इंटरनेट मानक

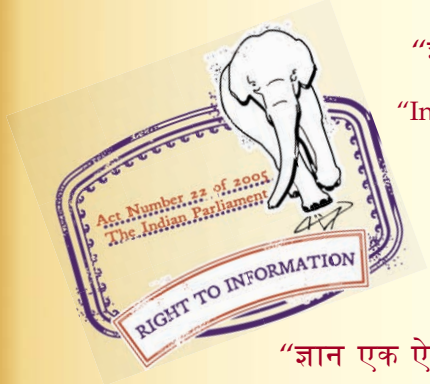
Disclosure to Promote the Right To Information

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 छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 4289-1 (1984): Flexible Cables for Lifts and Other Flexible Connections, Part 1: Elastomer Insulated Cables [ETD 9: Power Cables]



"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"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

Indian Standard (Reaffirmed 2001)

SPECIFICATION FOR FLEXIBLE CABLES FOR LIFTS AND OTHER FLEXIBLE CONNECTIONS

PART 1 ELASTOMER INSULATED CABLES

(First Revision)

Second Reprint NOVEMBER 1998

UDC 621.315.221.8:621.315.616.96:621.876

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

Gr 3 *October* 1984

Indian Standard

SPECIFICATION FOR FLEXIBLE CABLES FOR LIFTS AND OTHER FLEXIBLE CONNECTIONS

PART 1 ELASTOMER INSULATED CABLES

(First Revision)

Power Cables Sectional Committee, ETDC 59

Chairman

SHRI M. L. DONGRE
M-3, Satyam, 88, Sion Circle
Bombay 400 022

Members	*Representing*
SHRI J. P. AGAL	Bharat Heavy Electricals Ltd, Hyderabad
SHRI B. P. RAI (*Alternate*)	
SHRI M. R. BHAT	Tata Consulting Engineers, Bombay
SHRI D. K. BASU (*Alternate*)	
CHIEF ENGINEER (ELECTRICAL) I	Central Public Works Department, New Delhi
SURVEYOR OF WORKS (ELECT) V (*Alternate*)	
DR K. DAS GUPTA	Calcutta Electric Supply Corporation (India) Ltd, Calcutta
SHRI P. NEOGI (*Alternate*)	
DIRECTOR	Central Power Research Institute, Bangalore
SHRI M. C. RATRA (*Alternate*)	
DIRECTOR OF MINES SAFETY (ELECT) (HQ)	Directorate General of Mines Safety, Dhanbad
DIRECTOR OF MINES SAFETY (ELECT) (*Alternate*)	
SHRI RAVI K. DUTT	Cable and Conductor Manufacturers' Association of India, New Delhi
SHRI S. R. SARAN (*Alternate*)	
SHRI P. GHOSH	Indian Cable Co Ltd, Jamshedpur
SHRI K. V. R. RAO (*Alternate*)	
SHRI M. M. HONAVAR	Cable Corporation of India Ltd, Bombay
SHRI S. R. PADMANABHAN (*Alternate*)	
SHRI D. K. JAIN	Directorate of Technical Development & Production (Air), New Delhi
SHRI V. K. SHARMA (*Alternate*)	
SHRI K. S. JOSHI	Bombay Suburban Electric Supply Ltd, Bombay
SHRI R. K. SEHGAL (*Alternate*)	

(*Continued on page 2*)

(*Continued from page* 1)

