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BUREAU OF INDIAN STANDARDS

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Draft Indian Standard

HOT-ROLLED STEEL STRIP FOR WELDED TUBES AND PIPES — SPECIFICATION

(Third Revision of IS 10748)

Wrought Steel Products Sectional Committee, MTD 04	Last date for receipt of comments: **29 March 2025**

FOREWORD

(*Formal clauses would be added later*.)

This standard was first published in 1984 subsequently revised in 1995 and 2004. While reviewing the standard in the light of experience gained during these years, the Committee decided to revise it to bring it in line with the present practices followed by the Indian industry.

In this revision, the following changes have been made:

a) Amendment No. 1 and Amendment No. 2 have been incorporated;
b) Chemistry has been modified in Grade 2, Grade 3 and Grade 5;
c) New grades Grade 6, Grade 7 and Grade 8 have been added in the existing grades table. New grades for fine grain steel (Table 2) and new grades based on chemical compositions (Table 3) have been added in separate tables;
d) Clauses 1, 2, 3, 3.2, 4.2, 5, 7.1, 7.2, 8.1, 9.1, 13.2, 14, 15.2, 15.3 and 16.2.1 have been modified. Some clauses and tables have been re-designated such as 8.2.1 in place of 8.2, 8.2.2 in place of 8.3, Table 4 in place of Table 2 and Table 5 in place of Table 3; and
e) New clauses 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 6.3, 6.3.1, 6.4, 6.5, 7.3, 7.4 and 8.3 have been added; Table 2, Table 3 and Table 6 have also been added.

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.

While revising the standard, assistance has been derived from the following international specifications:

International Standard	*Title*
EN 10025-3:2019	Hot Rolled products of structural steels - Technical delivery conditions for normalized/ normalized rolled weldable fine grain structural steels
EN 10025-4:2019	Hot Rolled products of structural steels - Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels
SAE J403 : 2014	Chemical Compositions of SAE Carbon Steels
EN 10083-3:2006	Steels for quenching and tempering - Technical delivery conditions for alloy steels

The composition of the Committee responsible for the formulation of this standard is given in Annex B. (*to be added at later stage*)

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 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

HOT-ROLLED STEEL STRIP FOR WELDED TUBES AND PIPES — SPECIFICATION

(*Third Revision)*

1 SCOPE

This standard covers requirement for weldable quality hot-rolled carbon steel strip in coils intended for the manufacture of welded steel tubes and pipes including hollow sections for various applications.

The grades mentioned in this standard are specified with chemical composition alone and chemical composition along with mechanical properties. The grades mentioned in **Table 2** (chemical composition) and **Table 6** (mechanical properties) are hot rolled weldable fine grain structural steels. The grades mentioned in **Table 3** are chemical composition-based carbon steels.

NOTE — A range of steel grades are specified in this standard and the user should select the grade appropriate to the intended use and service conditions.

2 REFERENCES

The standards listed in Annex A 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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 1956 and the following definitions shall apply.

3.1 Micro-Alloying Elements — Elements, such as niobium, vanadium and titanium added singly or in combination to obtain higher strength levels combined with better toughness, formability and weldability as compared to unalloyed steel of similar strength level.

3.2 Coil — A rolled flat strip product which is wound into regularly superimposed laps so as to form a coil with almost flat side.

3.3 Hot-Rolled Steel Strip in Coils — A product obtained by rolling heated steel through a semi continuous/continuous-type or reversing strip mill to the required sheet thickness. The product has a surface covered with oxide or scale resulting from the hot rolling operation.

3.4 Weldability — A metallic substance is considered to be weldable by a given process and for the given purpose, when metallic continuity to a stated degree can be obtained by welding using a suitable procedure, so that the joints comply with the requirements specified in regard to both their local properties and their influence on the construction of which they form a part.

3.5 Fine-grain steel — Steel with fine-grain structure with an equivalent index of grain size ≥ 6 determined in accordance with IS 4748/ ISO 643.

3.6 As-rolled — Delivery condition without any special rolling i.e. Conventional hot rolling without any normalized rolling or thermos-mechanical rolling and/or heat treatment like normalizing or quenching.

3.7 Normalizing Rolling — A hot rolling process in which the final deformation is carried out within a certain temperature range equivalent to normalizing temperature, leading to a material condition equivalent to that obtained after normalizing, such that the specified mechanical properties would still be met in the event of any subsequent normalizing.

