भारतीय मानक **IS 14246 : 2024**

Indian Standard

सतत् पूर्व-रोगनीत जस्तिकृत इस्पात की चादरें एवं पत्तियाँ — विशिष्टि

(दूसरा पुनरीक्षण)

Continuously Pre-Painted Galvanized Steel Sheets and Strips — Specification

(Second Revision)

ICS 77.140.50; 91.060.20

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FOREWORD

This Indian Standard (Second 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 1995 and revised in 2013. While reviewing this 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 being followed by the Indian industry.

Pre-painted galvanized steel sheets and strips produced by coating synthetic resin/organic coating such as alkyd, epoxy, polyester, acrylic etc, on continuous paint line (CPL) covered by this standard are intended to be used for roofing, architectural siding, home appliances and other general article purposes.

In this revision the following changes have been made:

a) Scope has been modified;
b) Solvent resistance test has been added;
c) Assessment of degree of blistering has been added;
d) Requirements for salt spray resistance has been modified;
e) Clauses **4.1**, **4.2**, **4.3**, **6.1**, **6.2.3**, **9.4.1**, **9.4.2**, **10.1** and **10.2** have been modified;
f) Clauses **1.3**, **4.4**, **6.4.3**, **6.6**, **8.1** and **8.2** have been added; and
g) Clause **4.5** is added to facilitate supply of sheets of profiles if agreed to between the purchaser and the manufacturer.

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.

The Committee responsible for the formulation of this standard has reviewed the provisions of following International Standards referred in this standard and has decided that they are acceptable for use in conjunction with this standard:

International Standard	*Title*
ISO 2808 : 2019	Paints and varnishes — Determination of film thickness
ISO 4628-2 : 2016	Paints and varnishes — Evaluation of degradation of coatings. Designation of quantity and size of defects, and of intensity of uniform changes in appearance

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

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.

Indian Standard

CONTINUOUSLY PRE-PAINTED GALVANIZED STEEL SHEETS AND STRIPS — SPECIFICATION

(Second Revision)

1 SCOPE

1.1 This standard covers the requirement of continuously pre-painted hot-dip galvanized steel sheets and strips.

1.2 Sheets and strips produced by uniformly coating and baking durable organic coating, for example, alkyd, epoxy, polyester, acrylic etc, over one or both surfaces of galvanized steel sheets and strips using hot-rolled or cold-rolled steel sheets and strips as base are covered in this standard.

1.3 This standard also covers requirements for different classes of durability of paint coatings in accordance with the severity of the application.

2 REFERENCES

The standards listed in Annex D contains provision which through in the text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All the standards are subjected to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 SUPPLY OF MATERIAL

General requirement relating to the supply of pre-painted galvanized steel sheets and strips shall be as laid down in IS 8910.

4 MANUFACTURE

4.1 Steel Base

The base steel and its grade for pre-painted galvanized sheet and strip shall conform to IS 277.

4.2 Metallic Coating

The recommended grade of zinc coating shall be as per IS 277.

4.3 Organic Coating

Pre-painting shall be done on a continuous paint line by applying a conversion coating, primer, backer coat and finish coat on substrate that is galvanized steel. Curing of paint coatings shall be at a temperature suitable to produce an aesthetic and durable painted surface. While referring to Table 1, for Class 1, primer coat may not be there. For Class 2, Class 3 and Class 4, minimum primer coating for each surface shall not be less than 4 μm with specified top side coating thickness shall not be less than be 15 μm and the bottom side (backer coat) coating shall not be less than 4 μm. For Class 1, the top side coating shall not be less than 10 μm and the bottom side (backer coat) coating shall not be less than 4 μm. The triple spot organic coating thickness, that is, the average of three tests, shall not be less than 80 percent of the coating thickness specified. The single spot thickness, that is, the lowest value of the three determinations, shall not be less than 90 percent of the triple spot thickness. The double sided product shall have same organic coating system for both surfaces. Product with organic coating on one surface only is also possible and which is classified as “Class 0”.

For guidance, type and thickness of coating and applications are given in Annex A. Other coating thicknesses can be supplied as per mutual agreement between the manufacturer and the supplier.

4.4 Dry Film Thickness

This refers to the paint film thickness of the finish coat or topcoat. When measured by method as mentioned in **5B** of ISO 2808, the supplied dry film thickness of paint coating (finish coat or topcoat) shall comply with the requirements of the **4.3** of this specification or the agreement between the manufacturer and the purchaser.

4.5 Profiles

The pre-painted galvanized steel sheets of this standard may also be supplied in profiles based on mutual agreement between the purchaser and the supplier for structural applications subject to fulfillment of required condition for imposed load on roofs as per **4.2** of IS 875 (Part 2).

5 CLASSIFICATION OF DURABILITY OF ORGANIC COATING

It shall be as given in Table 1.

Table 1 Classification of Durability of Paint Coating

(*Clauses* 4.3, 5, 8.1 *and* 8.2)

Sl No.	Classification	Duration of Salt Spray Test in Hours, *Min*		Humidity Resistance (IS 101 Part 6/Sec 1)	
		Top Side	Bottom Side	Top Side	Bottom Side
(1)	(2)	(3)	(4)	(5)	(6)
i)	Class 1	350	200	350	200
ii)	Class 2	500	200	500	350
iii)	Class 3	1 000	500	1 000	500
iv)	Class 4	2 000	750	1 000	500

NOTES

1 Other durations may also be specified and agreed between the supplier and the purchaser.

2 Durability tests are for manufacturer's information only and are not necessarily mandatory at the time of production/coating.

6 TESTS FOR PHYSICAL PROPERTIES OF ORGANIC COATING

6.1 Sampling of Test Specimen

One sample for bend test, pencil hardness test, reverse impact resistance test, cross hatch adhesion and solvent resistance tests shall be taken from every 10 *t* of sheets/strips or part thereof of the same quality, dimensions, grade of zinc coating and colour. Unless otherwise specified, only one test piece shall be cut out of one sheet/strip in parallel to the rolling direction of the base metal.

6.2 Bend Test

6.2.1 Bend test shall be carried out for annealed and skin passed material.

6.2.2 The test piece shall have a width of 75 mm to 125 mm and length of 230 mm.

6.2.3 The test specimen shall be bent through an angle of 180 degree around a mandrel having diameter (times nominal thickness) specified in Table 2 with a hand vice or any other suitable means. A bench vice approximately 150 mm wide or alternative bending apparatus can also be used. The axis of the bend shall be in the direction of rolling. Bending shall be done such that top side surface is outside.

