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.

<table>
<thead>
<tr>
<th>“जानने का अधिकार, जीने का अधिकार”</th>
<th>“पुराने को छोड़ नये के तरफ”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mazdoor Kisan Shakti Sangathan</td>
<td>Jawaharlal Nehru</td>
</tr>
<tr>
<td>“The Right to Information, The Right to Live”</td>
<td>“Step Out From the Old to the New”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IS 2512 (1978): Miners cap lamp batteries (lead-acid type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETD 11: Secondary Cells and Batteries</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“ज्ञान में एक नये भारत का निर्माण”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satyanarayan Gangaram Pitroda</td>
</tr>
<tr>
<td>“Invent a New India Using Knowledge”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhartrhari—Nitisatakam</td>
</tr>
<tr>
<td>“Knowledge is such a treasure which cannot be stolen”</td>
</tr>
</tbody>
</table>
Indian Standard

SPECIFICATION FOR
MINERS' CAP-LAMP BATTERIES
( LEAD-ACID TYPE )

(First Revision)

First Reprint MARCH 1992

UDC 622.474:621.355.2

© Copyright 1978

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

December 1978
AMENDMENT NO. 4 JULY 2003
TO
IS 2512 : 1978 SPECIFICATION FOR MINERS' CAP-LAMP BATTERIES ( LEAD-ACID TYPE )

( First Revision )

( Page 6, clause 4.7 ) — Substitute the following for the existing:

'4.7 Mass — The mass of the battery, when filled and charged shall not exceed 2.0 kg for up to 12 Ah capacity and 2.4 kg up to 16 Ah capacity.'

(ET 11)

Reprography Unit, BIS, New Delhi, India
AMENDMENT NO. 3 MARCH 2002
TO
IS 2512 : 1978 SPECIFICATION FOR MINERS' CAP-LAMP BATTERIES (LEAD-ACID TYPE)
(First Revision)

(Page 4, clause 1.1, last line) — Substitute the following for the existing:

'nominal capacity of 9 Ah/12 Ah for use with miners' cap-lamps'.

(Page 9, clause 6.8.4) — Add the following at the end:

'For batteries suitable for bulb ratings above 0.8 A, up to and including 1.0 A, the discharge test conducted according to 6.8.3 shall have a capacity not less than 12 Ah or give a duration not less than 12 hours at a discharge current of 1.0A.'

(Page 10, clause 6.9.5, line 3, after 0.8 A) — Add the following:

'for 9 Ah battery and 1.0 A for 12 Ah battery'.

(Page 10, clause 6.9.7, line 2, after 0.8 A) — Add the following:

'for 9 Ah battery and 1.0 A for 12 Ah battery'.

(Page 10, clause 6.9.8, line 2) — Add the following at the end:

'for batteries suitable for a bulb rating of 4 V, 1.0 A, the discharge current under 6.9.2(a), 6.9.5 and 6.9.7 shall be at 1.0 A in lieu of 0.8 A.'

(Page 10, clause 6.10.4) — Add the following at the end:

'NOTE — For cap-lamp batteries used with 4 V, 1.0 A bulb, the continuous discharge (under 6.10.4) should be at 1.0 A in lieu of 0.8 A.'

(ETD 11)
AMENDMENT NO. 2 FEBRUARY 1993
TO
IS 2512 : 1978 SPECIFICATION FOR MINERS' CAP-LAMP BATTERIES (LEAD-ACID TYPE)
(First Revision)
[Page 7, clause 6.1.4 (a)] — Delete 'and mass (6.5)'.

(ETD 11)

Reprography Unit, BIS, New Delhi, India
AMENDMENT NO. 1 MARCH 1985

TO

IS:2512-1978 SPECIFICATION FOR MINERS' CAP-LAMP BATTERIES (LEAD-ACID TYPE)

( First Revision )

(Page 8, clause 6.3.3) - Add the following note after this clause:

NOTE - The voltmeter, ammeter and the thermometer of digital read-out type of similar accuracy also can be used.'

