

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 1992 (1979): Electroplated coatings of lead [MTD 24: Corrosion Protection]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



IS : 1992 - 1979

Indian Standard
SPECIFICATION FOR
ELECTROPLATED COATINGS OF LEAD
(*First Revision*)

REAFFIRMED

MAR 2006

First Reprint AUGUST 1996

UDC 621.487

© *Copyright* 1979

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

Gr 3

April 1979

**AMENDMENT NO. 1 JUNE 1999
TO
IS 1992 : 1979 SPECIFICATION FOR
ELECTROPLATED COATINGS OF LEAD**

(*First Revision*)

(*Page 4, clause 4.1.1*) — Substitute the following for the existing clause:

'4.4.1 Normally copper undercoat of 2.5 micron (*Min*), is required for all grades of lead plating.'

(*Page 5, Table 1*) — Substitute the following table for the existing:

Table 1 Thickness of Lead Plating

Grade	Designation	Thickness <i>Min</i> , Microns	Applications Area
4	FeCuPb40 or CuPb40	40	Accumulator fittings and other parts exposed to sulphuric acid and other industrial aggressive chemicals
3	FeCuPb25 or CuPb25	25	Outdoor exposures
2	FeCuPb12 or CuPb12	12	Mild outdoor exposures
1	FeCuPb6 or CuPb6	6	Indoor exposures

(*Page 6, clause 8.2.1*) — Substitute the following for the existing clause:

'8.2.1 Stress Relieving Before Plating — Severely cold-worked steel parts made from steel of tensile strength of 980 MPa (100 kg/mm² or corresponding hardness of 30 HRC or 295 HV or 280 HB or above), which have been ground or subjected to severe machining after tempering, should normally be stress relieved at a temperature 190 ± 10°C for 5 h.'

(*Page 6, foot-notes*) — Delete the second footnote

(*Page 9, clause B-4*) — Substitute ' $\frac{M}{A} \times 8.882$ ' for the existing.

(MTD 20)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR ELECTROPLATED COATINGS OF LEAD

(*First Revision*)

Metallic Finishes Sectional Committee, SMDC 23

<i>Chairman</i>	<i>Representing</i>
DR S. KRISHNAMURTHY	Indian Telephone Industries Ltd, Bangalore
<i>Members</i>	
DR S. L. N. ACHARAJULU	Ministry of Defence (R & D)
SHRI I. N. BHATIA (<i>Alternate</i>)	Ministry of Railways
ASSISTANT DIRECTOR (CHEM), RESEARCH, DESIGNS AND STANDARDS ORGANIZATION, LUCKNOW	
CHEMIST & METALLURGIST, INTEGRAL COACH FACTORY, PERAMBUR (<i>Alternate</i>)	
SHRI K. BALAKRISHNAN	Central Electrochemical Research Institute (CSIR), Karaikudi
SHRI S. R. NATARAJAN (<i>Alternate</i>)	
SHRI M. Y. BORKER	Ministry of Defence (DGI)
SHRI P. K. SEN (<i>Alternate</i>)	
SHRI M. S. CHAKRAVORTY	Premier Metal Finishers (P) Ltd, Calcutta
SHRI AHINDRA CHATTERJEE	Canning Mitra Phoenix Ltd, Bombay
SHRI S. V. KULKARNI (<i>Alternate</i>)	
SHRI D. K. CHATTERJEE	Sen-Raleigh Ltd, Asansol
SHRI O. P. CHHABRA	Bharat Heavy Electricals Ltd, Ranipur, Hardwar
SHRI R. M. SINGHAL (<i>Alternate</i>)	
SHRI KANTILAL T. DALAL	Kohinoor Electro-Gilders, Bombay
SHRI JAYENDRA K. DALAL (<i>Alternate</i>)	
SHRI P. K. DESHPANDE	The Premier Automobiles Ltd, Bombay
SHRI A. G. PRABHU (<i>Alternate</i>)	
SHRI C. P. DEY	Hindustan Motors Ltd, Calcutta
SHRI M. Z. KHAN	Geep Flashlight Industries Ltd, Allahabad
SHRI K. A. SIDDIQUI (<i>Alternate</i>)	
SHRI V. S. KULKARNI	Grauer and Weil (India) Ltd, Bombay
SHRI SUBHIL GOINKA (<i>Alternate</i>)	
SHRI S. PANGHAPAKESAN	T. I. Cycles of India, Madras
SHRI R. VENKATARAMAN (<i>Alternate</i>)	