6.2.4 There shall be no peeling or cracking of paint film at the bent portion.

6.3 Pencil Hardness Test

6.3.1 Standard pencils of hardness as given in Table 2 should be used for pencil hardness test as per IS 101 (Part 5/Sec 1).

Table 2 Physical Properties of Paint Coating

(*Clauses* 6.2.3 *and* 6.3.1)

Sl No.	Test	Requirement
(1)	(2)	(3)
i)	Bend test:	
	a) For roofing, cladding and accessories; and	4 *t*
	b) For appliances and other internal applications.	2 *t*
ii)	Pencil hardness test:	
	a) For roofing and cladding; and	2 *H*
	b) For appliances and other internal applications.	*H*

NOTES

1 *t* = Nominal thickness of sample.

2 *H* = Hardness of pencil.

6.3.2 The pencil shall be sharpened so as to expose about 3 mm of lead. Holding the pencil at an angle of 90 degree to the abrasive paper grit No. 400, rub the lead against the paper maintaining an angle of 90 degree to the abrasive paper until a flat, smooth and circular cross section is obtained. The tip of the lead shall be ground flat before use for each test.

6.3.3 Place the coated panels on a level, firm horizontal surface. Holding the pencil against the panel surface at 45 degree angle, push the pencil away from the operator with moderate pressure (*see* Fig. 1).

6.3.4 On visual inspection, there shall not be scratch on the tested portion.

6.4 Impact Resistance Test

6.4.1 Place the test panel on the impact tester with the bottom side up unless specified or agreed upon. Drop a 500 g mass of weight from 600 mm height on the test panel.

6.4.2 On visual inspection there shall not be any crack or peeling of the paint film.

6.4.3 The test is applicable for minimum base cold-rolled steel thickness of 0.40 mm.

6.5 Cross Hatch Test

6.5.1 Select an area free from blemishes and other surface imperfections. Make 11 parallel straight lines at intervals of 1 mm on the test panel with a cutting tool or cutting guide so as to reach the substrate through the paint film. Eleven such straight lines shall also be made crosswise (at right angle) at an interval of 1 mm.

6.5.2 After making the required cuts, brush the film lightly with a soft brush or tissue to remove any detached flakes or nubbins of coating. Cut a piece about 75 mm long from a standard ~ 25 mm wide semi-transparent pressure sensitive tape. Place the centre of the tape over the grid of cut lines. To ensure good contact with the paint film, rub the tape firmly with finger.

6.5.3 Remove the tape by holding the free end steadily (without jerk) pulling it off as close as possible to 180 degree angle. Inspect the grid area for removal of paint film from the substrate.

6.5.4 There should not be any lifting of paint by the tape (*see* Fig. 2).

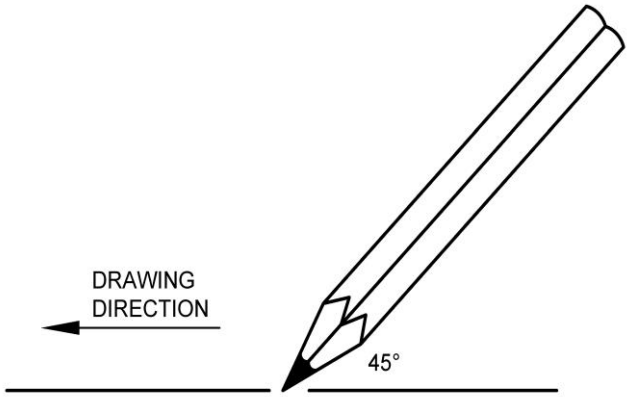

FIG. 1 PENCIL HARDNESS TEST

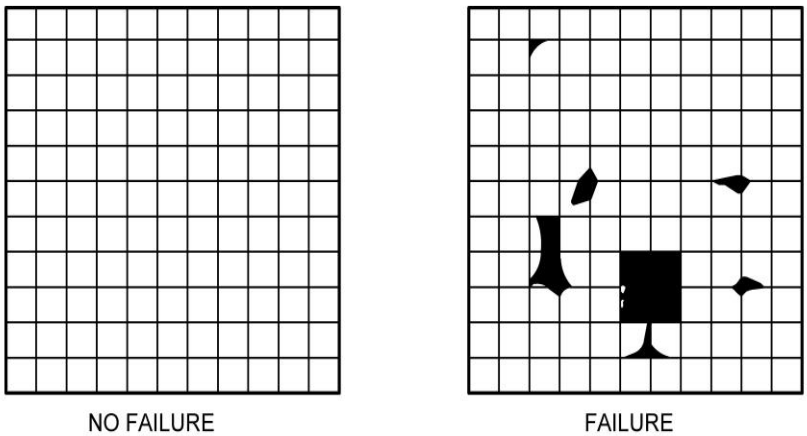

FIG. 2 CROSS HATCH TEST

6.6 Solvent Resistance Test

Solvent (Methyl Ethyl Ketone-MEK) double rub test shall be conducted on a test piece in accordance with Annex B. This is one of the measures for determination of oven paint curing process completion.

6.7 Other Tests

Any test other than those described in **6.1** may be carried out if agreed to between the manufacturer and the purchaser.

7 APPEARANCE

7.1 Pre-painted steel sheets and strips shall be reasonably flat and free from holes, tears, distinct colour differences and other defects detrimental to practical use.

7.2 Strips, however, may contain some abnormal imperfections which render a portion of the strip unusable since the imperfections in the strip cannot be removed as in case of cut lengths.

7.3 Gloss and colour of sheets and strips shall be as agreed to between the purchaser and supplier.

7.3.1 *Gloss*

Gloss of pre-painted steel product shall comply with the requirement as agreed between the supplier and the purchaser, when tested as per IS 101 (Part 4/Sec 4). Gloss unit normally do not apply to textured finishes. Gloss is dependent on the paint system. However, 10 percent to 40 percent gloss with 60 degree head is a typical range for typical pre-painted steel.

7.3.2 *Colour*

The colour shall match to standard colour specified. The degree of color match as determined by unaided visual inspection is described in Table 3. When tested in a light booth having a daylight simulator and incandescent light source, the visual color match shall achieve a rating of 2 or lower.

A more accurate instrumental measurement of color, with spectrophotometer adopting the hunter color measurement system, is also allowed for better batch-to-batch color consistency.

8 SALT SPRAY TEST (CORROSION RESISTANCE)

8.1 When suitably prepared test specimens (scribed or un-scribed, as appropriate) are exposed to the salt spray test specified in IS 9844 and Table 1 and assessed in accordance with Annex C, the pre-finished product shall comply with the requirements of Table 4.