Members	*Representing*
SHRI S. L. KAKKAR	Universal Cables Ltd, Satna
SHRI R. C. AGRAWAL (*Alternate*)	
SHRI RAJ K. MITAL	Delhi Electric Supply Undertaking, New Delhi
SHRI V. K. SAKHUJA (*Alternate*)	
SHRI R. V. NARAYANAN	Directorate General of Supplies & Disposals (Inspection Wing), New Delhi
SHRI D. R. CHANDRA (*Alternate*)	
SHRI H. M. PAI	The Federation of Electricity Undertakings of India, Bombay
SHRIMATI C. BALIGA (*Alternate*)	
SHRI S. N. PARWAL	The Premier Cable Co Ltd, Eranakulam (Kerala)
SHRI A. K. RAMAN	Asian Cables Corporation Ltd, Bombay
SHRI S. M. SAKHALKAR	Bombay Electric Supply & Transport Undertaking, Bombay
SHRI S. V. UPASANI (*Alternate*)	
SHRI L. K. SANGHI	Fort Gloster Industries Ltd, Howrah
SHRI A. S. BHATTACHARJEE (*Alternate*)	
LT-COL S. R. SEN	Controllerate of Inspection Electronics, Bangalore
SHRI S. K. MALHOTRA (*Alternate*)	
DR M. S. SUKHIJA	Punjab Research Institute, Rajpura
SHRI U. S. VERMA	National Test House, Calcutta
SHRI R. RAMAKRISHNA (*Alternate*)	
SHRI K. G. WARRIER	Oriental Power Cables Ltd, Kota
SHRI B. K. MUNDHRA (*Alternate*)	
SHRI S. P. SACHDEV, Director (Elec tech)	Director General, ISI (*Ex-officio Member*)

Secretary

SHRI K. M. BHATIA
Senior Deputy Director (Elec tech), ISI

Panel for Elastomeric and Thermoplastic Cables, ETDC 59/P4

Convener	
SHRI L. K. SANGHI	Fort Gloster Industries Ltd, Howrah
Members	
SHRI A. S. BHATTACHARJEE (*Alternate* to Shri L. K. Sanghi)	
SHRI B. ROY CHOWDHURY	The Calcutta Electric Supply Corporation (India) Ltd, Calcutta
SHRI P. NEOGI (*Alternate*)	
SHRI P. GHOSH	Indian Cable Co Ltd, Jamshedpur
SHRI K. V. R. RAO (*Alternate*)	
SHRI M. M. HONAVAR	Cable Corporation of India Ltd, Bombay
SHRI S. R. PADMANABHAN (*Alternate*)	
SHRI S. L. KAKKAR	Universal Cables Ltd, Satna
SHRI R. C. AGRAWAL (*Alternate*)	
SHRI J. V. MEHTA	The Ahmedabad Electricity Co Ltd, Ahmadabad
SHRI B. K. MUNDHRA	Oriental Power Cables Ltd, Kota
SHRI A. S. PINTO	Delhi Electricity Supply Undertaking, New Delhi
SHRI S. R. SARAN	Industrial Cables (India) Ltd, Rajpura

Indian Standard

SPECIFICATION FOR FLEXIBLE CABLES FOR LIFTS AND OTHER FLEXIBLE CONNECTIONS

PART 1 ELASTOMER INSULATED CABLES

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part 1) (First Revision) was adopted by the Indian Standards Institution on 11 June 1984, after the draft finalized by the Power Cables Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard was first published in 1967. This revision has been undertaken to align it with the international practices to the extent possible. The methods of test have been, now covered in a separate standard, reference to which has been made at appropriate places.

0.3 In preparing this standard, assistance has been derived from IEC Publication 245-5 'Rubber insulated cables of rated voltages up to and including 450/750 V, Part 5: Lift cables' issued by the International Electrotechnical Commission.

0.4 The requirements for polyvinyl chloride insulated lift cables are intended to be covered in Part 2 of this standard.

0.5 Recommendations for installation of elastomer-insulated lift cables are given in Appendix A for guidance only.

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, 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.

---

*Rules for rounding off numerical values (*revised*).

SECTION 1 GENERAL

1. SCOPE

1.1 This standard (Part 1) covers the requirements and tests for circular, elastomer insulated, overall braided or elastomer sheathed lift cables of rated voltage up to and including 1 100 V.