NOTE — In international publications for both the normalizing rolling, as well as the thermo-mechanical rolling, the expression "controlled rolling" may be found. However, in view of the different applicability of the products a distinction of the terms is necessary.

3.8 Normalized — Produced by heating to a suitable temperature above the transformation range (austenitizing) followed by air cooling.

3.9 Thermo-Mechanical Rolling (TM) — A hot rolling process in which the final deformation is carried out in a certain temperature range leading to a material condition with certain properties that cannot be achieved or repeated by heat treatment alone.

The term “Thermo-Mechanical Control Process (TMCP)” can also be used.

NOTES
1 Subsequent heating above 580 °C may lower the strength values.
2 Thermo-mechanical rolling can include processes with an increasing cooling rate with or without tempering including self-tempering but excluding direct quenching and quenching and tempering.

4 SUPPLY OF MATERIALS

4.1 General requirements relating to the supply of hot-rolled steel strip shall conform to IS 8910.

4.2 The material may be ordered on any of the following basis as agreed to between the manufacturer and the purchaser:

a) Chemical composition, or
b) Chemical composition and physical properties.

Impact test requirements can be mutually agreed between the purchaser and supplier for fine grain steel.

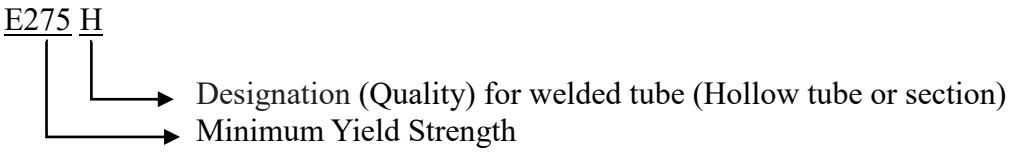
5 GRADES

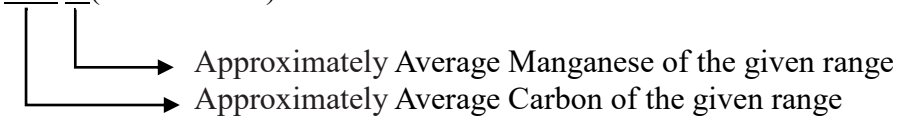
There shall be 30 grades of hot-rolled carbon steel strip.

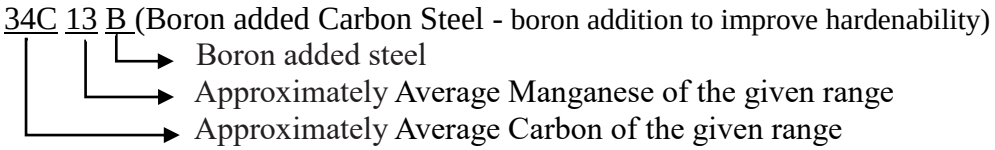
a) Chemical composition and physical properties (Table 1/ Table 5 contains 8 grades from Grade 1 to Grade 8 and Table 2/ Table 6 contains 4 grades E 275H, E 355H, E 420H and E 460H).

b) Chemical composition (Table 3 contains 18 grades – 8C3, 10C4, 20C4, 21C3, 26C8, 30C8, 35C8, 40C8, 20C12, 26C13, 30C13, 36C14, 41C15, 20C12B, 22C12B, 26C13B, 30C13B, 34C13B)

Nomenclature for new grades mentioned in Table 2/ Table 6 and Table 3







6 MANUFACTURE

6.1 The processes used in making steel and in manufacturing hot-rolled steel strip shall be left to the discretion of the manufacturer.

6.2 Steel shall be supplied in the killed, semi-killed or rimming condition subject to agreement between the manufacturer and the purchaser.

6.3 Fine grain steel grades shall be supplied in fully killed condition. The steels shall contain sufficient amount of nitrogen-binding elements and have a fine-grain structure. Fully killed steel containing nitrogen binding elements in amounts sufficient to bind the available nitrogen (for example, minimum 0.020 percent total aluminium). The usual guideline is minimum aluminium to nitrogen ratio of 2:1, when no other nitrogen binding elements are present.