8.2 When suitably prepared test specimens (scribed or un-scribed, as appropriate) are tested in accordance with IS 101 (Part 6/Sec 1) and Table 1 and assessed in accordance with Annex C, the pre-finished product shall comply with the requirements of Table 5.

Table 3 Degree of Color Match

(*Clause* 7.3.2)

Sl No.	Rating	Degree of Match	Explanatory Note
(1)	(2)	(3)	(4)
i)	0	Exact match	Color of test sample indistinguishable from that of reference or standard sample.
ii)	1	Critical match	A small, just perceptible colour difference can be seen when the samples are held in contact but it cannot be detected when separated by 5 mm.
iii)	2	Close match	When separated by 5 mm a small color difference can be seen, but it is undetectable when increased to 25 mm.
iv)	3	Approximate match	When separated by 20 mm a small color difference can be seen, but it is undetectable when increased to 100 mm.
v)	4	Crude match (poor match)	Difference is readily detectable even when separated by more than 100 mm.

NOTE — A standard light booth shall be used for the above qualitative measurement. These qualitative comparison measurements shall preferably be backed by color measurements with a standard spectrophotometer for high repeatability and reproducibility of colour.

Table 4 Requirements for Salt Spray Resistance

(*Clause* 8.1)

Sl No.	Type of Deterioration	Method of Test, Ref to	Requirement
(1)	(2)	(3)	(4)
i)	Undercut at scribed lines	**C-1**	Rating of 2 or less with no corrosion of base metal, no red dust formation
ii)	Corrosion of the base metal	**C-2**	Rating 0
iii)	Blistering	**C-3**	Not worse than rating 2(S3) [1)]

NOTE — Other requirement/acceptance level may be specified and agreed between the customer and the supplier.

Table 5 Requirements for Humidity Resistance

(*Clause* 8.2)

Sl No.	Type of Deterioration	Method of Test, Ref to	Requirement
(1)	(2)	(3)	(4)
i)	Undercut at scribed lines	**C-1**	Rating of 2 or less with no corrosion of base metal, no red rust formation
ii)	Blistering	**C-3**	Not worse than rating 3 (S2) [1)]

NOTE — Other requirement/acceptance level may be specified and agreed between the customer and the supplier.

9 DIMENSIONS AND TOLERANCES

9.1 The nominal thickness of sheets shall be as per IS 277 or as agreed between supplier and purchaser. Width and length (in case of sheet) shall be as agreed between the supplier and the purchaser.

9.2 In the case of strips, the internal diameter of coils shall be 450 mm or 510 mm or 610 mm as agreed between supplier and purchaser.

9.3 The mass of each pack shall not exceed 10 tonne.

9.4 Tolerances

9.4.1 *Thickness*

The tolerances on thickness sheets and strips shall be as given in IS 277.

9.4.2 *Width*

Width of the sheet or strip shall not be smaller than specified. The positive tolerance on width shall be 10 mm. The total unilateral width tolerance range may be allowed bilaterally as agreed between purchaser and supplier on mutual agreement basis.

9.4.3 *Length*

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

9.4.4 *Mass*

The tolerance on mass of individual sheets shall be within ± 10 percent and tolerance on mass of each bundle of sheets/strips shall be ± 5 percent.

9.5 Sizes and tolerances other than those specified in **9.1 9.2 9.3** and **9.4** may be supplied, if agreed to between the purchaser and the supplier.

9.6 In case of sheets of profiles the dimensions and tolerances shall be as agreed to between the purchaser and the manufacturer.

10 SHAPE

10.1 Camber

Maximum camber values for strips and sheets shall be as per IS/ISO 16163.

10.2 Deviation from Squareness (Out-of Square)

Deviation form squareness for flat sheets shall be as per IS/ISO 16163.

10.3 Deviation from Flatness

Maximum deviation from flatness (*see* Fig. 3) for cut sheets shall be as given in Table 6.

[1)] Face of panel.

Table 6 Deviations from Flatness

(*Clause* 10.3)

All dimensions in millimeters.

Sl No.	Thickness mm	Tolerances on Specified Width mm	
		Up to 1 200	Above 1 200
(1)	(2)	(3)	(4)
i)	Up to and including 0.7	15	18
ii)	Above 0.7 up to 1.6	12	15

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 weight.

FIG. 3 DEVIATION FROM FLATNESS

11 RETEST

When a part of the test results for physical properties fails to comply with the requirement, a retest (two more sets of test samples shall be taken for specific test requirements from the same lot) on the relevant items may be carried out to determine whether it is acceptable or not. If any of the retest samples fail to meet the test requirements of this standard, the entire batch of sheets represented by the sample shall be deemed as not conforming to this standard.

12 PACKING AND TRANSPORTATION

12.1 Strips and sheets should be suitably packed so as to avoid damage during transit, handling and storage.

12.2 During transportation, strip and sheet packs should be secure properly so as to avoid inter surface abrasion and damage to coating during transit.

13 STORAGE AND HANDLING

It is essential that pre-painted products be kept dry in transit and stored under cover clear of the ground. Sheet packs or strips of the product become wet, layers should be separated, wiped dry with a clean cloth and positioned so that air circulation will complete the drying process. The use of these procedures should prevent deterioration of the coating, which otherwise can lead to reduced life expectancy or poor appearance of the product.

Pre-painted products should be lifted directly and not dragged over rough surfaces or over each other. Care should also be taken to avoid dragging, cutting and forming tools over the surfaces of the pre-painted products.

Stocks of pre-painted products should be used in rotation as some mechanical properties of the coating may change slightly during prolonged storage, for example duration greater than

six months. These changes are typically small and in most fabrication processes are not significant. However, it is possible that they could cause fabrication problems during severe forming operations.

14 MARKING

14.1 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:

a) Manufacturer's name or trade-mark;

b) Material identification/coil number/ packet number/batch number etc;

c) Product dimension;

d) Number of sheets or mass;

e) Zinc coating grade;

f) Color name of top-coat; and

g) Date of packing.

14.2 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(s) may be marked with the Standard Mark.

