Finish

Sheet and strips shall be supplied in any one of the following surface finishes:

a) *Bright* — Produced on rolls having a moderately high finish. It is suitable for most requirements, but not generally for electroplating.

b) *Matt* — Produced on specially roughened rolls which makes it suitable for deep drawing.

c) *Rough* — Suitable for enamelling and lacquering.

8.1.1 The strips may also be supplied in any one of the following surface finishes:

a) *Plating* — Produced in certain thinner sizes by using specially prepared rolls and selected raw materials to give a surface essentially free from defects. Such strips require less preparation before electroplating than those with a commercially bright finish.

b) *Mirror* — Produced for plating finish, but with a higher lustre and reflectivitiy.

c) *Dark Annealed* — Bluish-grey tempering colours and adherent layers of scales are permissible.

d) *Blue* — Air tempered at a lower temperature than dark annealed to give a light blue oxide coating without any adherent layer of scale.

8.2 Surface Types

Cold rolled sheets and strips may be supplied in any one of the following surface types:

a) *Scale Free* — Pores, roll marks, and scratches are permitted.

b) *Improved Surface* — Pores, roll marks, and scratches are permitted on small scale only.

c) *Best Surface* — Having pores, roll marks or scratches which do not impair the uniform appearance of the finished product. This surface is ideal for spray painting and enamelling.

9 FREEDOM FROM DEFECTS

9.1 The finished sheets and strips shall be free from harmful defects, such as scale, rust, blisters, lamination, pitting, porosity, cracked or torn edges or any other defects which are harmful to the intended use.

9.2 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 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 cause for rejection.

9.3 The sheets shall be reasonably flat and edges cleanly sheared and squared to the specified dimensions.

10 DIMENSIONS AND DIMENSIONAL TOLERANCES

10.1 Unless otherwise agreed to between the manufacturer and the purchaser, standard dimensions of cold rolled sheets and strips shall be as given below:

Thickness mm = 0·18, 0·20, 0·22, 0·25, 0·28, 0·30, 0·32, 0·35, 0·40, 0·45, 0·50, 0·55, 0·63, 0·80, 0·90, 1·00, 1·20, 1·25, 1·40, 1·50, 1·60, 1·80, 2·00

The following are the preferred thicknesses for sheets above 2·00 mm:

2·50, 2·65, 3·00, 3·25, 3·50 and 4·00

10.2 Dimensional tolerances applicable to cold rolled sheets and strips shall be as given in Tables 6 to 16. Special tolerances required on thickness and flatness may be mutually agreed to between the purchaser and the manufacturer.

Table 6 Tolerances on Thickness of Sheets for Different Width Values

All dimensions in millimetres.

Nominal Thickness	Tolerances on Thickness for Different Widths		
	Up to 1 250	Above 1 250 Up to 1 600	Above 1 600
(1)	(2)	(3)	(4)
Up to 0·25	± 0·03	—	—
Above 0·25 up to 0·40	± 0·04	—	—
Above 0·40 up to 0·60	± 0·05	± 0·06	—
Above 0·60 up to 0·80	± 0·06	± 0·07	± 0·08
Above 0·80 up to 1·00	± 0·08	± 0·09	± 0·10
Above 1·00 up to 1·25	± 0·09	± 0·10	± 0·12
Above 1·25 up to 1·60	± 0·11	± 0·12	± 0·14
Above 1·60 up to 2·00	± 0·12	± 0·14	± 0·16
Above 2·00 up to 2·50	± 0·14	± 0·16	± 0·18
Above 2·50 up to 3·15	± 0·16	± 0·18	± 0·20
Above 3·15	± 0·19	± 0·20	—

Table 7 Tolerances on Thickness of Strips for Different Width Values

(*Clause* 10.2)

All dimensions in millimetres.

