भारतीय मानक प्रारूप

तप्त स्टैंपिंग अनुप्रयोगों के लिए इस्पात चादरें एवं पत्तियाँ – विशिष्टि

Draft Indian Standard

STEEL SHEETS AND STRIPS FOR HOT STAMPING APPLICATIONS — SPECIFICATION

ICS 77.140.50

Wrought Steel Products Sectional Committee. MTD 04	Last date for receipt of comments: **17 July 2025**

FOREWORD

(*Formal clauses would be added later*.)

This standard has been formulated to cover the technical requirements of uncoated and continuously metallic coated steel sheet and strip intended for hot stamping applications.

Hot stamping is a crucial process in automobile manufacturing, enabling the creation of ultra-high-strength, lightweight parts, especially for structural components like pillars, roof rails, and bumper beams. This method involves heating steel sheet to a high temperature, forming the sheet into the required shape and then rapidly quenching it in the die to achieve a martensitic microstructure. This process results in parts that are stronger, lighter, and more complex than those produced through traditional cold forming.

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

STEEL SHEETS AND STRIPS FOR HOT STAMPING APPLICATIONS — SPECIFICATION

1 SCOPE

This standard specifies the requirements for steel sheets and strips, uncoated and continuously metallic coated for hot stamping applications. These steel sheets and strips are used as raw material for direct, indirect and multi-step hot stamping of sheet metal parts and generally used for automotive applications.

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 this standard, the definitions given in IS 1956 (Part 4), IS 3531, IS 513 (Part 1 and Part 2), IS 5986, IS 18385, Document (MTD 04/27093) and the following definitions shall apply.

3.1 Manganese Boron (MB) Steel — The major constituents of this steel are Manganese ranging up to 3.0 percent, by mass and Boron in the range of 10 ppm to 70 ppm, which acts as good hardenability alloying elements. High strength in the hot stamping process is achieved through austenizing and quenching.

3.2 High Strength Low Alloy Steel (HSLA) — High Strength Low alloy steel exhibit good ductility after hot forming. These steels are mainly composed of low carbon and micro alloying elements.

3.3 Hot-Dip Galvanizing (G) — Zinc coating on steel by dipping an appropriately prepared strip into a molten bath with a zinc content of at least 99 percent, by mass.

3.4 Hot-Dip Galvannealing — Zinc-iron alloy coating produced by dipping appropriately prepared strip into a molten bath with a zinc content of at least 99 percent, by mass and by subsequently performing a heat treatment. The coating formed on the base metal is composed of zinc-iron alloy (iron content 7 percent to 15 percent).

3.5 Hot-Dip Coating with Aluminium-Silicon Coating (AS) — Aluminium-Silicon alloy coating produced by dipping appropriately prepared strip into a molten bath with aluminium and a silicon content of 5 to 11 percent, by mass.

3.6 Direct Hot Stamping (DS) — In the direct hot stamping process, the desired part geometry and mechanical properties are attained by shaping and rapidly cooling a flat blank that has been fully or partially heated to austenitic temperature within the tool.

3.7 Indirect Hot Stamping (IS) — In the indirect hot stamping process, the final part geometry is established through an initial cold stamping step. The necessary mechanical properties are then attained by austenitizing the part and subsequently quenching it in the tool.

3.8 Direct Hot Stamping with Precooling (PS) — In direct hot stamping with precooling, the ultimate part geometry and mechanical properties result from shaping and quenching a flat blank that has been austenitized and carefully pre-cooled within the tool. The temperature of the blank before stamping exceeds the martensite start temperature.

3.9 Multistep Hot Stamping (MS) — In the multistep hot stamping process, the desired part geometry and mechanical properties are achieved by shaping and quenching a flat blank that has been austenitized and carefully pre-cooled. These operations — precooling, stamping, and cutting — are carried out sequentially in a transfer press.

3.10 Metallic Coated Steel — Metallic coated steel is manufactured through the continuous hot-dip process, with aluminium-silicon alloy coating or Zinc or Zinc Alloy metallic coatings.