(*Continued on page 2*)

© Copyright 1979

BUREAU OF INDIAN STANDARDS

This publication is protected under the *Indian Copyright Act (XIV of 1957)* and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

IS : 1992 - 1979

(Continued from page 1)

Members

SHRI S. K. RAY

SHRI S. K. ROY

DEPUTY GENERAL MANAGER (Alternate)

SHRI R. SEN

SHRI KALYAN GHOSH (Alternate)

SHRI R. A. SHAH

KUMARI MRIDULA A. SHAH (Alternate)

DR R. C. SHARMA

SHRI V. THIYAGARAJAN

SHRI C. R. RAMA RAO,

Director (Struc & Met)

Representing

**National Metallurgical Laboratory (CSIR),
Jamshedpur**

Indian Posts & Telegraphs Department, Calcutta

**Hindustan Cables Ltd, Rupnarainpur (Dist
Burdwan)**

Ronuk Industries Ltd, Bombay

Eveready Flashlight Company, Lucknow

**Development Commissioner (Small Industries
Services Institute), New Delhi**

Director General, ISI (Ex-officio Member)

Secretary

SHRI S. L. BALI

Deputy Director (Metals), ISI

Indian Standard
**SPECIFICATION FOR
ELECTROPLATED COATINGS OF LEAD**
(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 30 January 1979, after the draft finalized by the Metallic Finishes Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 The appearance and properties of lead, limit its commercial use in electroplating largely to the field of corrosion protection. Lead-plated articles can be stamped and machined without distortion. The use of electroplated lead coating is increasing for protection of articles made of steel, copper and copper base alloys against certain acids, corrosive liquids and atmospheres. It is also used as a substitute for the more expensive and less easily available metals.

0.3 This standard was earlier published in 1962. Need was felt for reviewing this standard. Consequently the following modifications have been made:

- a) Table on thickness has been modified,
- b) Method for designating coatings has been changed,
- c) Copper has been included as a basis metal for lead plating apart from steel,
- d) Reference has been made to IS : 3203-1965* for determination of local thickness of lead plating and subsequently Appendix A has been deleted,
- e) Average thickness in case of sheet and strip has been specified and method of determination modified,
- f) Clause on heat treatment of steels prior to electroplating has been introduced, and
- g) Clause on porosity was deleted as it was found to be redundant in view of the corrosion test already specified.

*Methods of testing local thickness of electroplated coatings.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the tests and requirements for electroplated coatings of lead on steel, copper and copper base alloys.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definition shall apply.

2.1 Significant Surface — The part of the surface which is to be covered by the coating, which is essential to the appearance and serviceability of the article and which is indicated in the drawing or suitably marked on a sample, with particular reference to the surface subjected to wear and corrosion; it shall be a part of the surface that may be touched within a sphere of 20 mm diameter.

3. GRADES AND PLATING THICKNESSES

3.1 The following grades are specified in the standard:

Grade 4 For accumulator fittings

Grade 3 For outdoor exposure

Grade 2 For mild outdoor exposure

Grade 1 For indoor exposure

3.2 Coating Designation — The coating designation includes the chemical symbol Fe for iron and steel and Cu for copper and copper alloy as the basis metal and a number indicating the minimum thickness of lead coating. For example, 25 μm of lead on copper is designated as CuPb25.

4. THICKNESS

4.1 The thickness of 4 grades of lead plating shall be as specified in Table 1.

4.1.1 Wherever necessary, a flash coating of copper (about 1 μm) may be given, by agreement between the purchaser and the plater.

*Rules for rounding off numerical values (revised).