ANNEX A

(*Foreword and Clause* 4.3)

GUIDANCE FOR THE PAINT/RESIN TYPE, COATING THICKNESS AND APPLICATIONS FOR PRE-PAINTED GALVANISED STEEL

Sl No.	*Coat*	*Paint/Resin Coat Type*	*Coating Thickness* (*micrometer*)	*Remarks*
(1)	(2)	(3)	(4)	(5)
i)	Topcoat	Epoxy	15 to 30	For external and internal applications
		Polyester polyurethane	15 to 30	For external and internal applications and appliances
		Silicon modified polyester/high durable polyester	15 to 30	For external applications requiring very good paint durability
		PVDF/PVF2	15 to 30	For external applications requiring excellent paint durability
		Plastisol	70 to 200	For bus body, railway coaches and panels. Better flexibility and corrosion resistant
		PVC	100 to 200	For internal applications and interior decoration
		Zinc rich primer coated CRCA	14 to 16 (one side) and oiling (other side)	Automobiles and railway coaches primer coated side and oiling subjected to corrosion CRCA (other side)
ii)	Back coat	Alkyd/epoxy or polyester	4 to 10	All pre-painted steel. One coat system for two coat system with primer

ANNEX B

(*Clause* 6.6)

SOLVENT RESISTANCE TEST

B-1 This procedure is to be used to determine the degree of cure of a baked film by the paint films resistance to a specified solvent. This procedure is applicable whenever the resistance to Methyl Ethyl Ketone (MEK) or Methyl ISO-Butyl Ketone (MIBK) has to be determined.

B-2 PRINCIPLE

The determination of solvent resistance is carried out by using a double rub Machine. This machine rubs the test piece/panel with cotton doused in MEK or MIBK.

B-3 APPARATUS

a) Fume cupboard;
b) Protective gloves;
c) Cotton pad (~ 50 mm square);
d) Solvent (MEK or MIBK); and
e) Solvent double rub machine.

B-4 PREPARATION OF TEST PIECE

A panel of minimum size 60 mm × 200 mm is prepared from the production test sample to be tested face up in the solvent rub machine.

B-5 PROCEDURE

B-5.1 Clamp the panel of minimum size 60 mm × 200 mm in the solvent rub machine.

B-5.2 Place a 50 mm square cotton pad between the magnetic holders on the bottom of the solvent rub machine head.

B-5.3 Fill the reservoir with recommended solvent — MEK for topcoats and bottom coats or MIBK for primer evaluations.

B-5.4 Start the machine with minimum 1 kg load and stop it based on observations mentioned in following item **6**.

B-6 EVALUATIONS

B-6.1 Observe the operation of the solvent rub machine and stop the machine when failure has occurred. Failure shall consist of removal of the film to expose the primer or substrate at any spot along the centre-line of the double-rub stroke. The first and the last 25 mm of the stroke shall not be considered.

B-6.2 The solvent resistance of the organic coating is classified as the number of strokes the machine has made prior to failure of the organic coating.

B-6.3 The number of rubs required is dependent on the paint system. However, completion of 50 double rubs is sufficient for the test of standard paint system (for durability Class 2, Class 3 and Class 4). Failure of the paint film at less than 50 double rubs is an indication of a “problem”.

ANNEX C

(*Clauses* 8.1, 8.2 *and Table* 4)

METHODS OF ASSESSMENT OF SALT SPRAY AND HUMIDITY TEST RESULT

C-1 UNDERCUT AT SCRIBED LINES

C-1.1 This method describes the assessment of the degree of deterioration for a metal substrate that has been coated by a paint system.

C-1.2 Principle

Coated test panels are exposed to an accelerated corrosive (Salt Spray Test) or humid (Humidity Test) environment. The corrosion on the surface of the paint film and on the metal surface beneath the paint film is assessed by comparison with photographic reference standards and rating table.

C-1.3 Procedure

a) Remove loose corrosion products and any coating that has lost adhesion from the vicinity of the scribed line by scraping with a metal spatula or dull knife; and

b) Rate the mean creepage of undercut corrosion or loss of paint extending from the scribed line, as prescribed in Table 7.

C-2 CORROSION OF THE BASE METAL

C-2.1 This method describes the assessment of the degree of deterioration for a metal substrate that has been coated by a paint system.

C-2.2 Principle

Coated test panels are exposed to an accelerated corrosive environment. The corrosion on the metal surface beneath the paint film is assessed by comparison with photographic reference standards.

C-2.3 Procedure

a) Carefully remove a portion or whole of the paint film using a suitable solvent-based paint remover; and

b) Determine the severity of corrosion by referring to the pictorial standards in the following Fig. 4.

C-3 BLISTERING

C-3.1 This Annex sets out a method for determining the degree of blistering in a paint film exposed to accelerated weathering conditions.

C-3.2 Principle

The test is visually evaluated for the degree of blistering by comparing with diagram reference standards, which shows rated stages of blistering.

NOTE — The diagram reference standards have been adopted from ISO 4628-2.

C-3.3 Apparatus

Diagram standards (*see* Fig. 5, Fig. 6 and Fig. 7) — Required for comparison with the test film.

C-3.4 Viewing Environment

Examination of the films should be carried out under lighting conditions of at least 500 lux or lumen per square metre.

C-3.5 Procedure

a) Visually examine the test film by comparing the surface finish with the reference diagram standards (*see* **C-3.2**) that shows a similar amount of blistering;

b) Using Table 8 determine the rating for density of blistering and Table 9 for the size of blistering; and

c) Record the rating as for example, 2 (S3) where 2 stands for density and S3 stands for size of blister.

Table 7 Rating for Failure at Scribe and Panel Edge

(*Clause* C-1.3)

Sl No.	Rating Scale	Representative Mean Creepage of Under Film Corrosion from Scribed Line mm
(1)	(2)	(3)
i)	0	0
ii)	1	> 0 ≤ .1.0
iii)	2	> 1.0 ≤ 3.0
iv)	3	> 3.0 ≤ 7.0
v)	4	> 7.0 ≤ 13.0
vi)	5	> 13