4 DIMENSION

4.1 Steel Sheet and Strip for Hot Stamping is produced in thicknesses from 0.70 mm to 3.20 mm inclusive after coating, for cold rolled uncoated and cold rolled continuously coated. Steel Sheet and Strip for Hot Stamping is produced in thicknesses from 1.60 to 6.00 mm for hot-rolled coated and uncoated delivered in Hot-rolled and pickled condition.

4.2 Deviations from the thickness limits dependent on the steel grade, type of coating, manufacturing process, end usage application are permissible based on the mutual agreement between the purchaser and the manufacturer.

5 DESIGNATION

5.1 Steel sheet for hot stamping applications are designated by type of rolling (hot or cold rolled), tensile strength after hot-stamping, delivery condition, stamping condition and type of coating. The grades, therefore, are classified as given in Table 1.

Table 1 Type and Designation
(*Clause* 5.1)

Sl. No.	Grade	Delivery Condition	Alloy Type	Stamping Condition	Coating Type
(1)	(2)	(3)	(4)	(5)	(6)
i)	CR1100T	CR	MB	DS	UC,AS
ii)	CR1100T	CR	MB	PS	A
iii)	CR1500T	CR	MB	DS	UC,AS,A
iv)	FH1500T	CR	MB	DS	UC
v)	CR1500T	CR	MB	IS	UC
vi)	CR1500T	CR	MB	IS	G,A
vii)	CR1500T	CR	MB	PS	A
viii)	CR1500T	CR	MB	MS	UC,A
ix)	CR1900T	CR	MB	DS	UC, AS
x)	CR1900T	CR	MB	IS	G,A
xi)	FH1900T	CR	MB	DS	UC
xii)	HR1500T	HR	MB	DS	UC,AS
xiii)	HR1900T	HR	MB	DS/IS	UC,AS
xiv)	CR500T	CR	LA	DS	AS,A

Sl. No.	Grade	Delivery Condition	Alloy Type	Stamping Condition	Coating Type
(1)	(2)	(3)	(4)	(5)	(6)
xv)	CR500T	CR	LA	IS	G,A
xvi)	CR600T	CR	LA	DS	AS,A
xvii)	CR600T	CR	LA	IS	G,A
xviii)	HR500T	HR	LA	DS	AS
xix)	HR600T	HR	LA	DS	AS

NOTES
1) Delivery Condition : CR- Cold Rolled, FH- Full Hard, HR Hot rolled
2) Alloy Type : MB- Manganese Boron Alloy Steel , LA – High Strength Low Alloy Steel
3) Stamping Condition : DS- Direct Stamping, IS – Indirect Stamping, PS- Direct Hot Stamping with Precooling, MS - Multistep Hot Stamping
4) Coating Type : G- Galvanised , A-Galvannealed , AS- Aluminium Silicon Coated and UC- Uncoated Surface

5.2 Coating Class

Coating class is expressed as coated and uncoated. Coating mass for both sides is expressed in g/m^2. The recommended coating class and coating mass of the steel sheet and strip delivered in unhardened condition shall be as per Table 2.

Table 2 Type and Designation of Coating Mass in as Delivered Condition
(*Clauses* 5.2, 9.1, 10.4.2 *and* 10.4.3)

Sl. No.	Type	Coating Class	Coating Mass for both Sides g/m^2	Coating Mass per side g/m^2 *Min*	Thickness per Side µm (Informative)	Density g/cm^3 (Informative)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Galvanised (G)	G 140	120-180	60/60	8.5-13	7.1
		G 160	140-200	70/70	9.9-14	
		G 180	180-240	80/80	11-17	
ii)	Galvannealed (A)	A 100	80 - 120	40/40	5.6-8.5	7.1
		A 140	120-180	60/60	8.5-13	
		A 160	140-200	70/70	9.6-14	
		A 180	160-240	80/80	11-17	
iii)	Aluminium - Silicon (AS)	AS80	60-90	30/30	10-20	3
		AS150	120-200	60/60	20-33	

NOTES
1 Based on the end usage requirements, different coating masses and differentially coated surfaces can be agreed between the purchaser and the manufacturer.
2 For welded blanks, coating mass will be as per the applied grades and requirements.

