BUREAU OF INDIAN STANDARDS
DRAFT FOR COMMENTS ONLY

Draft Indian Standard

Specification for flexible cables for lifts and other flexible connections Part 1 elastomer insulated cables

(Second Revision)

Power Cables Sectional Committee, ETD 09	Last date for comments- 07 08 2024

FOREWORD

This draft Indian Standard (Part 1) (Second Revision) will be adopted by the Bureau of Indian Standards on the recommendation of the Power Cables Sectional Committee and approval of the Electrotechnical Division Council.

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

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

The requirements for polyvinyl chloride insulated and sheathed flat cables are covered in Part 3 of this standard

Recommendations for installation of elastomer-insulated lift cables are given in Annex A for guidance.

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

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: 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.

Draft Indian Standard

FLEXIBLE CABLES FOR LIFTS AND OTHER FLEXIBLE CONNECTIONS — SPECIFICATION PART 1 ELASTOMER INSULATED CABLES

(Second Revision)

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 1100 V.

1.2 These cables are suitable for use, where the combination of ambient temperature and temperatures rise due to load, results in a 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 application requiring flexible connections.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibilityof applying the most recent editions of the standard indicated below:

IS No.	***Title***
IS 1885 (Part 32) : 2019	Electrotechnical Vocabulary Part 32 Electric Cables (Second Revision)
IS 5831 : 1984	Specification for PVC insulation and sheath of electric cables (First Revision)
IS 8130 : 2013	Conductors for insulated electric cables and flexible cords - Specification (Second Revision)
IS 10418 : 2024	Drums for Electric Cables- Specification (First Revision)
IS 10810 (Part 0) : 1984	Methods of test or cables
IS 10810 (Part 1) : 1984	Methods of test for cables: Part 1 annealing test for wires used as conductors
IS 10810 (Part 2) : 1984	Methods of test for cables: Part 2 tensile test for aluminium wires
IS 10810 (Part 3) : 1984	Methods of test for cables: Part 3 wrapping test - For aluminium wires
IS 10810 (Part 4) : 1984	Methods of test for cables: Part 4 persulphate test of conductor
IS 10810 (Part 5) : 1984	Methods of test for cables: Part 5 conductor resistance test
IS 10810 (Part 6) : 1984	Methods of test for cables: Part 6 thickness of thermoplastic and elastomeric insulation and sheath

IS 10810 (Part 7) : 1984	Methods of test for cables: Part 7 tensile strength and elongation at break of thermoplastic and elastomeric insulation and sheath
IS 10810 (Part 10) : 1984	Methods of test for cables: Part 10 loss of mass test
IS 10810 (Part 11) : 1984	Methods of test for cables: Part 11 thermal ageing in air
IS 10810 (Part 12) : 1984	Methods of test for cables: Part 12 shrinkage test
IS 10810 (Part 14) : 1984	Methods of test for cables: Part 14 heat shock test
IS 10810 (Part 15) : 1984	Methods of test for cables: Part 15 hot deformation test
IS 10810 (Part 20) : 1984	Methods of test for cables: Part 20 cold bend test
IS 10810 (Part 21) : 1984	Methods of test for cables: Part 21 cold impact test
IS 10810 (Part 43) : 1984	Methods of test for cables: Part 43 insulation resistance
IS 10810 (Part 44) : 1984	Methods of test for cables: Part 44 spark test
IS 10810 (Part 45) : 1984	Methods of test for cables: Part 45 high voltage test
IS 10810 (Part 53) : 1984	Methods of test for cables: Part 53 flammability test
IS 10810 (Part 58) : 1998	Method of tests for cables: Part 58 oxygen index test
IS 10810 (Part 59) : 1988	Method of tests for cables: Part 59 determination of the amount of halogen acid gas evolved during combustion of polymeric materials taken from cables
IS 10810 (Part 60) : 1988	Methods of test for cables: Part 60 thermal stability of PVC insulation and sheath
IS 10810 (Part 64) : 2003	Methods of test for cables: Part 64 measurement of temperature index
IS 13360 (Part 6/Sec 9) : 2001	Plastics - Methods of testing: Part 6 thermal properties section 9 determination of density of smoke from the burning or decomposition of plastics

3 TERMINOLOGY

For the purpose of this standard, the definitions given in 3.1 to 3.3, in addition to those given in IS 1885 (Part 32) shall apply.