1.2 These cables are suitable for use, where the combination of ambient temperature and temperature rise due to load, results in a steady conductor temperature not exceeding 60°C.

1.3 Cables covered in this standard are intended for installations where the freely-suspended length does not exceed 35 m, and the speed of travel does not exceed 1·6 m/s. The requirements for cables outside these limits is a matter of negotiation between the purchaser and the manufacturer.

1.4 The cables covered in this standard may be used for similar applications requiring flexible connections.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions given in **2.1** to **2.3**, in addition to those given in IS : 1885 (Part 32)-1971*, shall apply.

2.1 Routine Tests — Tests to be carried out on each cable for checking requirements which are likely to vary during production.

2.2 Type Tests — Tests carried out to prove conformity with the specification. These are intended to prove the general quality and design of a given type of cable.

2.3 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

SECTION 2 MATERIALS

3. CONDUCTOR

3.1 The conductors shall be composed of tinned annealed copper wires complying with IS : 8130-1984† (*see also* **12.1**).

4. SEPARATOR

4.1 The separator shall be of dry paper, polyester tape or any other suitable material.

---

*Electrotechnical vocabulary: Part 32 Cables, conductors and accessories for electricity supply.

†Specification for conductors for insulated electric cables and flexible cords (*first revision*).

5. INSULATION

5.1 The insulation shall consist of general service elastomer complying with the requirements for Type IE1 insulation of IS : 6380-1984*.

6. CENTRAL HEART

6.1 The central heart shall consist of hemp, jute or similar material. If the central heart has a strain bearing member, the materials and construction of the central heart shall be as agreed between the manufacturer and the purchaser.

7. FILLERS

7.1 The fillers shall be of natural or synthetic fibres. The material shall be suitable for operating temperature and compatible with the insulating material.

8. PROOFED TAPE

8.1 Proofed tape shall be closely woven cotton, without selvedge, proofed on one side with any elastomeric material.

9. BRAID

9.1 Textile braid shall consist of textile material (natural or synthetic) excluding jute or hemp.

10. SHEATH

10.1 The sheath shall consist of heavy duty, oil-resisting and flame-retardant elastomer conforming to the requirements of Type SE4 sheath of IS : 6380-1984*.

SECTION 3 CONSTRUCTION

11. GENERAL DETAILS OF CONSTRUCTION

11.1 The cables shall comprise of the following:

a) Central heart with an optional strain bearing centre,
b) Up to 30 flexible conductors,
c) A separator around each conductor,
d) Elastomeric insulation,

*Specification for elastomeric insulation and sheath of electric cables (*first revision*).

e) Optional covering of textile braid over each core,

f) Optional fillers as required for core assembly,

g) Optional textile braid or textile tape or both applied on the core assembly, and

h) Elastomeric sheath or overall textile braid.

12. CONDUCTOR

12.1 The conductor shall comply with the requirements for Class 5 conductors given in IS : 8130-1984* except that the value of maximum resistance of the conductor at 20°C shall be increased by 5 percent on account of short lay of the core assembly. The nominal cross-sectional area of conductor shall be 0·75 or 1 mm^2 required. A separator shall be applied around each conductor.

13. INSULATION

13.1 The conductor (with separator) shall be provided with elastomeric insulation applied by extrusion. It shall be possible to remove the insulation without damaging the conductor.

13.2 The average thickness of the insulation shall be 1·0 mm, *Min.*

13.3 The smallest of the measured values of the thickness of insulation shall not fall below 0·8 mm.

13.4 A textile braid or equivalent protective covering (for example, polyamide) may be applied to each core.

14. CORE IDENTIFICATION

14.1 The cores shall be identified by colours or by printed numerals.

14.2 Colour identification may be by means of coloured insulation or by colour of the core protection. The colour scheme used shall be as agreed between the purchaser and the manufacturer.