6.3.1 Verification of the grain size is not required, when aluminium is used as the grain refining element and the grain size requirement shall be deemed to be fulfilled if the cast/ ladle analysis shows the total aluminium content ≥ 0.020 percent or alternatively soluble aluminium ≥ 0.015 percent.

6.4 The hot rolled strip may be rolled and supplied in as-rolled or normalized or normalizing rolling or controlled rolling or thermo-mechanical rolling as per the agreement between the purchaser and the manufacturer. For fine grain steel grades, the material shall be supplied in normalized or normalized rolling or thermomechanical rolling condition.

6.5 Hot rolled strips may be supplied in descaling condition along with oiled condition as per the agreement between the purchaser and the manufacturer/supplier. Descaling shall be either acid pickling or shot blasting.

7 CHEMICAL COMPOSITION

7.1 Ladle Analysis

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**, **Table 2** and **Table 3**. In case of dispute, the procedure given in IS 228 and its relevant parts shall be 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.

The ladle analysis shall be determined once per cast.

7.2 Product Analysis

Permissible variations in the case of product analysis from the limits specified in **Table 1**, **Table 2** and **Table 3** shall be as given in **Table 4**.

If a product analysis has been agreed upon at the time of enquiry and order, the purchaser shall specify the frequency if not once per cast. The product analysis shall be carried out on the finished product.

7.3 Carbon equivalent value

The maximum carbon equivalent value (CEV) requirements are given in the **Table 1** and **Table 2**.

Carbon equivalent value (CEV) would be calculated based on ladle analysis, only.

$$\text{CEV} = \mathbf{C} + \frac{\mathbf{Mn}}{\mathbf{6}} + \frac{\mathbf{(Cr+Mo+V)}}{\mathbf{5}} + \frac{\mathbf{(Ni+Cu)}}{\mathbf{15}}$$

7.4 When products are supplied with a control on Si e.g. for hot-dip zinc-coating so that there could be a need to increase the content of other elements like C and Mn to achieve the required tensile properties, the maximum carbon equivalent values of **Table 1** and **Table 2** shall be increased as follows:

a) for Si ≤ 0.04 percent, increase the value of the CEV by 0.02;
b) for Si ≤ 0.25 percent, increase the value of the CEV by 0.01.

Cold forming leads to reduction in the ductility. Furthermore, it is necessary to draw the attention to the risk of brittle fracture in connection with hot-dip zinc-coating.

Table 1 Chemical Composition for Steel Grades other than Fine Grain Steel

(Clauses 5, 7.1, 7.2, 7.3 *and* 7.4*)*

Sl No.	Grade	Constituent, Percent, *Max*				Carbon Equivalent Value (CEV) *Max*
		C	Mn	S	P	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	1	0.10	0.50	0.04	0.04	-
ii)	2	0.12	0.80	0.04	0.04	-
iii)	3	0.20	1.20	0.04	0.04	-
iv)	4	0.20	1.30	0.04	0.04	0.45
v)	5	0.25	1.40	0.04	0.04	0.45
vi)	6	0.25	1.50	0.04	0.04	0.45
vii)	7	0.25	1.60	0.04	0.04	0.50
viii)	8	0.25	1.65	0.04	0.04	0.52

NOTES

1 For semi-killed quality. Silicon content shall be 0.08 percent, maximum.

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.

3 Micro-alloying may be allowed subject to mutual agreement between the purchaser and the supplier. Micro-alloying elements like Nb, V or Ti, when used individually or in combination, the total content shall not exceed 0.20 percent.

4 Nitrogen content of steel shall not exceed 0.012 percent, which shall be ensured by the manufacturer by occasional check analysis.

