भारतीय मानक

जस्तीकृत इस्पात की चद्दरें (सादी एवं नालीदार)—विशिष्टि

(छठा पुनरीक्षण)

Indian Standard

GALVANIZED STEEL SHEETS (PLAIN AND CORRUGATED) — SPECIFICATION

(Sixth Revision)

ICS 77.140.50

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 4

FOREWORD

This Indian Standard (Sixth 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 1951 and subsequently revised in 1962, 1969, 1977, 1985 and 1992. While reviewing this standard in the light of experienced gained during these years, the Committee decided to revise the standard. In this revision, following changes have been made:

a) Amendments number 1, 2, 3, 4 and 5 have been incorporated.

b) Table 1 has been modified, interstitial free grade of base metal has been included.

c) Clause **7.1** has been modified.

d) Clause **2** have been updated.

Galvanized steel sheets covered by this standard are intended to be used for purposes such as panelling, roofing, lock forming etc.

For all tests specified in this standard (chemical/physical/others), the method as specified in relevant ISO standard may also be followed as an alternate method.

The composition of Committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether 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

GALVANIZED STEEL SHEETS (PLAIN AND CORRUGATED) — SPECIFICATION

(Sixth Revision)

1 SCOPE

This standard covers the requirements of plain galvanized steel sheets and strips (coils) and corrugated galvanized sheets.

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:

IS No.	*Title*
209 : 1992	Zinc ingot — Specification (*fourth revision*)
513 : 1994	Cold-rolled low carbon steel sheets and strips (*fourth revision*)
1079 : 1994	Hot-rolled carbon steel sheet and strip (*fifth revision*)
1956 (Part 4) : 1975	Glossary of terms relating to iron and steel : Part 4 Steel sheet and strip (*first revision*)
2629 : 1985	Recommended practice for hot dip galvanizing on iron and steel (*first revision*)
6745 : 1972	Method for determination of mass of zinc coating on zinc coated iron and steel acticles
8910 : 1978	General technical delivery requirements for steel and steel products
13229 : 1991	Zinc for galvanizing

3 TERMINOLOGY

3.1 For the purpose of this standard, the definition given in IS 1956 (Part 4) and the following shall apply.

3.2 Black Sheet — Hot rolled steel sheet prior to pickling operation.

3.3 Cold Rolled Sheet or Coil — Cold-rolled sheet or coil prior to continuous galvanizing process.

3.4 Thickness of Sheet — Thickness of hot-rolled or cold-rolled sheet in cut length or coil form.

4 SUPPLY OF MATERIAL

The general requirements relating to the supply of galvanized sheets and strips shall conform to IS 8910.

5 MANUFACTURE

5.1 The base metal of plain galvanized sheets and coils shall conform to IS 1079 or IS 513 as the case may be

5.1.1 When it is not possible to test the base metal before galvanizing, the base metal may be tested after stripping off the zinc coating.

5.1.2 For corrugated sheets, the maximum phosphorus content may be 0.09 percent.

5.2 Galvanizing shall be carried out by first pickling the black sheets or by cleaning the cold-rolled coils in the line and then dipping them in a bath of molten zinc at a temperature suitable to produce a complete and uniformly adhesive zinc coating (*see* IS 2629). The zinc ingots used for galvanizing shall conform to any of the grades specified in IS 209 or IS 13229.

6 CLASSIFICATION

Base metal of galvanized plain coils and sheets (spangled and zero spangled) as well as corrugated sheets are classified as per Table 1.

Table 1 Classification of Grades of GP/GC Coils and Sheets

(*Clause* 6)

Sl No.	Type	Designation	Grade Reference of Base Metal IS 1079/IS 513
(1)	(2)	(3)	(4)
i)	Deep Drawing	GPD	Grade DD
ii)	Extra Deep Drawing	GPED	Grade EDD
iii)	Interstitial Free	GPIF	Grade IF
iv)	Corrugated Ordinary	GC	Grade O

NOTE — Spangles should not be allowed to form on the surface of strips/sheets during galvanizing.