(ETDC 11)

Reprography Unit, BIS, New Delhi, India
Indian Standard

SPECIFICATION FOR MINERS' CAP-LAMP BATTERIES (LEAD-ACID TYPE)

(First Revision)

Secondary Cells and Batteries Sectional Committee, ETDC 11

Chairman
DR H. V. K. UDUPA

Representing
Central Electrochemical Research Institute (CSIR), Karaikudi

Members
SHRI P. V. VASUDEVA RAO (Alternate to Dr H. V. K. Udupa)
GP CAPT H. S. BHATIA
Directorate of Technical Development and Production (Air), New Delhi

SHRI H. C. PANDE (Alternate)
SHRI S. K. BISWAS (GUPTA)
Directorate General of Mines Safety, Dhanbad

SHRI N. K. SEN (Alternate)
SHRI K. L. GARG
Directorate General of Supplies and Dispositions (Inspection Wing), New Delhi

SHRI J. S. PASSI (Alternate)
GENERAL MANAGER (T)
Directorate General of Posts & Telegraphs (Department of Communication), New Delhi

DEPUTY GENERAL MANAGER (I) (Alternate I)
DIVISIONAL ENGINEER TELEGRAPHS (A) (Alternate II)

CDR P. C. GULATI
Naval Headquarters

LT. V. BALACHANDRAN (Alternate)
JOINT DIRECTOR STANDARDS Railway Board (Ministry of Railways)
(ELECTRICAL)-TL & AC, RDSO

DEPUTY DIRECTOR STANDARDS (ELECTRICAL)-AC, RDSO (Alternate)

SHRI B. S. KEDARE
SHRI S. S. WAGLE (Alternate)
SHRI D. B. MALIK
SHRI MOHD MUMTAS ALI KHAN (Alternate)
The Standard Batteries Ltd, Bombay
Directorate General of Technical Development, New Delhi

(Continued on page 2)

© Copyright 1978

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.
Members Representing

SHRI S. K. MUKHERJEE National Test House, Calcutta
SHRI VEPA A. MURARI Lucas TVS Ltd, Madras
SHRI J. SUBRAMANYAM (Alternate)
SHRI M. H. NARURKAR The Bombay Electric Supply and Transport Undertaking, Bombay
SHRI H. B. BHALEKAR (Alternate)
SHRI VIPAN PASRICHA Willard India Ltd, New Delhi
SHRI H. V. PANDE (Alternate)
SHRI D. PHANI Chief Inspectorate of Electronics, Ministry of Defence (DGI)
SHRI SURJIT SINGH (Alternate)
LT-COL RAM CHANDER Directorate of Electrical Mechanical Engineers (Ministry of Defence), New Delhi
MAJ P. K. PATNAIK (Alternate)
SHRI S. P. SAHA Indian Batteries Manufacturers Association, Calcutta
SHRI K. R. SEKHAR AMCO Batteries Ltd, Bangalore
SHRI J. SENGUPTA Chloride India Ltd, Calcutta
SHRI A. P. DR SOUSA (Alternate)
SHRI S. K. SHARMA Small Industries Service Institute, New Delhi
SHRI J. SUNDARARAJAN The Mysore Electrochemical Works Ltd, Bangalore
SHRI S. P. SACHDEV, Director (Elec tech)