5 Closer limits of composition may be agreed to between the supplier and the purchaser.

6 Max. CEV can be increased for steels with control on Si (e.g. for hot-dip zinc-coating), *see* 7.4.

Table 2 Chemical Composition for Fine Grain Steel Grades

(Clauses 5, 7.1, 7.2, 7.3 *and* 7.4*)*

Sl No.	Grade	Percent, *Max*														
		C	**Si**	**Mn**	**P**	**S**	**Nb**	**V**	**Al (total)** *Min*	**Ti**	**Cr**	**Ni**	**Mo**	**Cu**	**N**	**CEV**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
i)	**E 275H**	0.18	0.40	1.50	0.03	0.025	0.05	0.05	0.02	0.05	0.30	0.30	0.10	0.55	0.015	0.40
ii)	**E 355H**	0.20	0.50	1.65	0.03	0.025	0.05	0.10	0.02	0.05	0.30	0.50	0.10	0.55	0.015	0.43
iii)	**E 420H**	0.20	0.60	1.70	0.03	0.025	0.05	0.20	0.02	0.05	0.30	0.80	0.10	0.55	0.025	0.48
iv)	**E 460H**	0.20	0.60	1.70	0.03	0.025	0.05	0.20	0.02	0.05	0.30	0.80	0.10	0.55	0.025	0.53

NOTES

1 For some applications, e.g. for railways, a maximum S content of 0.010 percent may be agreed upon at the time of the order

2 If sufficient other N-binding elements are present the minimum total Al content does not apply. The other elements for N-binding: Nb ≥ 0.015 percent, V ≥0.020 percent, Ti: ≥0.020 percent. If these elements are used in combination, at least one of them shall be present with the minimum content indicated (*see* Clause 6.3). The N binding elements shall be mentioned in the inspection document.

3 Closer limits of composition may be agreed to between the supplier and the purchaser.

4 Maximum CEV can be increased for steels with control on Si (e.g. for hot-dip zinc-coating), *see* 7.4.

5 V + Nb + Ti ≤ 0.22 % and Mo + Cr ≤ 0.30 %.

6 For thermomechanical (TM) rolling condition

— C 0.13 max, CEV 0.34 max for grade E 275H,
— C 0.14 max, CEV 0.39 max for grade E 355H,
— C 0.16 max, V 0.12 max, Mo 0.20 max and CEV 0.43 max for grade E 420H and
— C 0.16 max, V 0.12 max, Mo 0.20 max and CEV 0.46 max for grade E 460H.

Table 3 Chemical Composition for grades with defined chemistry only (without mandatory mechanical properties requirement)

(Clauses 5, 7.1, and 7.2)

Sl No.	Grade	Percent, *Max*							
		C	Mn	Si	S	P	Cr	Ti	B
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	8C3	0.10 *Max*	0.50 *Max*	0.40	0.035	0.030	-	-	-
ii)	10C4	0.08-0.13	0.30-0.60	0.40	0.035	0.030	-	-	-
iii)	20C4	0.18-0.23	0.30-0.60	0.40	0.035	0.030	a)	a)	a)
iv)	21C3	0.18-0.24	0.10-0.60	-	0.035	0.030	a)	a)	a)
v)	26C8	0.22-0.28	0.60-0.90	0.40	0.035	0.030	a)	a)	a)
vi)	30C8	0.28-0.34	0.60-0.90	0.40	0.035	0.030	a)	a)	a)
vii)	35C8	0.32-0.38	0.60-0.90	0.40	0.035	0.030	a)	a)	a)
viii)	40C8	0.37-0.44	0.60-0.90	0.40	0.035	0.030	a)	a)	a)
ix)	20C12	0.16-0.23	1.10-1.40	0.40	0.035	0.030	a)	a)	a)
x)	26C13	0.22-0.28	1.10-1.50	0.40	0.035	0.030	a)	a)	a)
xi)	30C13	0.26-0.34	1.10-1.50	0.40	0.035	0.030	a)	a)	a)
xii)	36C14	0.30-0.38	1.20-1.50	0.40	0.035	0.030	a)	a)	a)
xiii)	41C15	0.36-0.44	1.35-1.65	0.40	0.035	0.030	a)	a)	a)
xiv)	20C12B	0.17-0.23	1.10-1.40	0.40	0.035	0.030	0.40	0.060	0.0008-0.005
xv)	22C12B	0.19-0.25	1.10-1.40	0.40	0.035	0.030	0.40	0.060	0.0008-0.005
xvi)	26C13B	0.22-0.28	1.15-1.45	0.40	0.035	0.030	0.40	0.060	0.0008-0.005
xvii)	30C13B	0.27-0.33	1.15-1.45	0.40	0.035	0.030	0.40	0.060	0.0008-0.005
xviii)	34C13B	0.32-0.38	1.15-1.45	0.40	0.035	0.030	0.40	0.060	0.0008-0.005

a) - No requirement but can be mutually agreed based on the application requirement.