TABLE 1 THICKNESS OF LEAD PLATING
(Clause 4.1)

GRADE	DESIGNATION	LOCAL THICKNESS, <i>Min</i>	AVERAGE THICKNESS, <i>Min</i>
(1)	(2)	(3)	(4)
		μm	μm
4	FePb75 or CuPb75	75	110
3	FePb25 or CuPb25	25	35
2	FePb15 or CuPb15	15	25
1	FePb8 or CuPb8	8	12

4.1.2 In the case of lead-plated strips or sheets, the average thickness of the plating on the specimens of area 15 cm^2 shall be not less than the minimum value specified for the appropriate grade given in Table 1, regardless of the portion from which the specimen is cut.

5. MATERIALS AND WORKMANSHIP

5.1 Materials — The materials for lead plating shall be such as to produce a coating conforming to the requirements of this specification.

5.2 Workmanship — The basis metal shall be substantially free from defects that are detrimental to the appearance or protective value of the plating.

6. PLATING

6.1 Application — Lead shall be deposited on the specified basis metal with an undercoat of copper, if necessary.

6.2 Quality of Plating — The plating shall appear as a smooth and continuous envelope over the basis metal and shall be free from blisters, pores and other defects visible to the naked eye, which may affect the protection against corrosion (see Appendix A).

7. TESTS

7.0 Classification of Tests — The tests shall be classified as routine tests and referee tests. The former are intended for quality control purposes and for normal acceptance. The latter, which are more accurate tests, are intended for use in case of dispute between the manufacturer and the purchaser.

7.1 Routine Tests

7.1.1 Local Thickness of Lead Plating by BNF Jet Test — The thickness of lead plating shall be determined by the BNF jet test as described in IS : 3203-1965*.

7.1.2 Local Thickness of Lead Plating by Magnetic Method (for Coatings on Steel only) — The thickness of plating on steel may be determined by using a magnetic thickness tester.

7.1.3 Average Thickness of Lead Plating on Strips and Sheets — In the case of lead plating on strips and sheets, the method specified in Appendix B is recommended for determination of thickness.

7.2 Referee Test

7.2.1 Thickness of Plating by Microscopic Method — The thickness of lead plating shall be determined by the microscopic method on the cross sections taken perpendicular to the significant surfaces as specified in IS : 3203-1965*.

8. CORROSION RESISTANCE

8.1 The lead coating shall not show any appreciable corrosion on significant surfaces after continuous exposure to salt spray, as described in Appendix C, for periods specified below:

Grade 4	200 hours
Grade 3	96 hours
Grade 2	48 hours
Grade 1	24 hours

8.1.1 Appreciable corrosion shall mean the appearance of more than six rust spots per 9 dm² or more than two rust spots on parts having an area less than 3 dm² on surfaces tested in accordance with the procedure laid down in Appendix C for the appropriate periods as specified in 8.1. Only such spots which may be clearly seen by the unaided eye and are larger than 1.5 mm in diameter, shall be counted for this purpose.

8.2 Heat Treatment — When required by the purchaser, heat treatment as described in 8.2.1 and 8.2.2 shall be carried out to reduce risk of damage due to hydrogen embrittlement.

8.2.1 Stress Relief Before Plating — Severely cold-worked steel parts or parts made from steel of tensile strength of 980 MPa (100 kgf/mm² or of corresponding hardness†) or above, which have been ground or subjected to severe machining after tempering, should normally be stress-relieved.

*Methods of testing local thickness of electroplated coatings.
†30 HRC or 295 HV or 280 HB (approximate values).

As a guide, they may be maintained at the highest temperature within the limit imposed by the tempering temperature for 30 minutes, or maintained at a temperature 190 to 210°C for not less than 1 hour.

8.2.1.1 Some steels which have been carburized, flame-hardened or induction-hardened and subsequently ground, would be impaired by the above treatment and should instead be stress-relieved at a lower temperature, say, at 170°C for not less than 1 hour.

8.2.2 De-embrittlement Treatment After Plating — Components subjected to fatigue or sustained loading stresses in service and made from severely cold-worked steels or from steels of tensile strength 980 MPa (100 kgf/mm²) (or of corresponding hardness*) or above, and which are not to be subsequently case-hardened, heat-treated or brazed, should be subjected to de-embrittlement treatment. Guidance is given in Appendix D.