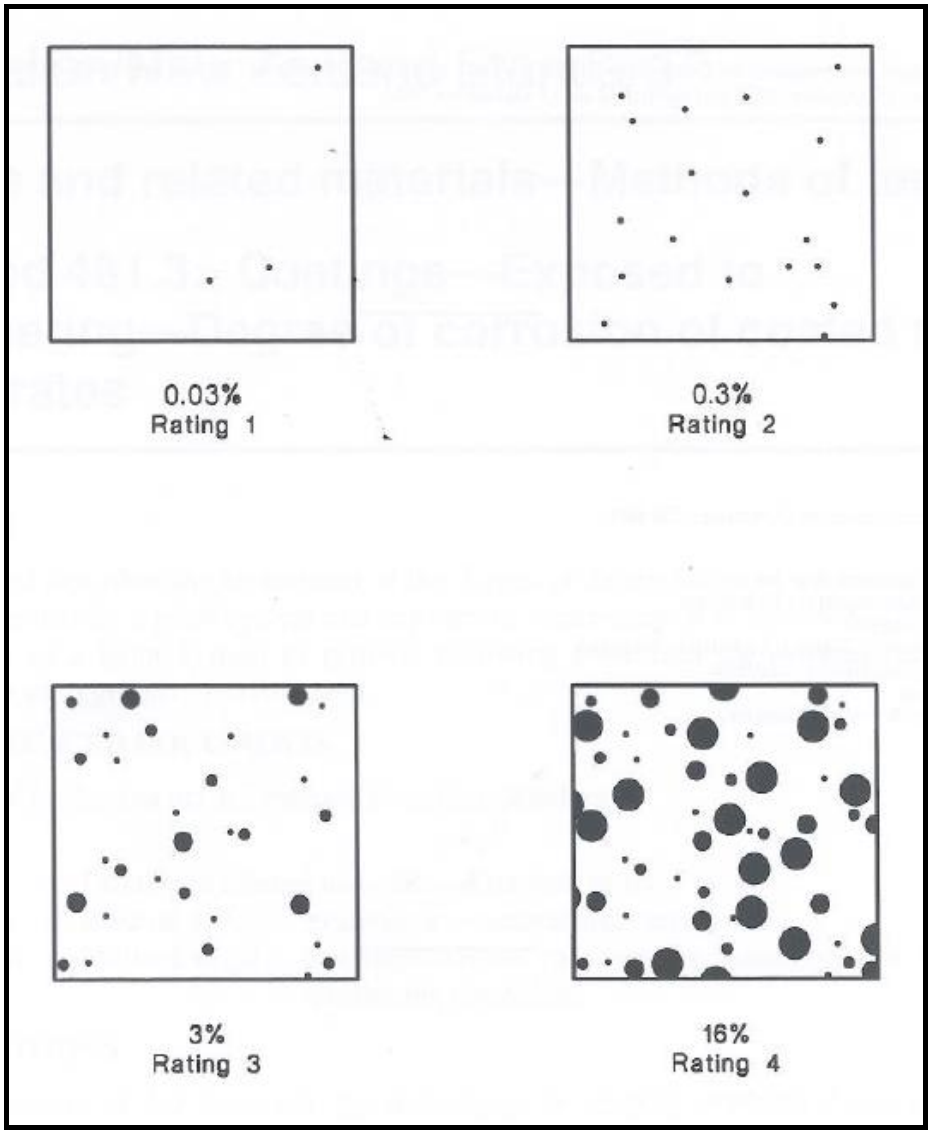

FIG. 4 TYPICAL CORROSION ON THE STRIPPED METAL SUBSTRATE

Table 8 Rating for Density of Blistering

(*Clause* C-3.5)

Sl No.	Rating Scale [1)]	Density of Blistering
(1)	(2)	(3)
i)	0	None
ii)	1	Less than few
iii)	2	Few
iv)	3	Medium
v)	4	Medium-dense
vi)	5	Dense

Table 9 Rating for Size of Blisters

(*Clause* C-3.5)

Sl No.	Rating Scale [1)]	Size of Blistering
(1)	(2)	(3)
i)	1	Finer than in Fig. 5
ii)	2	*See* Fig. 5
iii)	3	*See* Fig. 6
iv)	4	*See* Fig. 7

[1)] The rating scale conforms to current ISO practice.