NOTES

1 Unless otherwise agreed the grades mentioned in above table shall be supplied in full killed condition. For semi-killed quality, Silicon content shall be 0.08 percent, maximum.

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.

3 Micro-alloying may be allowed subject to mutual agreement between the purchaser and the supplier. Micro-alloying elements like Nb, V or Ti, when used individually or in combination, the total content shall not exceed 0.20 percent.

4 Nitrogen content of steel shall not exceed 0.012 percent, which shall be ensured by the manufacturer by occasional check analysis.

5 Closer limits of composition may be agreed to between the supplier and the purchaser.

6 Residual elements like Cu, Cr, Ni, Mo for specific applications shall be agreed upon between purchaser and supplier. As a guide, Cu ≤ 0.35 percent, Ni ≤ 0.25 percent, Cr ≤ 0.20 percent, Mo ≤ 0.06 percent can be considered for residual element limits.

7 Elements not quoted in this table shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition of such elements from scrap or other material used in the manufacture which affect the hardenability.

8 The grades in this table shall be chemical composition-based supplies as Hot Rolled Coil. However, mechanical properties can be mutually agreed between Supplier and purchaser based on end application, but it's not a mandatory requirement.

9 Grades with chemical composition not mentioned in above table can be agreed with the philosophy of new grade designation nomenclature as given in clause 5 based on the application requirements and corresponding agreements shall be mutually agreed between the supplier and purchaser within the scope of this standard for carbon up to 0.50 percent and Mn up to 1.70 percent.

Table 4 Permissible Variation for Product Analysis
(*Clauses 7.2*)

Sl No. (1)	**Constituent** (2)	**Percentage Limit of Constituent** (3)	**Permissible Variation Over/Under the Specified Limit, Percent**, *Max* (4)
i)	Carbon	<0.20 ≥0.20	0.02 0.03
ii)	Manganese	-	0.05
iii)	Sulphur	-	0.005
iv)	Phosphorus	-	0.005
v)	Silicon	-	0.05
vi)	Copper	-	0.03
vii)	Nickel	-	0.03
viii)	Chromium	-	0.04
ix)	Vanadium	-	0.01
x)	Niobium	-	0.01
xi)	Titanium	-	0.01
xii)	Molybdenum	-	0.01
xiii)	Aluminium	-	0.005
xiv)	Nitrogen	-	0.02
NOTE — Product analysis shall not be applicable to rimming steel.			

8 TENSILE TEST

8.1 Number of Tensile Tests

Number of test samples shall be 2 from each cast/heat and same grade, quality and delivery condition irrespective of cast/heat size.

8.2 Tensile Test Pieces

8.2.1 Tensile test samples shall be taken transverse to the direction of rolling, but for strips below 600 mm width, longitudinal test pieces may be taken. The sample for tensile test shall be from the end of the coil after coiling. Tensile test in other rolling direction can be mutually agreed between manufacturer and purchaser.

8.2.2 The tensile test shall be carried out in accordance with IS 1608 (part1) as applicable, generally using a proportion gauge length $L_o = 5.65\sqrt{S_o}$ where S_o is the cross-sectional area of the test piece. Test pieces with a non-proportional gauge length may be used, in this case the elongation values shall be converted in accordance with IS 3803 (Part 1). Elongation in other gauge lengths may be mutually agreed to between the purchaser and the manufacturer/supplier.

8.3 Tensile Test

Yield strength, tensile strength and percentage elongation, when determined in accordance with IS 1608 (Part 1), shall conform to the requirements as given in **Table 5** and **Table 6**.

For the specified yield strength, the upper yield strength (*R*eH) shall be determined.
If a yield phenomenon is not present, the 0.2 percent proof strength (*R*p 0.2) shall be determined.

8.3.1 Should a tensile test piece break outside the middle half of its gauge length (*see* IS 1608 Part 1) and the percentage elongation obtained is less than the specified, the test may be discarded at the option of the manufacturer and another test made from the sample selected representing the same cast and batch.

8.3.2 Stress relieving at more than 580 °C or for over 1 hour can lead to a deterioration of the mechanical properties of the fine grain steel grades. The maximum stress relief temperature should be 560 °C. If the purchaser intends to stress relief the products at higher temperatures or for longer times than mentioned above the minimum values of the mechanical properties after such a treatment should be agreed upon at the time of the order.