Secretary
SHRI H. C. DUNEJA
Assistant Director (Elec tech), ISI

Panel for Miners' Cap Lamp Batteries, ETDC 11/P6

DR H. V. K. UDUPA Central Electrochemical Research Institute (CSIR), Karaikudi

SHRI A. P. DR SOUSA Chloride India Ltd, Calcutta
SHRI A. N. CHATTOPADHYAYA (Alternate)
JOINT DIRECTOR STANDARDS (ELECTRICAL)-TL & AC, RDSO
DEPUTY DIRECTOR STANDARDS (ELECTRICAL)-AC, RDSO (Alternate)
SHRI B. S. KEDARE The Standard Batteries Ltd, Bombay
SHRI T. S. WAGLE (Alternate)
SHRI T. S. KUMAR Central Mining Research Station (CSIR), Dhanbad
SHRI M. R. PAUL (Alternate)
SHRI R. SINHA Mines-Safety Appliances Ltd, Calcutta
SHRI A. C. SRIVASTAVA Directorate General of Mines Safety, Dhanbad
SHRI S. K. BISWAS (GUPTA) (Alternate)
SHRI J. VEDAMUTHU The Standard Batteries Ltd (Oldham Division), Madras
SHRI M. DEVADOSS (Alternate)
Indian Standard
SPECIFICATION FOR
MINERS' CAP-LAMP BATTERIES
( LEAD-ACID TYPE )
(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 26 September 1978, after the draft finalized by the Secondary Cells and Batteries Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Miners' cap-lamps (operated by lead-acid batteries) are mostly used in gassy mines. Such lamp assemblies are in extensive use in India. These lamp assemblies are neither explosion-proof nor intrinsically safe and, hence, great care is to be taken in their design as they will be the suspected source of ignition when an explosion occurs in the mine. The internal construction and assembly of cap-lamp batteries shall therefore be such as to prevent any hazard during their normal life.

0.3 The concerned authorities give approval only for the complete lamp assembly and not for individual component units, such as battery, lamp, etc.

0.4 The complete miners' cap-lamp assembly and components, such as bulbs and cables are covered by the following Indian Standards:

    IS : 2593-1964 Specification for flexible cables for miners' cap-lamps
    IS : 2596-1964 Specification for bulbs (lamps) for miners' cap-lamps
    IS : 5679-1970 Specification for miners' cap-lamps

0.5 In the preparation of this standard assistance has been derived from BS 4945 : 1973 'Specification for miners' cap-lamp assemblies (incorporating lead-acid type batteries)' issued by the British Standards Institution.

0.6 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

*Rules for rounding of merical values (revised).
rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers performance and other requirements, and methods of test for lead-acid batteries of nominal voltage of 4V and of a nominal capacity of 9 Ah, for use with miners' cap-lamps.

2. TERMINOLOGY

2.1 For the purpose of this standard, the following definitions in addition to those given in IS : 1885 (Part VIII)-1965* and IS : 8320-1976† shall apply.

2.1.1 Type Tests — Tests carried out to prove conformity with the requirements of this standard. These are intended to prove the general quality and design of a given type of battery.

2.1.2 Acceptance Tests — Tests carried out on samples selected from a lot for the purpose of verifying the acceptability of the lot.

2.1.2.1 Lot — All batteries of the same type, design and rating, manufactured by the same factory during the same period, using the same process and materials, offered for inspection at a time shall constitute a lot.

2.1.3 Routine Tests — Tests carried out on every battery.

3. MATERIALS

3.1 Container — The rubber and plastics containers shall conform to IS : 1146-1972‡.

3.2 Electrolyte — The sulphuric acid used for the electrolyte in the battery shall conform to IS : 269-1961§.

3.3 Water — The water used for the electrolyte in the battery shall conform to IS : 1069-1964||.

*Electrotechnical vocabulary: Part VIII Secondary cells and batteries.
†General requirements and methods of test for lead-acid storage batteries.
‡Specification for rubber and plastic containers for lead-acid storage batteries (first revision).
§Specification for sulphuric acid (revised).
||Specification for water for storage batteries (revised).
4. CONSTRUCTIONAL AND GENERAL REQUIREMENTS

4.1 General — Battery for miners' cap-lamp shall be complementary unit of the cap-lamp. It shall be robust and durable in construction and suitable for use in underground service. When used with the cap-lamp assembly, the battery shall offer no possibility of an explosion hazard in mines in which dust, flammable gases or vapours may be present or of bodily hazard to the miners due to spillage of electrolyte.

4.2 Container and Lid

4.2.1 The container and cell lids shall be of rubber or plastics. Elastomer or other suitable polymeric material may also be used, subject to the suitability of the latter being established by authoritative tests. The container shall comprise of two cells and shall conform to the maximum overall dimensions shown in Fig. 1.

![Maximum Overall Dimensions of Container](image)

All dimensions in millimetres.