7 ZINC COATING

Unless otherwise agreed to between the purchaser and the manufacturer, the zinc coating shall conform to the requirement of any one of the grades prescribed in Table 2.

7.1 The zinc coating shall conform to the requirement of any of the grades prescribed in Table 2. The mass of coating referred to in this standard shall represent the total mass of zinc, both sides inclusive.

7.2 Any other mass of coating, than those specified in Table 2, may be supplied, if agreed to between the purchaser and the manufacturer.

7.3 The following are recommended grades of zinc coating for the various thickness of sheets:

Sl No.	*Thickness*	*Grade of Zinc Coating*
(1)	(2)	(3)
i)	0.18 to 0.28 (both inclusive)	200
ii)	0.30 to 0.55 (both inclusive)	220
iii)	0.63 to 1.0 (both inclusive)	275
iv)	above 1.0 mm	350

NOTES

1 The recommended thickness for roofing application is 0.63 mm and corresponding recommended grade of coating shall be minimum 275 g/m².

2 If agreed to between the manufacturer and the purchaser for thickness 0.18 mm to 0.28 mm (both inclusive), other coating grades 180 and 120 may be used.

7.4 In addition X-ray fluorescence method (on line/off line) can also be used for the same.

Table 2 Mass of Coating (Total Both Sides)

(Clauses 7 and 9.2)

Sl No.	Grade of Coating	Minimum Average Coating Triple Spot Test g/m²	Minimum Coating Single Spot Test[1] g/m²
(1)	(2)	(3)	(4)
i)	600	600	510
ii)	450	450	380
iii)	350	350	300
iv)	275	275	235
v)	220	220	190
vi)	200	200	170
vii)	180	180	155
viii)	120	120	100

[1] Minimum individual value obtained in triple spot test.

8 BEND TEST

8.1 Test Samples

Bend test for the purpose of conformity shall be carried out at the rate of one set of 2 samples for every 1 000 plain sheets or part thereof. However, bend test shall not be applicable to GPH, GC and GCH grades of sheets intended for corrugation.

8.1.1 One bend test shall be conducted for every coil.

8.1.2 For bend test, the test piece shall be 230 mm long and 75 mm to 100 mm wide cut across the direction of rolling.

8.1.3 Specimens for bend tests shall be free from burrs. Filling or machining to remove burrs is permitted. Cracks of the base metal developing at the edge of the specimen or coarse grain developing at the line of the bend shall be disregarded.

8.2 Requirements

Samples of galvanized steel sheets selected as described in **8.1** shall withstand bending through 180° around a mandrel having diameter specified in Table 3 without peeling or flaking of zinc coating. Crack or fracture of base metal, except those indicated in **8.1.3**, shall not be permitted.

9 COATING TEST

9.1 Test Samples

One set of three samples each 50 mm²/or 50 mm diameter, shall be selected at random from one sheet for every 1 000 galvanized sheets or part thereof. In the case of the galvanized sheets produced from black sheets, one set of three samples shall be taken, two from each extremities of a diagonal and one from the middle of the sheet. Whereas in the case of galvanized sheet produced from cold-rolled coils, one set of three samples shall be taken from the middle of the width of the sheet and one from each side of the sheet. The sample from extremities, diagonal or from the side of the sheet shall not be closer than 75 mm from the edge of the sheet.

9.1.1 In case of galvanized sheet supplied in coils, one set of 3 samples, each 50 mm² or 50 mm diameter shall be selected from one end of each coil across the width.

9.2 Determination of Mass of Zinc Coating

The average masses of zinc coating of samples as selected under **9.1** and determined by the method given in IS 6745 or by any other established instrumental or chemical method shall conform to both the values specified in Table 2.

10 RETESTS

10.1 If any test sample fails to meet test requirements

Table 3 Mandrel Diameters for Bend Test

(*Clause* 8.2)

All dimensions in millimetres.