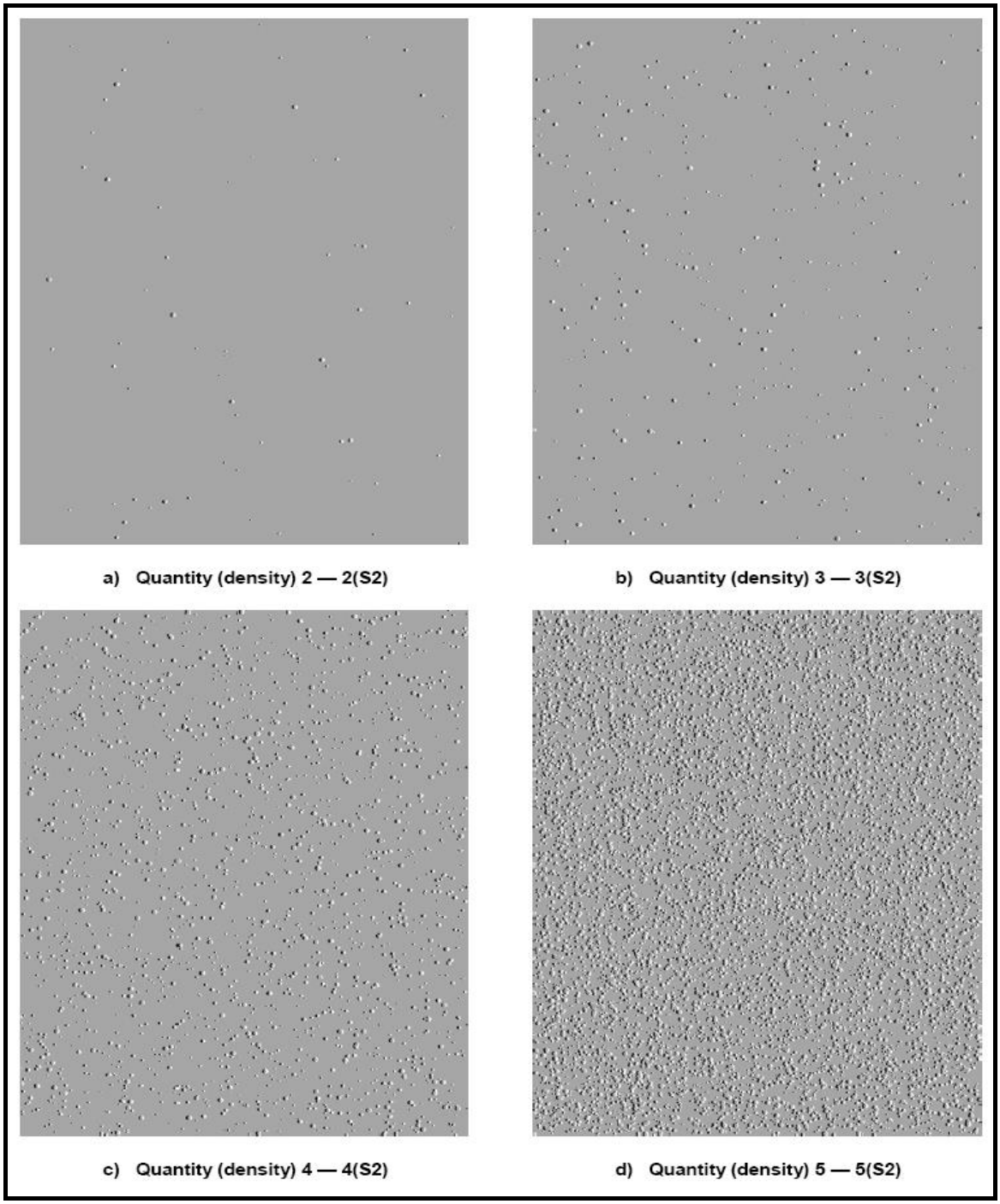

FIG. 5 BLISTERS OF SIZE 2

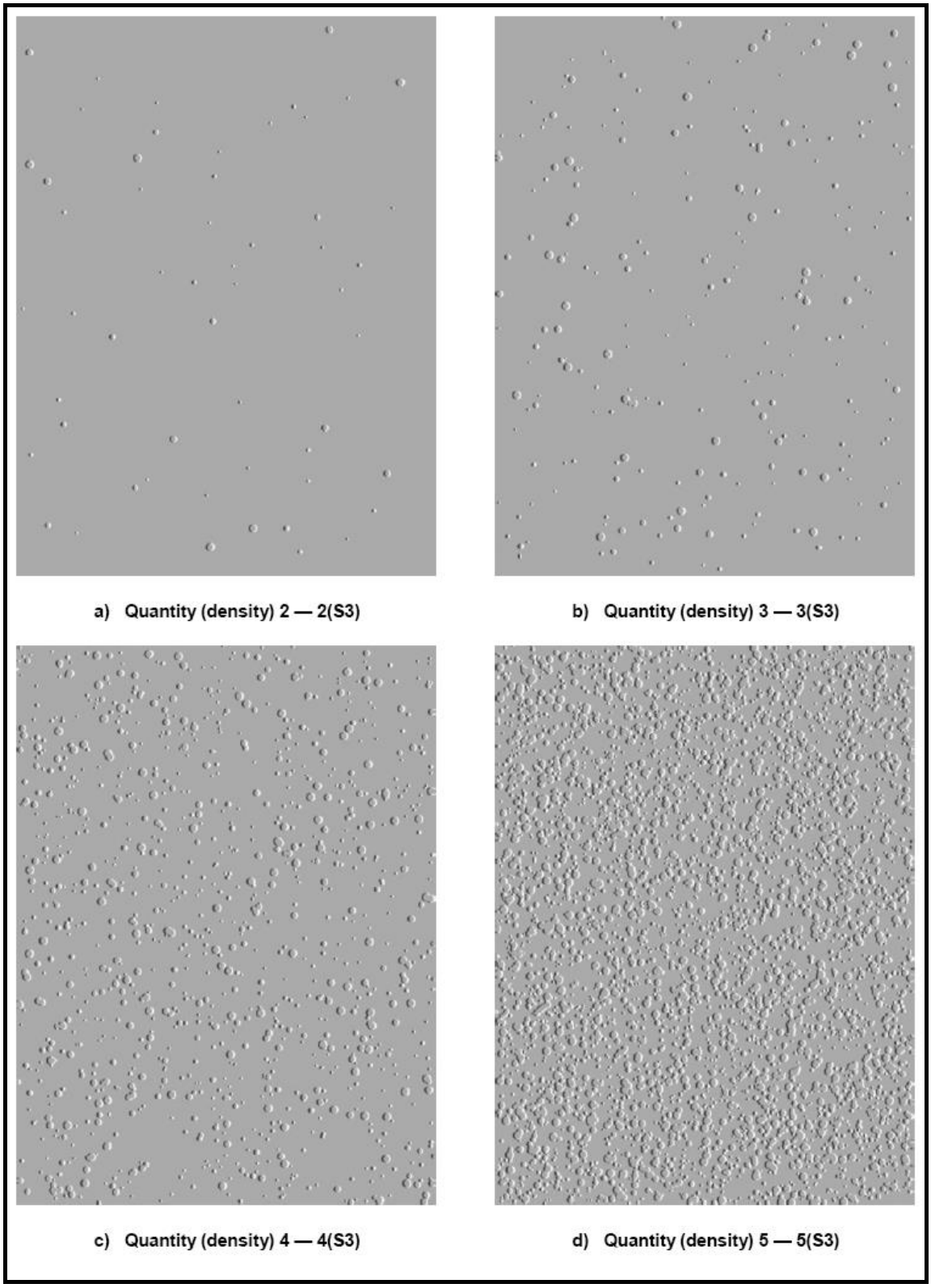

FIG. 6 BLISTERS OF SIZE 3

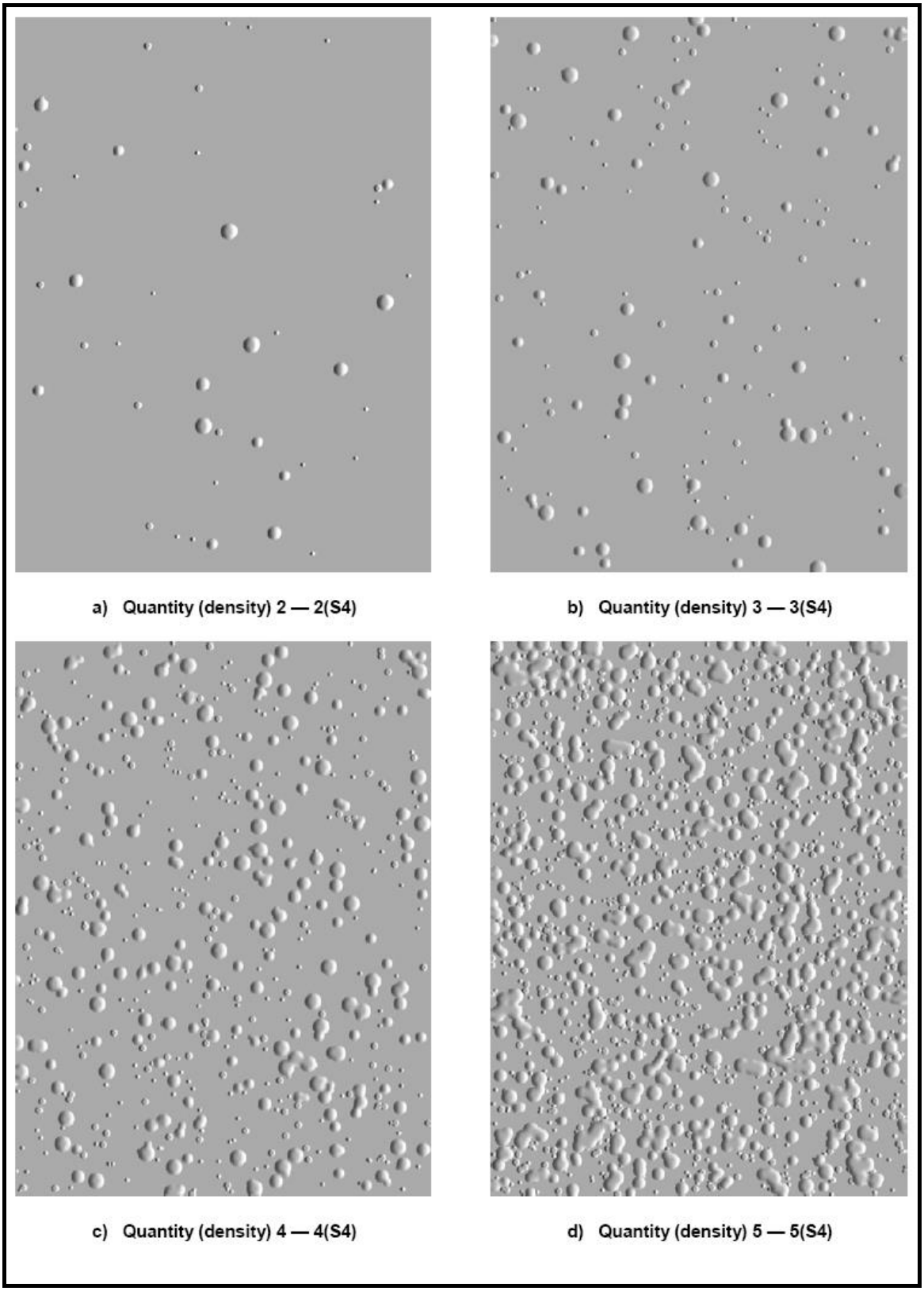

FIG. 7 BLISTERS OF SIZE 4

ANNEX D

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No./Other Standards	*Title*
IS 101	Methods of sampling and test for paints, varnishes and related products:
(Part 4/Sec 4) : 2020/ISO 2813 : 2014	Optical test, Section 4 Gloss — Determination of gloss value at 20°, 60° and 85° (*fourth revision*)
(Part 5)	Mechanical test on paint films,
(Sec 1) : 1988	Hardness tests (*third revision*)
(Sec 2) : 1988	Flexibility and adhesion (*third revision*)
(Part 6/Sec 1) : 1988	Durability tests, Section 1 Resistance to humidity under conditions of condensation (*third revision*)
IS 277 : 2018	Galvanized steel strips and sheets (plain and corrugated) — Specification (*seventh revision*)
IS 875 (Part 2) : 1987	Code of practice for design loads (other than earthquake) for buildings and structures: Part 2 Imposed loads (s*econd revision*)
IS 8910 : 2022/ ISO 404 : 2013	Steel and steel products — General technical delivery requirements (*second revision*)
IS 9844 : 1981	Methods of testing corrosion resistance of electroplated and anodized aluminium coatings by neutral salt spray test
IS/ISO 16163 : 2012	Continuously hot-dipped coated steel sheet products — Dimensional and shape tolerances (*first revision*)
ISO 2808 : 2019	Paints and varnishes — Determination of film thickness
ISO 4628-2 : 2016	Paints and varnishes — Evaluation of degradation of coatings Designation of quantity and size of defects, and of intensity of uniform changes in appearance