Nominal Thickness	Tolerances on Thickness for Different Widths					
	Up to 80	Above 80 Up to 125	Above 125 Up to 250	Above 250 Up to 450	Above 450 Up to 680	Above 680
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Up to 0·10	± 0·01	± 0·01	—	—	—	Refer Table 6
Above 0·10 up to 0·16	± 0·02	± 0·02	± 0·03	± 0·03	± 0·03	
Above 0·16 up to 0·20	± 0·02	± 0·02	± 0·03	± 0·03	± 0·03	
Above 0·20 up to 0·25	± 0·03	± 0·03	± 0·03	± 0·03	± 0·03	
Above 0·25 up to 0·32	± 0·03	± 0·03	± 0·04	± 0·04	± 0·04	
Above 0·32 up to 0·40	± 0·03	± 0·03	± 0·04	± 0·04	± 0 04	
Above 0·40 up to 0·50	± 0·03	± 0·04	± 0·04	± 0·05	± 0·05	
Above 0·50 up to 0·63	± 0·04	± 0·04	± 0·05	± 0·05	± 0·05	
Above 0·63 up to 0·80	± 0·04	± 0·05	± 0·05	± 0·05	± 0·05	
Above 0·80 up to 0·90	± 0·05	± 0·05	± 0·05	± 0·06	± 0·06	
Above 0·90 up to 1·00	± 0·05	± 0.05	± 0·05	± 0·06	± 0·06	
Above 1·00 up to 1·25	± 0·05	± 0·06	± 0·06	± 0·07	± 0·07	
Above 1·25 up to 1·60	± 0·05	± 0·06	± 0·06	± 0·08	± 0·08	
Above 1·60 up to 1·80	± 0·05	± 0·06	± 0·07	± 0·08	± 0·09	
Above 1·80 up to 2·00	± 0·06	± 0·06	± 0·08	± 0·09	± 0·09	
Above 2·00 up to 2·50	± 0·06	± 0·08	± 0·08	± 0·09	± 0·11	
Above 2·50 up to 4·00	± 0·06	± 0·08	± 0·08	± 0·09	± 0·11	

Table 8 Tolerance on Width of Sheets

(*Clause* 10.2)

All dimensions in millimetres.

Width of Sheets	Tolerance
Up to 1 250	$+ 7$ $- 0$
Above 1 250	$+ 10$ $- 0$

NOTE – In case of coils with mill edges, the variation in width shall not be more than $+ 30$ mm, $- 0$.

Table 9 Tolerance on Width of Strip with Slit Edges

(*Clause* 10.2)

All dimensions in millimetres.

Nominal Thickness	Tolerances on Nominal Width			
	Up to 160	Above 160 Up to 250	Above 250 Up to 400	Above 400 Up to 600
(1)	(2)	(3)	(4)	(5)
Up to 0·60	± 0·15	± 0·20	± 0·25	± 0·30
Above 0·60 up to 1·00	± 0·20	± 0·25	± 0·25	± 0·30
Above 1·00 up to 1·60	± 0·20	± 0·30	± 0·30	± 0·40
Above 1·60 uo to 2·50	± 0·25	± 0·35	± 0·40	± 0·50
Above 2·50 up to 4·00	± 0·30	± 0·40	± 0·45	± 0·50

Table 10 Tolerance on Width of Strips with Mill Edges

(*Clause* 10.2)

All dimensions in millimetres.