Sl No.	Grade of Coating	Diameter[1] of Mandrel for Thickness of Sheet										
		Over 3	Over 2.3 Up to 3	Over 1.6 Up to 2.3	Over 1.25 Up to 1.6	Over 1.0 Up to 1.25	Over 0.8 Up to 1.0	Over 0.5 Up to 0.8	Over 0.4 Up to 0.5	Over 0.3 Up to 0.4	Over 0.22 Up to 0.3	Over 0.16 Up to 0.22
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
i)	600	4	6	8	8	9	10	11	12	–	–	–
ii)	450	3	4	6	6	7	8	8	8	9	10	11
iii)	350	3	4	4	4	5	6	6	7	8	8	9
iv)	275	3	4	4	4	5	6	6	6	7	7	8
v)	220	2	3	3	3	4	4	4	4	5	5	5
vi)	200	2	2	2	3	3	3	3	3	4	4	4
vii)	180	2	2	2	3	3	3	3	3	3	4	4
viii)	120	2	2	2	3	3	3	3	3	3	4	4

[1] Expressed as number of times the thickness of sheet.

given in **8.2** and **9.2**, two more set of test samples shall be taken for the specific test requirements from the same lot.

10.2 If any of the retest sample fails to meet the requirements of this standard, the entire batch of the sheets represented by the sample shall be deemed as not conforming to the standard.

11 FREEDOM FROM DEFECTS

11.1 Galvanized plain sheets, corrugated sheets and coils shall be reasonably flat and free from bare spots, holes, tears and other harmful defects.

11.2 Coils, however, may contain some abnormal imperfections which render a portion of the coil unusable since the imperfections in the coil cannot be removed as in the case with cut length.

12 MASS

12.1 Mass of sheets and coils shall be given in kg, of actual or calculated mass.

12.2 The mass of sheets and coils shall be calculated as given in Table 4 on the basis of nominal dimensions and mass of zinc coating.

13 DIMENSIONS AND TOLERANCES OF PLAIN SHEETS/COILS

13.1 Sizes of Plain Sheets

The plain sheets shall be supplied in any combination of the following lengths, widths and thicknesses:

a) Length – 1 800, 2 200, 2 500, 2 800 and 3 000 mm

b) Width – 750, 900, 1 000 and 1 200 mm

c) Thickness (uncoated sheets) – 0.18, 0.22, 0.25, 0.28, 0.32, 0.40, 0.45, 0.50, 0.55, 0.63, 0.70, 0.80, 0.90, 1.00, and 1.60 mm

NOTE — Sheets for other sizes (length, width and thickness) may also be supplied subject to the mutual agreement between the purchaser and the manufacturer.

13.1.1 Unless otherwise agreed, the internal nominal diameter of sheet supplied in coil shall be 450, 510 or 610 mm.

13.2 Tolerances

13.2.1 *Length*

No sheet shall be smaller in length than that specified. Tolerances on length on plus side shall be 15 mm or 0.5 percent of length whichever is greater.

13.2.2 The diagonal distance between opposite corners of any sheet shall not differ by more than 20 mm.

13.2.3 *Width*

No plain sheet shall be smaller in width than that specified. The positive tolerances on width shall be 10 mm.

Table 4 Calculation of Mass of Sheets or Coils

(*Clause* 12.2)

Sl No.	Type of Material	Order of Calculation	Method of Calculation	Number of Numerals in Resultant Value
(1)	(2)	(3)	(4)	(5)
i)	Sheet	Mass of single sheet	Nominal mass of single sheet plus mass of zinc coating	Rounded off to 4 effective figures
		Total mass	Mass of single sheet (kg) × Number of sheets	Rounded off to integral value of kg
ii)	Coil	Unit mass of coil	Unit mass of sheet (kg/m^2) × Width (mm) × 10^{-3}	Rounded off to 3 effective figures
		Mass of single coil	Unit mass of coil (kg/m) × Length (m)	–
		Total mass (kg)	Total mass of each coil	Integral number of kg

NOTES

1 Nominal mass of single sheet shall be calculated by calculating the volume of the sheet and multiplying the same with density of sheet (density 7.85 g/cm^3) and rounding the same to 4 effective figures.