FIG. 1 MAXIMUM OVERALL DIMENSIONS OF CONTAINER

4.2.2 Means shall be provided for attachments to fix the battery to a belt. Provision shall be made for securing a protective top cover to the battery. An entry port giving access to the individual cells of the battery for initial filling and subsequent topping up of electrolyte shall be provided on the outer face of the container. The port shall be provided with a plug. Cell lids shall be securely sealed to the box. The seal shall prevent leakage of electrolyte under normal conditions of use.

4.3 Cell Post Sealing — The seal between cell post and cell lid shall prevent electrolyte leakage under normal conditions of use.
4.4 Cell Venting — Suitable venting arrangements shall be provided to permit free escape of gases produced inside each cell, preventing at the same time, any leakage of electrolyte.

4.5 Fuse — The battery shall have provision for a replaceable cartridge type or totally-enclosed fuse unit.

NOTE — The fuse is intended for restricting the amount of current flow between the conductors of the cord, if short-circuited just outside the battery container or the cord armour, to such a value as will not produce sparks that will ignite an explosive mixture of methane and air.

4.6 Terminals — The terminals of the battery shall be so designed and constructed and so disposed that they are not likely to become short-circuited.

4.7 Mass — The mass of the battery, when filled and charged, shall not exceed 2.0 kg.

5. MARKING

5.1 Each battery shall be distinctly and durably marked to indicate the following particulars:

   a) Manufacturer's name or trade-mark,
   b) Country of origin,
   c) Voltage,
   d) Maximum nominal bulb rating for which the battery is designed, and
   e) Any other special mark(s) specified for safety requirements.

5.1.1 The positive terminal location shall be marked on the container with a positive symbol (+).

5.1.2 The battery may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which it devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.
6. TESTS

6.1 Classification of Tests

6.1.1 Type Tests — The tests given in 6.1.1.2 shall constitute the type tests.

6.1.1.1 Number of samples — Six samples shall be drawn at random for the type tests by the testing or the inspecting authority.

6.1.1.2 Sequence of tests — The sequence of type tests shall be as indicated in the schedule below:

<table>
<thead>
<tr>
<th>Test</th>
<th>Battery Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Physical examination and</td>
<td>1   X   X   X   X   X   X</td>
</tr>
<tr>
<td>mass (6.5)</td>
<td>2   X   X   X   X   X   X</td>
</tr>
<tr>
<td>b) Air pressure test (6.6)</td>
<td>3   X   X   X   X   X   X</td>
</tr>
<tr>
<td>c) Non-spillability test (6.7)</td>
<td>4   X   X   X   X   X   X</td>
</tr>
<tr>
<td>d) Capacity test (6.8)</td>
<td>5   X   X   X   X   X   X</td>
</tr>
<tr>
<td>e) Life test (6.9)</td>
<td>6   X   X   —   —   X   X</td>
</tr>
<tr>
<td>f) Drop test (6.10)</td>
<td></td>
</tr>
</tbody>
</table>

6.1.1.3 If any of the samples fail in the relevant type test, the testing authority may call for fresh samples not exceeding twice the original number and subject them again to the test(s) in which failure occurred. If there is any failure in the retest(s), the type shall be considered as not having passed the requirements of this standard.

6.1.2 Acceptance Tests — The following shall comprise the acceptance tests:

a) Physical examination and mass (6.5),

b) Air pressure test (6.6),

c) Non-spillability test (6.7), and
d) Capacity test (6.8).

6.1.3 Sampling Scheme and Criteria for Acceptance — The sampling scheme and the criteria for acceptance shall be in accordance with 5.1.4 of IS : 8320-1976*.

6.1.4 Routine Tests — The following shall constitute the routine tests:

a) Physical examination and mass (6.5), and

b) Air pressure test (6.6)

---

*General requirements and methods of tests for lead acid storage batteries.
6.2 Temperature for Tests

6.2.1 The capacity and life tests specified in this standard shall be carried out at an ambient temperature of 27 ± 2°C.

6.2.1.1 It is preferable to conduct the tests in an air-conditioned room maintained at the standard temperature specified. In case, however, such an arrangement is not available, the tests shall be carried out at the standard temperature maintained by any suitable means.