5.3 Coating Type

Different type of coatings based on product, stamping process are applicable. The applicable coatings are Galvanised (G), Galvannealed (A), Aluminium Silicon Coated (AS) and Uncoated Surface (UC).

5.4 For further information on coatings, surface and coating properties, respective Indian standards for Hot-dip coated products and uncoated products shall be referred. For Galvanised (G), Galvannealed (A) - IS 18385, for Al-Si Coated Steel (AS)- (MTD 04/27093), for Uncoated IS 513 (Part 1 and Part 2) for Cold-rolled base and IS 1079 and IS 5986 for Hot-rolled base shall be referred for surface Requirements.

5.5 Surface Finish

The surface finish shall be as per Table 3.

Table 3 Surface Finish
(*Clause* 5.5)

Sl. No.	Type	Description
(1)	(2)	(3)
i)	As Coated Surface (AC)	Delivered in Skin Passed or Minimised Spangles for Galvanised (G)
ii)	Improved Surface (B)	Material requirements with Special requirements on Surface quality
NOTE — Different kinds of surface finishes can be applied, based on the agreement between the purchaser and the manufacturer.		

5.6 Welded Blanks comprising of Steel sheets for Hot-stamping can also be supplied. Delivery conditions, dimensions tolerances, coating methods shall be as per mutual agreement between the purchaser and the manufacturer.

5.7 Surface Treatment

The surface treatment shall be as per mutual agreement between the purchaser and the manufacturer.

5.8 Example of Grade order condition is explained in Annex B.

6 SUPPLY OF MATERIAL

The general requirements relating to the supply of Steel sheet and strip for Hot-stamping applications shall conform to IS 8910.

7 MANUFACTURE

7.1 Processes used in steel making, rolling, and manufacturing process of Steel sheet and strip for Hot-stamping applications and corresponding coatings shall be left to the discretion of the manufacturer unless there is a restriction on the steel grades or as per mutual agreement between purchaser and manufacturer.

7.2 For the hot-dip coating process, cold-rolled or hot rolled substrates shall be used.

7.3 The coating conditions shall be as per the respective Indian Standard for Hot Dip coated steel based on type of coating (*see* **5.4**).

8 CHEMICAL COMPOSITION

8.1 Ladle Analysis

The ladle analysis of the base metal of steel sheet and strip shall be as per the requirements given in Table 4 when carried out either by the method specified in the relevant parts of IS 228 or any other national/international standard for instrumental/chemical method. In case of dispute, the procedure given in the relevant part of IS 228 shall be the referee method. One sample is to be tested for a ladle.

Table 4 Chemical Composition and Mechanical Property Requirements

(*Clause* 8.1*and* 10.2*)*

Sl. No	Grade	Delivery Condition	Alloy Type	Stamping Condition	Coating Condition	Constituent, Percent, *Max*													YS N/mm^2	TS N/mm^2	%Elongation, *Min* (Type of Test Piece as per IS 1608 Part 1)		
						C	Si	Mn	P	S	Al	Ti	Nb	Cr	Mo	Ni	B	Cu			Type 1	Type 2	Type 3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
i)	CR1100T	CR	MB	DS	UC,AS	0.05 to 0.14	0.10 to 0.60	1.00 to 2.30	≤ 0.030	0.010	0.01 to 0.15	0.050	0.100	0.25	--	0.10	0.0010 to 0.0050	0.20	300 to 650	600 to 900	11	10	11
ii)	CR1100T	CR	MB	PS	A	0.05 to 0.14	0.10 to 0.60	1.00 to 2.30	≤ 0.030	0.010	0.01 to 0.15	0.050	0.100	0.25	--	0.10	0.0010 to 0.0050	0.20	300 to 650	600 to 900	11	10	11
iii)	CR1500T	CR	MB	DS	UC,AS,A	0.20 to 0.25	0.50	1.10 to 1.50	0.025	0.010	0.015 to 0.080	0.010 to 0.050	--	0.35	0.35	0.10	0.0010 to 0.0050	0.20	300 to 650	440 to 750	11	10	11
iv)	FH1500T	CR	MB	DS	UC	0.20 to 0.25	0.50	1.10 to 1.50	0.025	0.010	0.015 to 0.080	0.010 to 0.050	--	0.25	0.35	0.10	0.0010 to 0.0050	0.20	650 to 1100	750 to 1200	--	--	--
v)	CR1500T	CR	MB	IS	UC	0.20 to 0.25	0.50	1.10 to 1.50	0.025	0.010	0.015 to 0.080	0.010 to 0.050	--	0.25	0.35	0.10	0.0010 to 0.0050	0.20	300 to 530	440-700	19	18	19
vi)	CR1500T	CR	MB	IS	G,A	0.20 to 0.25	0.50	1.10 to 1.50	0.025	0.010	0.015 to 0.080	0.010 to 0.050	--	0.25	0.35	0.10	0.0010 to 0.0050	0.20	350 to 480	470 to 700	19	18	19
vii)	CR1500T	CR	MB	PS	A	0.17 to 0.23	0.50	1.70 to 2.50	0.025	0.010	0.015 to 0.300	0.050	--	0.25	0.35	0.10	0.0010 to 0.0050	0.20	300 to 600	600 to 900	13	12	13
viii)	CR1500T	CR	MB	MS	UC,A	0.20 to 0.25	0.60 to 1.40	2.00 to 2.40	0.025	0.010	0.020 to 0.080	0.050	--	0.25	--	0.10	0.0010 to 0.0050	0.20	350 to 900	590 to 1100	7	5	7