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

3.2 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.

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

SECTION 2 MATERIALS

4 CONDUCTOR

4.1 The conductors shall be composed of tinned wires complying with IS 8130. (*see* also 13.1*)*

5 SEPARATOR

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

6 INSULATION

6.1 The insulation shall consist of general service elastomer complying with the requirements for Type IEl insulation of IS 6380.

7 CENTRAL HEART

7.1 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.

8 FILLERS

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

9 PROOFED TAPE

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

10 BRAID

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

11 SHEATH

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

SECTION 3 CONSTRUCTION

12 GENERAL DETAILS OF CONSTRUCTION

12.1 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,
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.

13 CONDUCTOR

13.1 The conductor shall comply with the requirements for Class 5 conductors given in IS 8130 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.

14 INSULATION

14.1 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.

14.2 The average thickness of the insulation shall be 1.0 mm, *Min.*

14.3 The smallest of the measured values of the thickness of insulation shall not fall below 0.8 mm.

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

15 CORE IDENTIFICATION

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

15.2 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.

15.3 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.

15.4 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.

16 CORE ASSEMBLY

16.1 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.

17 OVERALL COVERING

17.1 Sheathed Cable - The core assembly which may be covered by a textile braid or proofed textile tape, shall be covered by an elastomeric sheath.

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

17.1.2 *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.

17.2 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

18 CLASSIFICATION OF TESTS

18.1 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.

18.2 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.

18.3 Routine Tests - This following shall constitute routine tests:

a) Conductor resistance test, and
b) High voltage test.

19 METHODS OF TESTS

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.

19.1 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.

19.2 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 locate 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.

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

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

SECTION 5 IDENTIFICATION, PACKING AND MARKING

20 IDENTIFICATION

20.1 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 trademark 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 Bureau of Indian Standards shall be employed, the indentation, printing or embossing shall be done only on the outer sheath.

21 PACKING AND MARKING

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

21.2 The cables shall carry the following information either stenciled 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.

22 BIS CERTIFICATION MARKING

The use of the Standard Mark is covered by the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

SECTION 6 TABLES

TABLE 1
THICKNBSS OF SHEATH
(*Clause* 17.1.1 *and* 17.1.2)

Sl. No.	No. OF CORES	NOMINAL THICKNESS OF SHEATH (t_s) mm
(1)	(2)	(3)
1.	6	1.5

2.	9	2.0
3.	12	2.0
4.	18	2.0
5.	24	2.5
6.	30	2.5

TABLE 2
HIGH VOLTAGE TEST REQUIREMENTS
(*Clause* 19.1)

Sl. NO	**TYPE OF TEST**	**VOLTAGE**	**DURATION OF IMMERSION IN WATER**	**TEST TEMPERATURE**	**DURATION OF VOLTAGE ON EACH CONDUCTOR**
(1)	(2)	(3)	(4)	(5)	(6)
		kV	h	°C	min
1.	Type and acceptance test of finished cable and cores taken from finished cable	3	12	27 ± 2	5
2.	Routine test	3	-	Ambient	5

TABLE 3
REQUIREMENTS FOR FLEXIBILITY TEST
(*Clause* 19.2.1)

Sl. No.	**NUMBER OF CORES**	**LOOP DIAMETER, cm Minimum Maximum**	
(1)	(2)	(3)	
		m	m
1.	6	0.46	0.52
2.	9 and 12	0.44	0.50
3.	18 and above	0.40	0.47