8.2.2.1 Where the proposed temperature would be harmful, for example, for some surface-hardened parts, a lower temperature for a longer time may be required.

9. SAMPLING AND INSPECTION

9.1 Sampling for Production Control — Statistical quality control is recommended for controlling the quality of lead plating. For this purpose it is recommended that samples for tests should be taken from a place in the plating bath where the thickness of deposit is expected to be minimum. The appropriate tests as specified in 7 shall be conducted on such samples.

9.2 Sampling for Acceptance of a Lot — For the purpose of acceptance sampling, a lot shall be such divided into sub-lots consisting of 100 articles or part thereof of such articles as are electroplated at one time in the same bath. Two samples shall be selected from each sub-lot and subjected to the appropriate tests as specified in 7.1.

9.2.1 Criteria for Acceptance — If these samples pass the tests, the sub-lot represented by them shall be accepted. If one or both the samples should fail, two further samples shall be selected from the same sub-lot and subjected to the tests. If these latter samples pass the tests, the sub-lot shall be accepted. If any of the second set of samples fails in any test, the sub-lot shall be rejected.

10. MARKING

10.1 The marking related to the coating shall include service grade and classification numbers as specified in this standard and the name or trade-mark of the manufacturer.

*30 HRC or 295 HV or 280 HB (approximate values).

10.2 BIS Certification Marking

The product may also be marked with Standard Mark.

10.2.1 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 Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

A P P E N D I X A

(*Clause 6.2*)

SUGGESTIONS FOR MEETING THE SPECIFICATIONS AS TO THICKNESS AND QUALITY OF THE COATINGS

- a) Ensure that the basis metal is properly cleaned.
- b) Use anodes of high purity, such as 99.9 percent lead for lead plating (*see IS : 2604-1979**).
- c) To avoid buildup of impurities, work pieces should not remain in the bath unless current is flowing.
- d) Filtration should be continuous.
- e) Agitation should be employed. Lead baths should be agitated continuously to prevent concentration and temperature gradients in the solution.
- f) During preparation of a bath a carbon treatment is recommended to remove organic impurities.
- g) Demineralized water should be used for the last rinse prior to plating to prevent chloride and sulphate contamination.
- h) When hydroquinone is used as an addition agent, about 48 h are required at room temperature to allow an equilibrium between quinone and hydroquinone to be established. If this is not done, there may not be adequate grain refinement, and treeing may be excessive with thick deposits.
- j) Maintain regular control of all solutions and inspect the equipment at regular intervals, paying special attention to electrical contacts and accuracy of instruments.

*Specification for lead anodes for electroplating (*first revision*).

- k) Maintain an inspection department, using the test methods prescribed in this specification in order to trace immediately the source of irregularities. On jobs running continuously over any length of time, the quality of the coatings on each part should be checked at least twice every shift after initial difficulties have been overcome.

APPENDIX B

(Clause 7.1.3)

AVERAGE THICKNESS OF LEAD COATING ON STRIPS AND SHEETS

B-1. Cut a specimen to obtain an area about 10 to 30 cm². Measure the area (*A*). Weigh the specimen accurately to the nearest milligram.

B-2. Dissolve the lead coating completely in a solution containing 15 g of sulphamic acid in 100 ml of water and 5 ml of hydrogen peroxide 30 percent (100 volume).

B-3. When all the lead is dissolved as determined by visual inspection, rinse the specimen in water, then in alcohol and dry between sheets of filter paper and weigh.

B-4. Thickness of lead coating (in μm) = $\frac{M}{A} \times 0.882$

where

M = loss of mass in g of the specimen, and

A = area in cm² from which the coating is stripped off.

APPENDIX C

(Clauses 8.1 and 8.1.1)

SALT SPRAY TEST FOR CORROSION RESISTANCE

C-1. PRELIMINARY TREATMENT

C-1.1 The sample shall first be cleaned by treatment with an organic solvent, such as trichloroethylene, and wiped by a clean cotton cloth. It shall then be so placed that liquid is not trapped on the surface to be tested. If this is not possible, areas where liquid is trapped shall be disregarded.