14.3 In case of identification by printed numerals, the insulation of the cores shall be of the same colour, and the cores shall be numbered sequentially starting with number 1 in the inner layer.

The numbers shall be legibly printed in Hindu-Arabic numerals at regular intervals on the outer surface of the cores with an ink of contrasting colour. The numerals shall be legible and not easily erasible.

---

*Specification for conductors for insulated electric cables and flexible cords (*first revision*).

15. CORE ASSEMBLY

15.1 The cores with the fillers, if any, shall be twisted around the central heart, so as to form one layer for cables having up to 12 cores, and two layers for cables having more than 12 cores.

16. OVERALL COVERING

16.1 Sheathed Cables — The core assembly which may be covered by a textile braid or proofed textile tape, shall be covered by an elastomeric sheath.

16.1.1 *Thickness of Sheath* — The average thickness of sheath shall be not less than the nominal value (t_s) specified in Table 1.

16.1.2 *Tolerance of Thickness of Sheath* — The smallest of the measured values of the thickness of sheath shall not fall below the nominal value (t_s) specified in Table 1 by more than 0·2 mm + 0·2 t_s.

16.2 Braided Cables — The core assembly, which may be covered by a textile braid, shall be wrapped with a proofed textile tape and then covered with a textile braid. For flame-retardant braided lift cables, the overall braid shall be saturated with a flame-retardant compound as agreed between the purchaser and the manufacturer.

SECTION 4 TESTS

17. CLASSIFICATION OF TESTS

17.1 Type Tests — The following shall constitute the type tests:

a) Persulphate test;

b) Annealing test;

c) Conductor resistance test;

d) Test for thickness of insulation and sheath;

e) Physical tests for insulation:

   1) Tensile strength and elongation at break,
   2) Ageing in air oven, and
   3) Ageing in oxygen bomb;

f) Physical tests for sheath:

   1) Tensile strength and elongation at break,
   2) Ageing in air bomb,
   3) Oil resistance, and
   4) Tear resistance;

g) High voltage (water immersion) test;

h) Insulation resistance test;

j) Static flexibility test; and

k) Flammability test.

NOTE — Test at (k) is not applicable to braided elastomeric cables not treated with flame retardant compound.

17.2 Acceptance Tests — The following shall constitute acceptance tests:

a) Annealing test,

b) Conductor resistance test,

c) Test for thickness of insulation and sheath,

d) High voltage (water-immersion) test, and

e) Insulation resistance test.

17.3 Routine Tests — The following shall constitute routine tests:

a) Conductor resistance test, and

b) High voltage test.

18. METHODS OF TESTS

18.0 Unless otherwise specified, the tests shall be carried out in accordance with relevant Part of IS : 10810*, taking into account additional information given in this standard.

18.1 High Voltage Test — The values of test voltage, duration and test conditions are given in Table 2. Cables shall withstand the appropriate high voltage without breakdown.

18.2 Static Flexibility Test — A sample of sufficient length of cable shall be unreeled from the drum and tested in an apparatus similar to that shown in Fig. 1. Two clamps *A* and *B* shall be located at a height of not less than 1·5 m above ground level. Clamp *A* shall be fixed and clamp *B* shall be movable horizontally at the level of clamp *A*. After the cable has been allowed to be hung in the position indicated in Fig. 1 for 3 min, movable clamp *B* shall be relocated to position shown in Fig. 2 without disturbing cable in clamp *A* and the loop inside diameter shall be measured. The loop shall now be reversed to position shown in Fig. 3 by rotating the movable clamp *B* through 360° in the plane of the loop; care shall be taken that the cable is not rotated about its own axis. The loop inside diameter shall be measured once again.

18.2.1 The average loop inside diameter of the two readings corresponding to Fig. 2 and 3 shall be within the limits specified in Table 3.

*Methods of test for cables (*under preparation*).