SECTION 7 FIGURES

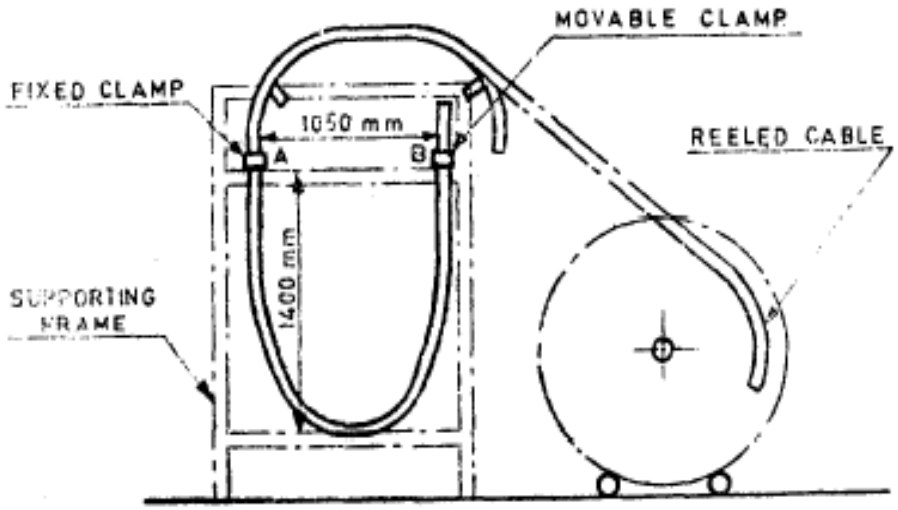

FIG 1 STATIC FLEXIBILITY TEST ARRANGEMENT

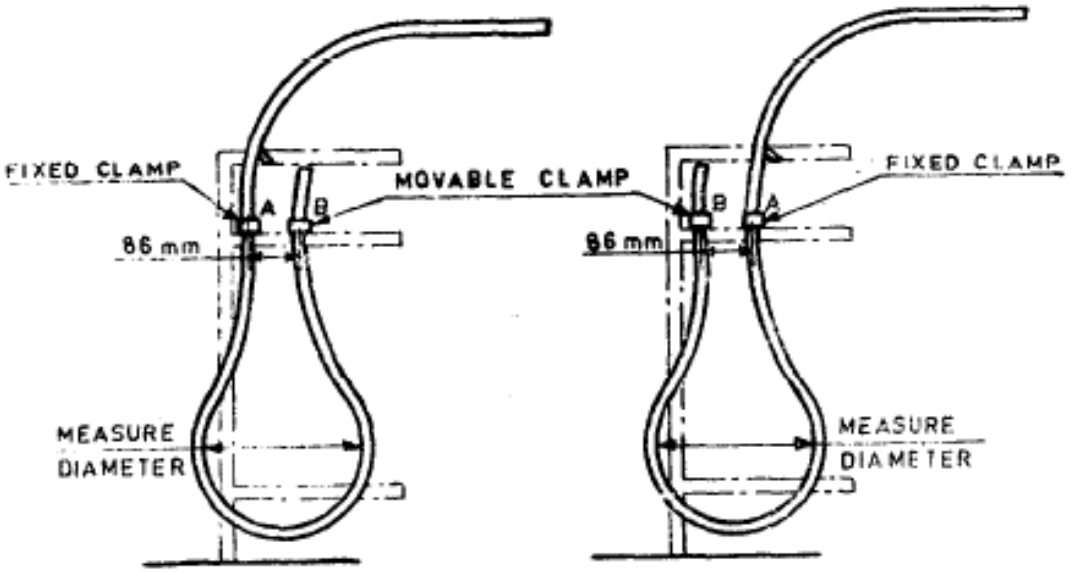

FIG 2 RELOCATED POSITION

FIG 3 RELOCATED POSITION WITH LOOP REVERSED

SECTION 8

ANNEX A
(*Forward*)

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.

ANNEX B
(*Foreword*)
COMMITTEE COMPOSITION
Power Cables Sectional Committee- ETD 09