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Wrought Steel Products Sectional Committee, MTD 04

Organization	*Representative(s)*
SAIL, Research & Development Center for Iron & Steel, Ranchi	SHRI NIRVIK BANERJEE **(*Chairperson*)**
AM/NS Steel Hazira, Surat	SHRI DEEPAK GUPTA SHRI KALPESH DAVE (*Alternate*)
Bharat Heavy Electrical Ltd, Bhopal	SHRI S. K. MAHAJAN SHRI ARUN KHARE (*Alternate*)
Cold Rolled Steel Manufacturers Association of India, New Delhi	SHRI SHIVAJEE PATHAK SHRI N. K. SOOD (*Alternate*)
Jindal Steel & Power Ltd (JSPL), Raigarh	SHRI MORESHWAR BORKAR SHRI JOY DUTTA (*Alternate*)
JSW Ltd, Bellary	SHRI DEVASISH MISHRA SHRI G. V. RAMANA (*Alternate*)
JSW Steel Ltd, Dolvi/Salem	SHRI SUBHASIS CHAKRABORTY SHRI B. M. HASAN (*Alternate*)
Ministry of Defence (DGQA), Ichapur	SHRI K. YADAV SHRI G. SUBBA RAO (*Alternate*)
Ministry of Shipping, New Delhi	SHRI ANIL PRUTHI SHRI RAMJI SINGH (*Alternate*)
Ministry of Steel (Government of India), New Delhi	SHRI PRAMJEET SINGH SHRI BHAGIRATHI PRADHAN (*Alternate*)
Rashtriya Ispat Nigam Limited, Vizag	SHRIMATI RUCHIRA GUPTA SHRI SHANKAR JEE (*Alternate*)
Research Designs and Standards Organization (RDSO), Lucknow	SHRI MANOJ KUMAR GUPTA SHRI SALISH ORAON (*Alternate*)
SAIL, Bhilai Steel Plant, Bhilai	SHRI SHRIRANG KHANKHOJE SHRI K. V. SHANKAR (*Alternate*)
SAIL, Bokaro Steel Plant, Bokaro	SHRIMATI BISWASI SUNITA MINZ SHRIMATI ROSELIN DODRAE (*Alternate*)
SAIL, Research & Development Center for Iron & Steel, Ranchi	SHRI P. PATHAK SHRI S. SRIKANTH (*Alternate*)
SAIL, Rourkela Steel Plant, Rourkela	SHRI KUNTAL PATWARI SHRI RAMAKRISHNAN P. (*Alternate*)
Society of Indian Automobile Manufacturers (SIAM), New Delhi	SHRI AMIT SHRI KANISHKA CHANA (*Alternate*)