Width		Tolerance	
Above	Up to 75	Plus	Minus
—	75	1·6	1·2
75	150	2·0	1·6
150	250	3·2	1·6
250	355	4·0	2·4
355	600	4·0	3·2

Table 11 Tolerance on Length of Sheets and Strips

(Cut Length)

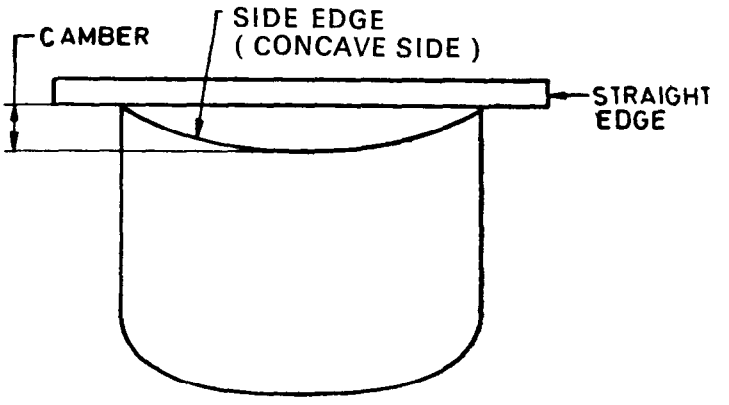
(*Clause* 10.2)

Length	Tolerance
Up to 2 000 mm	$+ 15$ mm $- 0$
Above 2 000 mm	$+ 0{\cdot}75$ percent of length $- 0$

Table 12 Camber Tolerance for Coils and Cut Length not Resquared

(*Clause* 10.2)

Form	Camber Tolerance
Coil	20 mm in any 5 000 mm length
Cut lengths	0·4 percent × length



NOTE – Camber is the greatest deviation of a side edge from a straight line, the measurement being taken on the concave side with a straight line.

Table 13 Maximum Edge Camber for Hot Rolled and Cold Rolled Material Produced on Narrow Mills : Mill Edge and Sheared Edge Material

(*Clause* 10.2)

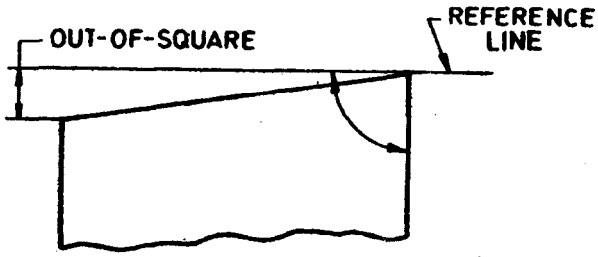
All dimensions in millimetres.

Nominal Width		Nominal Thickness		*Max.* Edge Camber in Any 2 000 mm Length
Over	Up to and Including	Over	Up to and Including	
(1)	(2)	(3)	(4)	(5)
—	25	—	2	13
25	50	—	2	10
—	50	2		13
50	250	—	2	6·5
50	250	2	—	13
250	600	—	2	6·5
250	600	2	—	13

Table 14 Out-of-Square Tolerance for Cut Lengths not Resquared

(*Clause* 10.2)

Dimensions	Out-of-Square Tolerance
All thicknesses and all sizes	1·0 percent × width



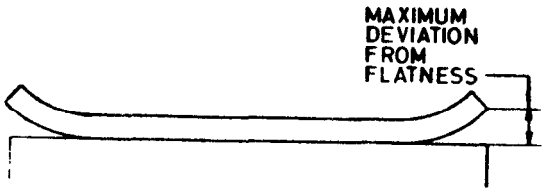
NOTE — Out-of-square is the greatest deviation on an edge from a straight line at right angles to a side and touching one corner, the measurement being taken as shown above. It can also be measured as one-half the difference between the diagonals of cut length sheet.

Table 15 Standard Flatness Tolerances for Cut Lengths

(*Clause* 10.2)

All dimensions in millimetres.

Thickness	Tolerances on Specified Width		
	Up to 1 200	Above 1 200 Up to 1 500	Above 1 500
(1)	(2)	(3)	(4)
Up to 0·63	15	18	22
Above 0·63 up to 1·25	12	15	19
Above 1·25	10	12	17



NOTE — Maximum deviation from flatness is the maximum distance between the lower surface of the sheet and flat horizontal surface on which the sheet is made to rest with its own weight.