18.3 Flammability Test — Period of burning after removal of the flame shall not exceed 60 seconds and the unaffected portion (uncharred) from the lower edge of top clamp shall be at least 50 mm.

SECTION 5 IDENTIFICATION, PACKING AND MARKING

19. IDENTIFICATION

19.1 Manufacturer's Identification — The manufacturer shall be identified throughout the length of the cable by means of a tape bearing manufacturer's name or trade-mark or by manufacturer's name or trade-mark being printed, indented or embossed on the cable. In case none of these methods can be employed, or if the purchaser so desires, colour identification threads in accordance with a scheme to be approved by the Indian Standards Institution shall be employed. The indentation, printing or embossing shall be done only on the outer sheath.

20. PACKING AND MARKING

20.1 The cables shall be either wound on drums or supplied in coils, packed and labelled.

20.2 The cables shall carry the following information either stencilled on the drum or contained in a label attached to drum or coil:

a) Reference to this Indian Standard;

b) Manufacturer's name, brand name or trade-mark;

c) Type of cable and voltage grade;

d) Number of cores;

e) Nominal cross-sectional area of the conductor;

f) Length of the cable on the drum, reel or coil;

g) Number of lengths on the drum, reel or coil (if more than one);

h) Direction of rotation of drum (by means of arrow);

j) Approximate gross mass;

k) Country of manufacture; and

m) Year of manufacture.

20.3 The cable (reel, drum or label) may 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 is 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.

SECTION 6 TABLES

TABLE 1 THICKNESS OF SHEATH

(*Clauses* 16.1.1 *and* 16.1.2)

No. of Cores	Nominal Thickness of Sheath (*ts*) mm
6	1·5
9	2·0
12	2·0
18	2·0
24	2·5
30	2·5

TABLE 2 HIGH VOLTAGE TEST REQUIREMENTS

(*Clause* 18.1)

	Type of Test	Voltage	Duration of Immersion in Water	Test Temperature	Duration of Voltage on Each Conductor
	(1)	(2)	(3)	(4)	(5)
		kV	h	°C	min
i)	Type and acceptance test on finished cable and cores taken from finished cable	3	12	27 ± 2	5
ii)	Routine test	3	—	Ambient	5

TABLE 3 REQUIREMENTS FOR FLEXIBILITY TEST

(*Clause* 18.2.1)

Number of Cores	Loop Diameter, cm	
	Minimum	Maximum
	m	m
6	0·46	0·52
9 and 12	0·44	0·50
18 and above	0·40	0·47