6.3 Test Equipment

6.3.1 Voltmeter — The voltmeter used for tests shall be of an accuracy class not inferior to 0.5 in accordance with IS : 1248-1968*. The resistance of voltmeter used shall be at least 1 000 ohms per volt. The range of voltmeter used shall be such that the magnitude of the voltage to be measured falls in the last third part of the scale.

6.3.2 Ammeter — The ammeter used for tests shall have an accuracy class not inferior to 1.0 (see IS : 1248-1968*). The range of ammeter used shall be such that the magnitude of the current to be measured falls in the last third part of the scale.

6.3.3 Thermometer — Thermometers with an appropriate scale shall be used for measuring temperatures, and one division of the graduated scales shall represent at the most 1°C. The accuracy of the calibration shall be not less than 0.5°C.

6.3.4 Hydrometer — The specific gravity of the electrolyte shall be measured by hydrometers provided with a graduated scale, one division of which shall represent at the most 0 005 unit of specific gravity.

NOTE — Alternatively for the purpose of this standard the specific gravity of electrolyte may be measured by any other suitable method.

6.4 First Charge — The battery shall be first charged in accordance with the manufacturer's instructions.

6.4.1 Specific Gravity of Electrolyte — For the purpose of the tests covered in this standard, the specific gravity of electrolyte in fully charged condition shall be between 1.280 and 1.285 corrected to 27°C when corrected in accordance with 3.2.2 of IS : 8320-1976†.

6.5 Physical Examination and Mass — The batteries shall conform to the requirements of 4.

6.6 Air Pressure Test — The sealing of each cell of the battery shall be checked by compressed air at a pressure equal to 700 mm height of water column. The volume of the tubes and ancilliary parts connected to the cell under pressure shall not exceed 0.5 litres.

*Specification for direct acting electrical indicating instruments (first revision).
†General requirements and methods of tests for lead acid storage batteries.
6.6.1 **Requirement** — The air pressure shall not fall below 670 mm of water column in 15 seconds after the air supply to the cell is disconnected.

6.7 **Non-spillability Test** — The charged battery shall be subjected to a static non-spillability test by keeping it upside down for 2 hours.

6.7.1 **Requirement** — There shall be no visible spillage of electrolyte during and at the completion of 2 hours.

6.8 **Capacity Test**

6.8.1 The battery shall be prepared and charged in accordance with the manufacturer's instructions.

6.8.2 The battery shall be discharged and charged as many times as recommended by the manufacturer, up to a maximum of 5 such conditioning cycles.

6.8.3 After not less than 2 hours and not more than 24 hours from the completion of the charge in accordance with the manufacturer's instructions, and at an ambient temperature of 27 ± 2°C, the battery shall be discharged continuously through a suitable resistance at a constant current of 1.0 A until the battery terminal voltage falls to 370 V.

6.8.4 **Requirement** — The battery shall have a capacity of not less than 9.0 Ah or a duration of not less than 9 hours.

NOTE — This battery (9 Ah nominal capacity) is suitable for bulbs of rating up to and including 0.8 A.

6.9 **Life Test**

6.9.1 The life test shall be performed on three batteries which have passed the tests in accordance with 6.5, 6.6, 6.7 and 6.8.

6.9.2 Each battery shall be subjected to a series of continuous charges and discharges as follows:

a) Discharge continuously at a current of 0.8 A for 9 hours through a suitable resistance.

b) Recharge for a period of 15 hours at a constant potential source of 5.1 V with a resistance of 0.35 ohm in series with the battery.

6.9.3 After every 25 cycles, each battery may be subjected to a full recharge in accordance with the manufacturer's instructions.
6.9.4 After each series of 100 cycles up to the 500th cycle and after each series of 50 cycles thereafter, after correction of electrolyte levels and after receiving a recharge in accordance with the manufacturer's instructions, each battery shall be subjected to a capacity test in accordance with 6.9.5.

6.9.5 After not less than 2 hours and not more than 24 hours from the completion of charge, the battery shall be discharged at a continuous current of 0.8 A through a suitable resistor until the terminal voltage of the battery fails to 3.70 V.