Table 5 Mechanical Properties for steel grades other than fine grain steel
(*Clause* 8.3 *and* 9.2.4)

Sl No.	Grade	Tensile Strength, MPa Min	Yield Strength, MPa Min	Elongation at Gauge Length, $L_0=5.65\sqrt{So}$, Percent, *Min*	Internal Diameter of Bend
(1)	(2)	(3)	(4)	(5)	(6)
i)	1	290	170	30	t
ii)	2	330	210	28	2t
iii)	3	410	240	23	2t
iv)	4	430	275	22	3t
v)	5	450	310	21	3t
vi)	6	490	355	20	3t
vii)	7	540	410	18	3t
viii)	8	570	450	17	3t

NOTES
1 t = Nominal thickness of the test piece.
2 1MPa = 1N/mm^2 = 1MN/m^2 = 0.102 kgf/mm^2 = 144.4 psi.
3 Mechanical properties other than those specified in this table may be as per agreement between the purchaser and the manufacturer for specific applications.

Table 6 Mechanical Properties for fine grain steel grades
(*Clause* 8.3 *and* 9.2.4)

Sl No.	Grade	Yield Strength, MPa, *Min*	Tensile Strength, MPa	Elongation at Gauge Length, $L_0=5.65\sqrt{So}$, Percent, *Min*	Internal Diameter of Bend
(1)	(2)	(3)	(4)	(5)	(6)
i)	ISH S275H	275	370-510	24	2t
ii)	ISH S355H	355	470-630	22	2t
iii)	ISH S420H	420	520-680	19	4t
iv)	ISH S460H	460	540-720	17	4t

NOTES
1 t = Nominal thickness of the test piece.
2 1MPa = 1N/mm^2 = 1MN/m^2 = 0.102 kgf/mm^2 = 144.4 psi.
3 Mechanical properties other than those specified in this table may be as per agreement between the purchaser and the manufacturer for specific applications.

9 BEND TEST

9.1 Number of Bend Tests

Number of test samples shall be 2 from each cast/heat and same grade, quality and delivery condition irrespective of cast/heat size.

9.2 Bend test shall be carried out in accordance with IS 1599.

9.2.1 Bend test sample shall be taken transverse to the direction of rolling.

9.2.2 The test piece shall be 75 mm long and 25 mm wide for thickness less than 3 mm and not less than 40 mm wide for 3 mm and other. For small sizes the maximum width available shall be used.

9.2.3 The edge of the bend test piece shall be free from burrs. Filling or machining to remove burrs is permissible.

9.2.4 The test piece shall be bend cold through 180°. The internal diameter of the bend for the different grades of material shall be as given in **Table 5** and **Table 6**. The test piece shall be deemed to have passed the test, if the outer convex surface is free from cracks.

10 RE-TESTS

Should any one of the test pieces first selected fail to pass any of the tests specified in this standard two further samples shall be selected from the same lot for testing in respect of each failure. Should the test pieces from both these additional samples pass the material represented by the test, samples shall be deemed to comply with the requirement of that particular test. Should the test pieces from either of these additional test samples fail, the material represented by the test samples shall be deemed as not conforming to the standard.

11 FREEDOM FROM DEFECTS

The steel shall be free from such segregation, lamination, surface flaws and other defects, which are detrimental to subsequent processing and ultimate use.

> NOTE — As internal surface of coils is not amenable to inspection. Some surface defects may be expected to be found during slitting. The purchaser in his assessment of the material shall take this into account. The amount of defects liable for rejection shall be mutually agreed between the purchaser and the supplier.

12 DIMENSIONS

Nominal dimensions and thickness of hot-rolled steel strip may be as specified in IS 1730. Sizes other than those specified in IS 1730 may also be supplied by mutual agreement between the purchaser and the manufacturer.

13 TOLERANCES

13.1 Tolerances on thickness and width shall conform to 1S 1852.

13.2 Tolerance on edge camber shall be as specified as below.

The edge camber that is, lateral departure of the edge of the material from a straight line forming a chord (*see* Fig. 1) of hot rolled steel sheets, including descaled sheets, in cut lengths and coil shall not exceed the tolerances given below :

Form	*Camber tolerance, Max*
Cut length	0.5 percent x length
Coil	25mm in any 5000mm 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 edge.