Sl. No	**Grade**	**Delivery Condition**	**Alloy Type**	**Stamping Condition**	**Coating Condition**	**Constituent, Percent, *Max***													**YS** N/mm^2	**TS** N/mm^2	**%Elongation, *Min* (Type of Test Piece as per IS 1608 Part 1)**		
						C	**Si**	**Mn**	**P**	**S**	**Al**	**Ti**	**Nb**	**Cr**	**Mo**	**Ni**	**B**	**Cu**			**Type 1**	**Type 2**	**Type 3**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
ix)	CR1900T	CR	MB	DS	AS	0.30 to 0.38	0.80	2.00	0.03	0.010	0.010 to 0.080	0.050	0.250	0.50	0.55	0.10	0.0010 to 0.0050	0.20	450 to 650	600 to 800	13	12	13
x)	CR1900T	CR	MB	IS	G,A	0.30 to 0.38	0.80	2.00	0.030	0.010	0.010 to 0.080	0.050	0.250	0.50	0.55	0.10	0.0010 to 0.0050	0.20	400 to 650	550 to 800	13	12	13
xi)	CR1900T	CR	MB	DS	UC,A	0.30 to 0.38	0.80	2.00	0.030	0.010	0.010 to 0.080	0.050	0.250	0.50	0.55	0.10	0.0010 to 0.0050	0.20	280 to 680	440 to 850	11	10	11
xii)	**FH1900T**	CR	MB	DS	UC	0.30 to 0.38	0.80	2.00	0.030	0.010	0.010 to 0.080	0.050	0.250	0.50	0.55	0.10	0.0010 to 0.0050	0.20	800 to 1250	900 to 1350	--	--	--
xiii)	HR1500T	HR	MB	DS	UC,AS	0.20 to 0.25	0.50	1.10 to 1.50	0.025	0.005	0.015 to 0.080	0.010-0.050	--	0.30	0.35	0.10	0.0010 to 0.0050	0.20	≥280	450 to 800	11	10	11
xiv)	HR1900T	HR	MB	DS	UC,AS	0.30 to 0.38	0.80	2.00	0.030	0.005	0.010 to 0.080	0.050	0.25	0.30	0.10	0.10	0.0010 to 0.0050	0.20	280 to 680	440 to 850	11	10	11
xv)	CR500T	CR	LA	DS	AS,A	0.13	0.50	1.50	0.030	0.025	≥ 0.015	Ti+Nb < 0.150		--				0.20	280 to 500	380 to 540	21	21	23
xvi)	CR500T	CR	LA	IS	G,A	0.13	0.50	1.50	0.030	0.025	≥ 0.015	Ti+Nb < 0.150		--				0.20	280-500	380 to 540	21	21	23
xvii)	CR600T	CR	LA	DS	AS,A	0.13	0.50	2.00	0.030	0.025	≥ 0.015	Ti+Nb < 0.190		--				0.20	320 to 650	500 to 750	12	12	13