2 Mass of the coating shall be calculated by multiplying the surface area of the single sheet with indicated nominal coating mass (g/m^2) as shown for triple spot test (*see* Table 2).

3 For calculation of corrugated sheet mass, the width before corrugation considered while calculating the area.

13.2.4 *Thickness*

The tolerance on thickness of sheet and coil shall be according to IS 1079 or IS 513 as applicable.

13.2.5 *Tolerance on Mass*

The tolerance on mass of individual sheets calculated in accordance with **12.2** shall be within ±10 percent and tolerance on mass of each bundle of sheet shall be ±5 percent.

14 DIMENSIONS AND TOLERANCES OF CORRUGATED SHEETS

14.1 Sizes of Corrugated Sheets

14.1.1 *Length*

The length of the corrugated sheets shall be as follows:

1 800, 2 200, 2 500, 2 800, 3 000 and 3 050 mm.

NOTE — Sheets of other lengths may also be supplied subject to the mutual agreement between the purchaser and the manufacturer.

14.1.2 *Depth and Pitch of the Corrugations*

The depth and pitch of corrugation shall be as follows (*see* Fig. 1):

Grade	*Depth of Corrugation* mm	*Pitch of Corrugation* mm
A	17.5	75
B	12.5	75

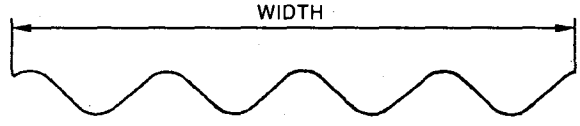
14.1.3 Number of Corrugations

The number of corrugations shall be 8, 10, 11 and 13 depending on the width of the sheet. The overall width of the corrugated sheets before and after corrugation shall be as shown in Table 5.

14.1.3.1 Sheets of sizes other than those specified above may be supplied, if agreed to between the contracting parties.

Table 5 Overall Widths and Corrugations of Sheets

(*Clause* 14.1.3)



Sl No.	Number of Corrugation	Grade	Overall Width of Sheet	
			Before Corrugation mm	After Corrugation mm
(1)	(2)	(3)	(4)	(5)
i)	8	A	750	660
ii)	10	A	900	810
iii)	11	A	1 000	910
iv)	13	A	1 200	1 110
v)	8	B	750	680
vi)	10	B	900	830
vii)	11	B	1 000	930
viii)	13	B	1 200	1 130

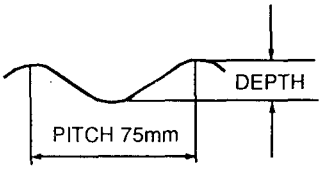


FIG. 1 DEPTH AND PITCH OF CORRUGATIONS

14.2 Tolerances

14.2.1 The tolerances on dimensions of corrugated sheet shall be as given in Table 6.

15 MARKING

15.1 Manufacturer's name or trade-mark, grade of coating, length, width, thickness and number of corrugations, grade in case of corrugated sheets and material identification (grade, quality, etc) shall legibly be marked on top of each sheet or shown on a tag attached to each bundle.

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

15.1.2 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.

Table 6 Tolerance on Dimension of Corrugated Sheets

(*Clause* 14.2.1)

Sl No.	Dimensions	Tolerance[1)]
(1)	(2)	(3)
i)	Depth of corrugation	± 2.5 mm
ii)	Pitch of corrugation	± 5 mm
iii)	Overall width after corrugation	± 25 mm

[1)] Average of 4 measurements.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Wrought Steel Products Sectional Committee, MTD 4

Organization	*Representative(s)*
The Tata Iron and Steel Co Ltd, Jamshedpur	DR T. MUKHERJEE ***(Chairman)***
All India Induction Furnace Association of India, New Delhi	SHRI R. P. VARSHNEY
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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices: Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 — 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi, KOLKATA 700054 — 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022 — 60 3843, 60 9285

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 — 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093 — 2832 9295, 2832 7858, 2832 7891, 2832 7892

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