Organization	*Representative(s)*
Steel Authority of India Limited, IISCO Steel Plant, Barddhaman	SHRI A. DASGUPTA SHRI SAIKAT DE (*Alternate*)
Tata Blue Scope Steel Ltd, Pune	SHRI VED PRAKASH
Tata Motors Ltd, Pune	SHRI LOKESH PALIWAL SHRI TUSHAR BAVISKAR (*Alternate*)
Tata Steel Ltd, Jamshedpur	SHRI AVTAR SINGH SAINI SHRI SUDIPTO SARKAR (*Alternate*)
The Tinplate Company of India Limited, Jamshedpur	DR SOURAJYOTI DEY SHRI SUBRATA SADHU (*Alternate*)
Thyssenkrupp Electrical Steel India Private Limited, Nashik	SHRI KAPIL KAPOOR
BIS Directorate General	SHRI SANJIV MAINI, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (METALLURGICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI ARUN PUCCHAKAYALA
SCIENTIST 'D'/JOINT DIRECTOR
(METALLURGICAL ENGINEERING), BIS

Flat Steel Products Subcommittee, MTD 04 : 03

Organization	*Representative(s)*
Tata Steel Limited, Kolkata	SHRI AVTAR SINGH SAINI **(*Convener*)**
AM/NS India, Hazira	SHRI DEEPAK GUPTA SHRI KALPESH DAVE (*Alternate*)
Ashok Leyland Limited, Chennai	SHRI RAVISHANKAR S.
Central Power Research Institute, Bengaluru	SHRI G. KISHORE KUMAR SHRI R. K. KUMAR (*Alternate*)
Cold Rolled Steel Manufacturers Association of India, New Delhi	SHRI SHIVAJEE PATHAK SHRI N. K. SOOD (*Alternate*)
CSIR – National Metallurgical Laboratory, Jamshedpur	SHRI MAINAK GHOSH DR GOPI KISHOR MANDAL (*Alternate*)
Indian Transformers Manufacturers Association, Ghaziabad	SHRI B. LAL SHRI A. K. KAUL (*Alternate*)
Institute of Steel Development and Growth, Kolkata	SHRI P. L. RAO SHRI SAJAL KUMAR GHORAI (*Alternate*)
ISGEC Heavy Engineering Limited, Noida	SHRI DAAN SINGH
IZA India (International Zinc Association), New Delhi	DR RAHUL SHARMA SHRI KENNETH DE SOUZA (*Alternate*)
JSW, Salem	SHRI S. SIVAKUMAR
JSW Steel Limited, Bellary/Tarapur	SHRI DEVASISH MISHRA SHRI CHANCHAL KUMAR KARMAKAR (*Alternate* I) SHRI G. V. RAMANA (*Alternate* II)
JSW Steel Limited, Raigad	SHRI PANKAJ KHASNE SHRI ATUL THORAT (*Alternate*)
Jindal Steel and Power Limited, Raigarh	SHRI MORESHWAR BORKAR SHRI JOY DUTTA (*Alternate*)
Ministry of Steel, New Delhi	SHRI PARMJEET SINGH SHRI BHAGIRATHI PRADHAN (*Alternate*)
POSCO Maharashtra Steel Private Limited, Raigad	SHRI YOGESH SONAWANE SHRI SUDHIR BADGAL (*Alternate*)
Power Grid Corporation of India, Gurugram	SHRI MANOJ KUMAR GUPTA SHRI DEEPAK KUMAR SAHOO (*Alternate*)
Research Designs and Standards Organization (RDSO), Lucknow	SHRI MANOJ KUMAR GUPTA SHRI SHAILESH ORAON (*Alternate*)
Society of Indian Automobile Manufacturers (SIAM), Delhi	SHRI AMIT KUMAR MS KANISHKA CHANA (*Alternate*)

Organization	*Representative(s)*
Steel Authority Of India Limited (SAIL), Research & Development Centre for Iron & Steel, Ranchi	SHRI SANTOSH KUMAR SHRI K. A. ANAND (*Alternate*)
Steel Authority of India Limited (SAIL) Rourkela Steel Plant, Rourkela	SHRI KUNTAL PATWARI SHRI RAMAKRISHNAN R. (*Alternate*)
Steel Authority of India Limited, Bhilai Steel Plant, Bhilai	SHRI SUDHIR RAMAKRISHNA SHRI RAJAT C. BARMATE (*Alternate*)
Steel Authority of India Limited, Bokaro Steel Plant, Bokaro	SHRI BISWASI SUNITA MINZ
Tata Blue Scope Steel Private Limited, Jamshedpur	SHRI VED PRAKASH
Tata Motors Limited, Pune	SHRI LOKESH PALIWAL SHRI TUSHAR BAVISKAR (*Alternate*)
Tata Steel Limited, Jamshedpur	SHRI G. SENTHIL KUMAR
The Tinplate Company of India Limited, Jamshedpur	DR SOURAJYOTI DEY SHRI SUBRATA SADHU (*Alternate*)
Thyssenkrupp Electrical Steel India Private Limited, Nashik	SHRI KAPIL KAPOOR

Panel for Formulation of Standards on Cold-Reduced and Coated Flat Steel Products, MTD 04 : Panel 11

Organization	*Representative(s)*
Tata Steel Limited, Jamshedpur	SHRI AVTAR SINGH SAINI **(*Convener*)**
AM/NS India, Hazira	SHRI DEEPAK GUPTA SHRI MOHAMMED BASHA TAPPA (*Alternate*)
Cold Rolled Steel Manufacturers Association of India, New Delhi	SHRI SHIVAJEE PATHAK SHRI N. K. SOOD (*Alternate*)
IZA India (International Zinc Association), New Delhi	SHRI KENNETH DE SOUZA
JSW Steel Coated Products Limited, Tarapur	SHRI CHANCHAL KUMAR
JSW Steel Limited, Bellary	SHRI DEVASISH MISHRA SHRI G. V. RAMANA (*Alternate*)
Maruti Suzuki India Limited, Gurugram	SHRI ABHINANDAN NAULAKHA
POSCO Maharashtra Steel Private Limited, Raigad	SHRI YOGESH SONAWANE SHRI SUDHIR BADGAL (*Alternate*)
Society of Indian Automobile Manufacturers (SIAM), Delhi	SHRI AMIT KUMAR SHRIMATI KANISHKA CHANA (*Alternate*)
Steel Authority of India Limited, Bokaro Steel Plant, Bokaro	SHIRMATI BISWASI SUNITA MINZ
Volkswagen India Private Limited, Mumbai	SHRI DINESH JOSHI SHRI KEDAR BHIDE (*Alternate*)

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