Sl. No	Grade	Delivery Condition	Alloy Type	Stamping Condition	Coating Condition	Constituent, Percent, *Max*													YS N/mm^2	TS N/mm^2	%Elongation, *Min* (Type of Test Piece as per IS 1608 Part 1)		
						C	Si	Mn	P	S	Al	Ti	Nb	Cr	Mo	Ni	B	Cu			Type 1	Type 2	Type 3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
xviii)	CR600T	CR	LA	IS	G,A	0.13	0.50	2.00	0.030	0.025	≥ 0.015	Ti+Nb < 0.190		--				0.20	320 to 650	500 to 750	12	12	13
xix)	HR500T	HR	LA	DS	AS	0.13	0.50	1.50	0.030	0.025	≥ 0.015	Ti+Nb < 0.150		--				0.20	280 to 500	380 to 600	21	21	23
xx)	HR600T	HR	LA	DS	AS	0.13	0.50	2.00	0.030	0.025	≥ 0.015	Ti+Nb < 0.190		--				0.20	320 to 650	380 to 800	12	12	13

NOTES

1 In chemical composition, specified value indicates the maximum permissible value, unless a range is indicated.
2 (--) → No specific requirement. Can be Supplied as agreed upon .
3 Closer chemical composition or Stricter Mechanical properties may be agreed upon between the purchaser and manufacturer.
4 If specified, elongation percent of Full Hard grades may be as agreed upon.
5 Based on the application specific requirements, different chemical compositions may also be agreed upon.
6 If agreed upon, tensile tests may be carried out in different testing directions and the values may also be agreed upon
7 For hot rolled products greater than 3 mm, proportional specimens can also be used to determine the elongation with $L0=5.65\sqrt{S0}$, where L0 is the initial gauge length and S0 is the specimen cross section.
8 1 N/mm^2 = 1 MPa.

8.2 Product Analysis

Permissible variation in case of product analysis, after stripping of coating, from the limits specified in Table 4 shall be as given in Table 5.

Table 5 Permissible Variations of Chemical Composition on Product Analysis

(*Clause* 8.2)

Sl. No.	Element	Permissible Maximum content in the ladle analysis % by mass	Permissible Variation [a] % by mass
(1)	(2)	(3)	(4)
i)	C	≤ 0.30 >0.30 ≤ 1.00	±0.02 ±0.03
ii)	Si	≤ 1.00	±0.03
iii)	Mn	≤ 1.00 >1.00	±0.04 ±0.06
iv)	Cr	≤ 0.40	±0.03
v)	Mo	≤ 0.40 > 0.40	±0.03 ±0.04
vi)	Ni	≤ 1.00	±0.03
vii)	Cu	≤ 0.40	+0.05
viii)	B	≤ 0.005	±0.0003
ix)	Other Elements		As agreed

a) ± specifies that in once cast the deviation may occur over the upper value or under the lower value of the specified range in Tables 4, but not both at the same.

9 COATING PROPERTIES

9.1 Coating Mass

The coating mass expressed in grams per square metre given for both surfaces shall conform to the requirements specified in Table 2. The maximum coating mass may be agreed upon between the purchaser and the manufacturer. Different coating mass and differentially coated products can be mutually agreed upon between the purchaser and manufacturer.

9.2 Coating Mass Test

The coating mass test shall be as per the relevant procedures and requirements mentioned in respective Indian standards for hot dip coated products (*see* **5.4**).

9.3 Adherence Test

The coating adherence test shall be as per the relevant procedures and requirements mentioned in respective Indian standards for hot dip coated products or as per the mutual agreement between the purchaser and the manufacturer (*see* **5.4**).

10 MECHANICAL PROPERTIES

10.1 Test Frequency

Specimen for mechanical properties shall be drawn from each mother coil or a lot of 50 t or less processed under the identical conditions of a single ladle, hot and cold rolling conditions, thickness, width, coating, and process conditions at a hot dip coating line. The direction for the tensile test pieces shall be in transverse to the rolling condition.