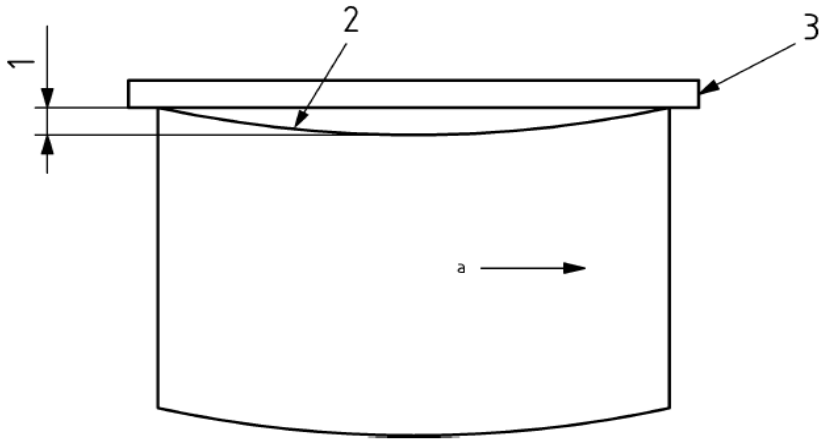


Figure 1 — Measurement of edge camber

Key
1 Edge Camber
2 Side edge (concave side)
3 Straight edge
a Rolling direction

The specified value for tolerance shall not apply to the uncropped ends of the coil for a total length *l*, which is calculated using the formula.

l (m) = $\frac{90}{\text{Nominal thickness (mm)}}$, provided that the result does not exceed 20 m.

13.3 Tolerances closer than those specified in 13.1 and 13.2 on the dimensions of hot-rolled steel strip may also be agreed between the purchaser and the supplier.

14 COIL MASS AND DIAMETERS

The limits of mass outside diameter and internal diameter of the coils shall be agreed to between the manufacturer and the purchaser. The mass of the steel shall be calculated on the basis that steel weighs 7.85 g/cm^3.

15 CONDITION OF COILS

15.1 The edges may be mill edges or slit edges as agreed between the supplier and the purchaser. When mill edges are specified the depth of defects shall be within 5 mm from the edges on either side of the coil.

15.2 The material shall be in as-rolled or normalized or normalized rolling or thermomechanical rolling condition without any skin passing, pickling, oiling, and blast cleaning, annealing and normalizing unless otherwise specified by the purchaser.

15.3 Outer end of the coil may be cropped, if agreed by the manufacturer and the purchaser. There should be no folding of ends in the packed coils. In case the material is supplied without cropping, fish tail length should not be more than 0.5 m unless agreed for thickness ≥5mm.

15.4 The coils shall be suitably packed, so that they do not get damaged during transit.

15.5 Telescopicity in the coils should not be more than 100 mm.

16 MARKING

16.1 Every coil shall be legibly marked outside or inside with the following:

a) Name or trade-mark of the manufacturer,
b) Grade of steel,
c) Cast or identification mark,
d) Size, and
e) Mass of coils.

NOTE — For strip below 600 mm width, marking of mass may not be necessary.

16.2 BIS Certification Marking

The material may also be marked with the Standard Mark.

16.2.1 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act,* 2016 and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A
(*Clause* 2)
LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 228 (in various parts)	Methods of chemical analysis of steels
IS 1599: 2019/ ISO 7438: 2016	Metallic materials – Bend test (*fourth revision*)
IS 1608 (Part 1) : 2022 /ISO 6892-1 : 2019	Metallic materials — Tensile testing — Part 1 : Method of test at room temperature (*fifth revision*)
IS 1730: 1989	Steel plates, sheets, strips and flats for structural and general engineering purposes – Dimensions (*second revision*)
IS 1852: 1985	Specification for rolling and cutting tolerances for hot rolled steel products (*fourth revision*)
IS 1956 (in various parts)	Glossary of terms relating to iron and steel (*second revision*)
IS 3803 (Part 1): 1989	Steel – Conversion of elongation values: Part 1 Carbon and low alloy steels (*second revision*)
IS 8910: 2022/ ISO 404: 2013	General technical delivery requirements for steel and steel products (*second revision*)