6.9.6 After each capacity test, the battery shall be recharged in accordance with the manufacturer's instructions and the cycles of discharge and recharge resumed.

6.9.7 The life test is terminated when the duration of the discharge at 0.8 A to 3.70 V in the capacity test falls below 9.0 hours.

6.9.8 Requirement — The number of charge and discharge cycles shall be not less than 600.

NOTE — The life test is intended to give an indication of the service performance of a battery coupled to a cap-lamp fitted with a 4.0 V, 0.8 A bulb.

6.10 Drop Test

6.10.1 Drop tests shall be conducted on three batteries which have passed the tests in accordance with 6.5, 6.6, 6.7 and 6.8.

6.10.2 A test platform shall be prepared in accordance with Appendix A.

6.10.3 Each battery shall be subjected to a total of six drops on to the test platform from a height of one metre. The six drops shall comprise two on the base and one on each of the four sides of the battery respectively. The face containing the terminals shall not strike the platform.

6.10.4 Requirement — There shall be no crack in the battery container after six drops. If the battery case falls into pieces, the battery is considered too brittle for satisfactory service and is rejected.

After six drops each battery when discharged through a suitable resistor shall give a continuous discharge of 0.8 A for 7.0 hours before the voltage at the battery terminals falls below 3.70 V.
APPENDIX A
(Clause 6.10.2)

TEST PLATFORM FOR DROP TEST

A-1. The test platform will be a square block 450 x 450 mm comprising 25 mm thick wooden boards laid over a concrete block 90 mm thick making up a total height of 115 mm.

A-2. The wooden boards shall be selected from one of the following woods and shall be well-seasoned and free from knots:
   a) Kokko (Albizia lebbek),
   b) Benteak (Lagerstrolmia lanceolata),
   c) Kindal (Terminalia paniculata),
   d) Kharsu (Quercus semecarpifolia), and
   e) Teak or Indian teak.

A-3. CONSTRUCTION

A-3.1 Starting with a square wooden frame pour concrete to a height of 90 mm. Lay the 25 mm floor boards over the finished concrete and plane outer frame flush with wooden flooring.

NOTE — It is advisable to surround the test platform with rubber or form mats since the cap-lamp battery generally bounces off the platform when dropped and sustains additional knocks on the surrounding floor.
HEADQUARTERS:

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

Telephones: 331 01 31, 331 13 75

Telegrams: Manaksanstha

( Common to all Offices )

REGIONAL OFFICES:

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

*Eastern: 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktoria, CALCUTTA 700054

Northern: SCO 445-446, Sector 35-C, CHANDIGARH 160036

Southern: C. I. T. Campus, MADRAS 600113

†Western: Manakalaya, E9 MIDC, Marol, Andheri (East), BOMBAY 400093

BRANCH OFFICES:

'Pushpakan', Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001

‡Peenya Industrial Area 1st Stage, Bangalore Tumkur Road, BANGALORE 560058

Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar, BHOPAL 462003

Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002

53/5, Ward No 29, R.G. Barua Road, 5th Byelane, GUWAHATI 781003

5-8-56C L. N. Gupta Marg (Nampally Station Road), HYDERABAD 500001

R14 Yudhister Marg, C Scheme, JAIPUR 302005

117/418 B Sarvodaya Nagar, KANPUR 208005

Patliputra Industrial Estate, PATNA 800013

T.C. No. 14/1421. University P.O. Palayam

TRIVANDRUM 605035

INSPECTION OFFICES (With Sale Point):

Pushpanjali, First Floor, 205-A West High Court Road, Shankar Nagar Square, NAGPUR 440010

Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005

*Sales Office in Calcutta is at 6 Chowringhee Approach, P. O. Prineep 27 68 00 Street, Calcutta 700072

†Sales Office in Bombay is at Novelty Chambers, Grant Road, 89 65 28 Bombay 400007

‡Sales Office in Bangalore is at Unity Building, Narasimharaja Square, 22 36 71 Bangalore 560002

Reprography Unit, BIS, New Delhi, India