For hot-rolled substrate one tensile test sample shall be taken from each cast, when processed under identical conditions at hot-rolling and hot-dip coating line. When there is a change in the process conditions at Hot rolling and Hot dip coating, a sample shall be drawn from the coil, where such process variations are made.

10.2 Tensile Test

10.2.1 *Tensile Test Specimen* — Tensile test values shall be as mentioned in Table 4. Strips having a width of 250 mm and below shall be tested longitudinally.

10.2.2 *Testing* — Tensile test to be conducted as IS 1608 (Part 1) at room temperature and Tensile properties such as Yield Strength, Tensile Strength and % Elongation shall meet the requirements specified in Tables 4. The yield strength value applies to 0.2% of proof stress, if Yield stress is not clearly defined, otherwise the value applies to lower yield stress or upper yield stress based on mutual agreement between purchaser and manufacturer.

10.3 Ageing Period

The values mentioned against the different mechanical properties' requirements are applicable for a period of 6 months from the date, the product is available for the shipment at manufacturer's end.

10.4 Thickness for calculating tensile properties shall be either one of the following:

a) Actual measured thickness after removing the coating layer;
b) Result after subtracting the coating thickness on each side specified in Table 2 from the actual measured thickness including the coating layers; or
c) Results after subtracting the equivalent coating thickness of the actual measured coating mass from the measured thickness including the coating layers. Refer to Table 2 for calculating coating thickness based on coating mass.

11 MICROSTRUCTURE, INCLUSION AND CLEANLINESS

11.1 Grain size should to be consistent throughout the thickness. If specified by the purchaser, the grain size shall be tested according to IS 4748.

11.2 It is recommended to control the size and concentration of inclusions by adopting state of the art technologies of manufacturing of steel and should be limited in order to not to affect the purchaser's manufacturing processes and desired qualities, as per the mutual agreement between the purchaser and the manufacturer.

11.3 Based on the mutual agreement between the purchaser and the manufacturer, non-metallic inclusions can be determined as per the IS 4163 and the acceptance limits may be mutually agreed upon.

12 SURFACE TREATMENT

12.1 Surface treatment shall be as per the mutual agreement between the purchaser and the manufacturer.

12.2 Oiling — Steel strip as produced shall be oiled to prevent marring and scratching of the soft surface during handling or shipping and to minimize wet storage stains.

12.3 As agreed upon between the purchaser and the manufacturer, other applicable and suitable kinds of surface treatments can be applied.

12.4 Unless otherwise agreed upon, steel sheet and strip are supplied in skin passed conditions for all type of products and coating. For galvanised finish, material can be supplied in un-skin passed condition with minimised spangles. Based on end-use requirements, the purchaser and manufacturer decide upon and mutually agree on the kind of surface finish requirements.

13 DIMENSION, SHAPE AND TOLERANCES

13.1 Tolerances

Tolerances on dimensions (thickness, width, length), shape (flatness, waviness), camber, and out-of-squareness shall be as per IS/ISO 16162 for uncoated cold-rolled products, IS/ISO 16163 for Cold-rolled and hot-rolled coated products and IS/ISO 16160 for uncoated hot-rolled products.

13.2 Sheets and strips may be supplied either with mill or trimmed edges. For untrimmed/hot rolled mill edges, width tolerances shall be +20/-0 mm and for edges that are trimmed before cold rolling, width tolerances shall be +7/-0 mm. For edges trimmed after cold rolling, annealing and coating, width tolerances shall be as per IS/ISO 16163 or IS/ISO 16162.

13.3 For Hot-rolled substrate coated steel sheet and strip with untrimmed or mill edges, thickness is measured at any point not less than 40 mm from a side edge.

14 RETEST

14.1 When any portion of the test results does not meet the specified requirements, two additional sets of test samples from the same lot must be retested for the relevant specific test criteria to determine the overall acceptability of the lot.

14.2 If any of the re-test samples fail to meet the test requirements of this standard, the lot represented by the sample shall be deemed as not conforming to this standard.

14.3 On any tensile test, if any part of the fracture is outside the gauge length as scribed before the test, the test shall be discarded, and a retest carried out.