Table 16 Special Flatness Tolerances for Cut Lengths Roller Levelled and Stretcher Levelled

(*Clause* 10.2)

All dimensions in millimetres.

Thickness	Tolerance on Specified Width		
	Up to 1 200	Above 1 200	Above 1 500
(1)	(2)	(3)	(4)
Up to 0·63	6	7	8
Above 0·63 up to 1·25	5	6	7
Above 1·25	4	5	6

11 SAMPLING FOR TESTS

11.1 One representative sample from a coil or a lot of sheets shall be taken for tensile testing. A lot consists of 50 tonnes or less of sheets or strips of the same quality rolled to the same thickness and condition. If the lot consists of more than one heat, samples from each heat shall be tested.

11.2 For cupping, hardness and bend tests, one sample from each lot of 5 tonnes of the same heat or part thereof or one sample from each coil shall be taken.

11.2.1 The specimens shall not undergo any treatment on either surface before testing. In the case of coils, samples shall be taken from the beginning or end of the coil.

12 DELIVERY

12.1 Marking

12.1.1 The following shall be legibly marked on the top of each bundle of package of sheets or shown on a tag attached to each coil.

a) Manufacturer's name or trade-mark,

b) Quality designation,

c) Product dimensions,

d) Cast or identification mark by which the sheet or strip may be traced to cast or casts from which they were made,

e) Mass/Net weight, and

f) Date of dispatch.

12.1.2 The material may also be marked with the Standard Mark.

12.2 Packing

12.2.1 Each sheet shall be treated on both sides with non-hardening type rust preventive oil, which can be easily washed with aqueous alkali solution.

12.2.2 Sheets and strips shall preferably be supplied in bundles or packages not weighing more than 3 tonnes or as agreed to between the purchaser and the manufacturer.

12.2.3 Sheets and strips shall be securely packed in waterproof material, and covered all over with steel envelope and securely tied round with steel straps and preferably with wooden battens underneath to prevent the sheets from rusting and damage during transit.

ANNEX A

(*Clause* 4.4.3)

STABILITY TEST

A-1 A tensile test piece shall be subjected to a total strain of 10 percent and the load (P_1) required to produce this strain shall be noted. The test piece shall then be subjected to an accelerated ageing treatment by heating at a nominal temperature of 100°C for 30 min. The test piece shall thereafter again be strained to 10 percent, calculated on the original (unstrained) gauge length, and the load (P_2) noted.

The steel shall be considered stabilized, if the percentage increase in load $= \frac{P_2 - P_1}{P_1} \times 100$, does not exceed 6.

Bureau of Indian Standards

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Review of Indian Standards

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AMENDMENT NO. 1 NOVEMBER 1997
TO
IS 513 : 1994 COLD ROLLED LOW CARBON STEEL SHEETS AND STRIPS — SPECIFICATION

(Fourth Revision)

(*Page* 1, *clause* **2**):

a) Substitute '1608 : 1995 Mechanical testing of metals — Tensile testing (*second revision*)' *for* '1608 : 1972 Method for tensile testing of steel products (*first revision*)'.

b) Delete '1663 : 1972 Method for tensile testing of steel sheet and strip of thickness 0.5 mm to 3 mm (*first revision*)'.

(*Page* 2, *clause* **7.1.2**, *lines* 2 *and* 3) — Substitute 'IS 1608 : 1995' *for* 'IS 1663 : 1972 or IS 1608 : 1972 as applicable'.

(*Page* 2, *Table* 3, *col* 4) — Substitute the following for the existing column heading:

'Elongation Percent on Gauge Length 80 mm and Width 20 mm, *Min*
(4)
—
28
32
36'

(MTD 4)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 NOVEMBER 2002
TO
IS 513 : 1994 COLD ROLLED LOW CARBON STEEL SHEETS AND STRIPS — SPECIFICATION

(Fourth Revision)

(*Foreword*) — Insert the following before last para:

'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.'

(MTD 4)

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