SECTION 7 FIGURES

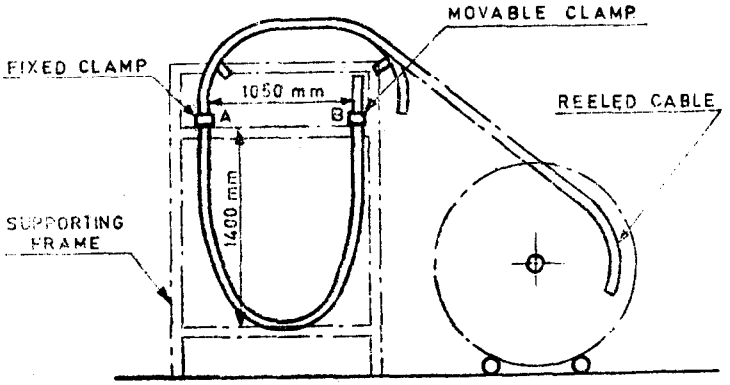


FIG. 1 STATIC FLEXIBILITY TEST ARRANGEMENT

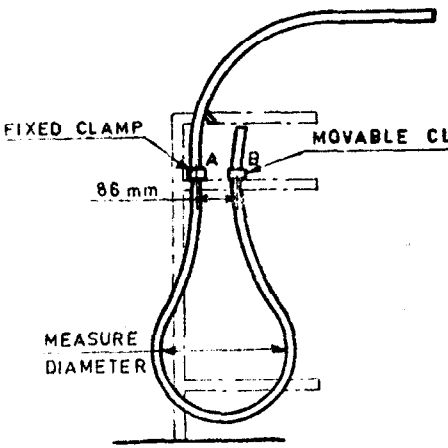


FIG. 2 RELOCATED POSITION

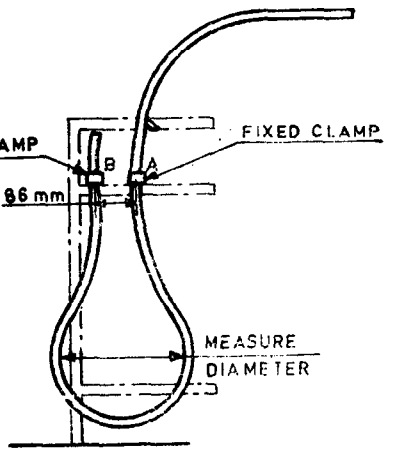


FIG. 3 RELOCATED POSITION WITH LOOP REVERSED

SECTION 8

APPENDIX A

(*Clause* 0.5)

RECOMMENDATIONS FOR THE INSTALLATION OF ELASTOMER INSULATED, CIRCULAR, FLEXIBLE CABLES

A-1. It is necessary to uncoil and hang the cable in such a manner as to avoid twisting or kinking. It is desirable to hang the cable in the lift well, suspended from one end only, for a few days prior to final installation.

A-2. It is desirable to provide a facility on both car and well-cable anchorages to permit each cable to be rotated to counter accumulated twist. To maintain the best performance it may be necessary to do so several times during the first few months of service, and the design of the clamping device should be such as to facilitate this without disturbing the cables or disconnecting them.

A-3. The characteristics of the cables (loop size, running performance and liability to twist) vary with the number of cores. For these reasons all cables that are grouped together should preferably be of the same size. Very small cables tend to be less satisfactory, therefore, cables with 12 or more cores should be preferred.

A-4. Where ledges are present in the well behind the travelling cables, such as trimmer beams running from back to front of multiple lift wells, against or on to which the swinging cables of a descending car may fall, further precautions are necessary. A recommended method is to provide a continuous screen of adequate width extending from the well-cable anchorage to the lowest projection.

BUREAU OF INDIAN STANDARDS

Headquarters:
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones: 323 0131, 323 3375, 323 9402
Fax : 91 11 3234062, 91 11 3239399, 91 11 3239382

Telegrams : Manaksanstha
(Common to all Offices)

	Telephone
Central Laboratory:	
Plot No. 20/9, Site IV, Sahibabad Industrial Area, Sahibabad 201010	8-77 00 32
Regional Offices:	
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	323 76 17
*Eastern : 1/14 CIT Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054	337 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43
Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113	235 23 15
†Western : Manakalaya, E9, Behind Marol Telephone Exchange, Andheri (East), MUMBAI 400093	832 92 95
Branch Offices::	
'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001	550 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. 62-63, Unit VI, Ganga Nagar, BHUBANESHWAR 751001	40 36 27
Kalaikathir Buildings, 670 Avinashi 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
E-52, Chitaranjan Marg, C- Scheme, JAIPUR 302001	37 29 25
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
NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010	52 51 71
Patliputra Industrial Estate, PATNA 800013	26 23 05
Institution of Engineers (India) Building 1332 Shivaji Nagar, PUNE 411005	32 36 35
T.C. No. 14/1421, University P. O. Palayam, THIRUVANANTHAPURAM 695034	6 21 17

---

*Sales Office is at 5 Chowringhee Approach, P.O. Princep Street, CALCUTTA 700072	27 10 85
†Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007	309 65 28
‡Sales Office is at 'F' Block, Unity Building. Narashimaraja Square, BANGALORE 560002	222 39 71

Reprography Unit, BIS, New Delhi, India