IS : 1992 - 1979

C-2. TEMPERATURE

C-2.1 The temperature at which the test is carried out shall be between 15°C and 25°C.

C-3. SPRAYING MEDIUM

C-3.1 The spraying medium shall be 5 percent solution of sodium chloride conforming to IS : 797-1967*.

C-4. PROCEDURE

C-4.1 The spray may be continuous or intermittent but the surface of the specimen shall be thoroughly wetted with the spraying medium and shall not be allowed to dry during the period of test. On reaching the surface, the spray shall be in the form of a mist. Air used in producing the spray shall be free from oil.

C-4.2 The spraying medium should not be re-circulated because of the danger of corrosion products affecting the results of the test. For details on apparatus, reference may be made to IS : 6910-1973†.

*Specification for common salt for chemical industries (*first revision*).

†Methods of testing corrosion resistance of electroplated and anodized aluminium coatings by acetic acid salt spray test.

A P P E N D I X D

(Clause 8.2.2)

**GUIDANCE ON HEAT TREATMENT OF STEEL PARTS
AFTER PLATING**

TENSILE STRENGTH MPa (kgf/mm²)	SECTIONAL THICKNESS OF PART mm	MINIMUM PERIOD AT 190 TO 210°C hours
980 to 1 130 (100 to 115)	Less than 12	2
	12 to 25	4
	Over 25	8
Over 1 130 to 1 370 (Over 115 to 140)	Less than 12	4
	12 to 25	12
	25 to 40	24 Heating to commence within 16 hours of plating
	Over 40	Requires experimental determination
Over 1 370 (Over 140)	Requires experimental determination	Requires experimental determination

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 331 01 31

331 13 75

371 94 02

Telegrams : Manaksanstha

(Common to all Offices)

Regional Offices :

	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	331 6617 335 3841
*Eastern : 1/14 CIT Scheme VII M, V.I.P. Road, Manikola, CALCUTTA 700054	37 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43
Southern : C.I.T. Campus, IV Cross Road, MADRAS 600113	235 23 15
†Western : Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093	832 92 95

Branch Offices :

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001	30 13 48
‡Peenya Industrial Area, 1st Stage, Bangalore-Tumkur Road, BANGALORE 560058	839 49 55
Gangotri Complex, 5th Floor, Bhadbhada Road, T.T. Nagar, BHOPAL 462003	55 40 21
Plot No. 21 Satyanagar, BHUBANESHWAR 751007	40 36 27
Kalaikathir Building, 6/48, Avanashi Road, COIMBATORE 641037	21 01 41
Plot No. 43, Sector 16 A, Mathura Road, FARIDABAD 121001	8-28 88 01
Savitri Complex, 116 G.T. Road, GHAZIABAD 201001	8-71 19 96
53/5 Ward No. 29, R.G. Barua Road, 5th By-lane, GUWAHATI 781003	54 11 37
5-8-56C L.N. Gupta Marg, Nampally Station Road, HYDERABAD 500001	20 10 83
R 14, Yudhister Marg, C Scheme, JAIPUR 302005	38 13 74
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76
Seth Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road, LUCKNOW 226001	23 89 23
Patliputra Industrial Estate, PATNA 800013	26 23 05
T.C. No. 14/1421, University P.O., Palayam, THIRUVANANTHAPURAM 695034	6 21 17

Inspection Offices (With Sale Point) :

Pushpanjali, 1st floor, 205-A, West High Court Road, Shankar Nagar Square, NAGPUR 440010	52 51 71
Institution of Engineers (India) Building 1332 Shivaji Nagar, PUNE 411005	32 36 35
* Sales Office is at 5 Chowringhee Approach, P.O. Princep Street, CALCUTTA 700072	27 10 85
†Sales Office is at Novelty Chambers, Grant Road, BOMBAY 400007	309 65 28
‡Sales Office is at 'F' Block, Unity Building, Narasimharaja Square, BANGALORE 580002	222 39 71