15 SURFACE APPEARANCE

15.1 For galvanised (G), galvannealed (A) surfaces, voids and bare spots are allowed to an acceptable limit, as agreed upon between the purchaser and the manufacturer.

15.2 For Aluminium-Silicon coatings (AS), voids and bare spots are acceptable, if their diameter does not exceed a size of 3.0 mm or if they demonstrably do not influence the paint adhesion or corrosion resistance or as per the agreement between the purchaser and the manufacturer.

15.3 Uncoated Hot-rolled products shall be supplied in a pickled and oiled condition.

15.4 For uncoated semi rolled or full hard products, pores, scratches, dents and slight discoloration along with agreed amount of residual oil and fines are permitted, which are not detrimental to the manufacturing process.

15.5 The steel sheet in cut lengths shall be free from laminations, surface flaws and other imperfections that are detrimental to the final product’s practical application or subsequent appropriate processing.

15.6 However, it is difficult to inspect the overall coils for defects and removing defects in strips is not as easy as the removal of defects in sheets. There can be a mutual agreement between the purchaser and manufacturer for treating such cases.

15.7 Unless otherwise specified, surface defects shall be applied to one side. For sheets, it is generally referred to the top side of the packing and for strips, the outer side is referred to as the applicable side.

15.8 The acceptance level of the defects may be agreed upon between purchaser and manufacturer.

16 PACKING

Steel sheet and strip for Hot-stamping applications should be suitably packed to avoid any transit/handling/storage damage and as per the agreement between the purchaser and the manufacturer.

17 MARKING

The following shall be legibly and indelibly marked on the top of each coil or package of sheets or shown on a tag attached to each coil or packet:

a) IS No. of this standard;
b) Manufacturer's name or trademark;
c) Material identification/coil number/packet number/batch number, etc.;
d) Product dimensions;
e) Number of sheets or mass;
f) Designation of steel sheet/strip; and
g) Date of manufacture.

18 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

19 STORAGE AND TRANSPORTATION

19.1 Moisture, in particular condensation between the sheets, laps of the coil or other adjacent parts made of Hot-dip coated flat products, can lead to the formation of corrosion products. The possible types of temporary surface protection are given in **12**. As a precaution, the products should be transported and stored dry and protected from moisture.

19.2 During transportation, dark spots may appear on the surfaces as a result of friction. Generally, they only impair the appearance. Friction is reduced by oiling the products. Additionally, secure packing, transporting the coils laid flat and avoiding local pressure points, reduce the risk of dark spots.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS Standard No.	*Title*
IS 228(Various parts)	Method for chemical analysis of steel
IS 1079 : 2017	Hot Rolled Carbon Steel Sheet, Plateand Strip — Specification (*seventh 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 1956 (Part 4) : 2013	Glossary of terms relating to iron and steel : Part 4 Flat products (*second revision*)
IS 5986 : 2017	Hot Rolled Steel Sheet, Plate and Strip for Forming and Flanging Purposes — Specification (*fourth revision*)
IS 8910 : 2022 / ISO 404:2013	General technical delivery requirements for steel and steel products (*second revision*)
IS 18385 : 2023	Hot-dip galvanized/galvannealed steel sheet, plate and strip for automotive applications — Specification
IS 4163 : 2021	Steel — Determination of content of non-metallic inclusions — Micrographic method using standard diagrams
IS/ISO 16160 : 2012	Hot-rolled steel sheet products — Dimensional and shape tolerances (*first revision*)
IS/ISO 16162 : 2012	Cold - Rolled steel sheet products - Dimensional and shape tolerances (*first revision*)
IS/ISO 16163: 2012	Continuously hot — dipped coated steel sheet products — Dimensional and shape tolerances (*first revision*)
MTD 04/27093	Hot-dip aluminium and aluminium- silicon coated steel sheet and strip — Specification

ANNEX B

(*Clause* 5.8)

GRADE ORDERING CONDITION

Cold Rolled substrate with typical tensile strength of 1500 MPa after hot forming comprising of Manganese-Boron Alloy supplied with Aluminium Silicon Coated with a coating mass of minimum 60 gm/m^2/both sides in a coated and skin passed condition with no special surface requirements.