BUREAU OF INDIAN STANDARDS
DRAFT FOR COMMENTS ONLY

Draft Indian Standard

Specification for Elastomer Insulated Cables
Part 1 for Working Voltages up to and including 1 100 volts

(*Second Revision of IS 9968-1*)

Power Cables Sectional Committee, ETD 09	Last date for comments- 04 10 2024

FOREWORD

(Formal Clause will be added)

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 originally published in 1981. The first revision of this standard was published in 1988. This Second revision of this standard has been brought out to take into account the experience gained since then and to align with the international practices, to the extent considered appropriate. Also the amendments of first revision have been incorporated.
Major change in this revision also include addition of braided cords.

Other part of this standard part 2 covers specification for elastomer — insulated cables for working voltages from 3.3 kV up to and including 33 kV.

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

SPECIFICATION FOR ELASTOMER INSULATED CABLES PART 1 FOR WORKING VOLTAGES UP TO AND INCLUDING 1 100 VOLTS

(*Second Revision*)

SECTION 1 GENERAL

1. SCOPE

1.1 This standard specifies the requirements of elastomer/rubber /silicon insulated cables for fixed wiring, flexible cables and flexible cords for electric power and lighting for operation at voltages up to and including 1100 volts.

1.2 The following types of cables and cords are covered in this standard

1.2.1 *Cables for fixed wiring*

a) Braided and compounded/varnished,
b) Elastomer sheathed (normal duty),
c) Elastomer sheathed (normal duty) with earth continuity conductor.
d) Rubber insulated and/or Sheathed cables
e) Silicon Insulated and/or Sheathed cables

1.2.2 *Flexible Cables*

a) Braided and varnished,
b) Elastomer sheathed (heavy duty) and
c) Rubber/Silicon insulated sheathed Cables

1.2.3 *Flexible Cords*

a) Braided or unbraided
b) Elastomer Sheathed (normal duty),
c) Unkinkable flexible cords - braided and compounded (workshop type). and
d) Unkinkable flexible cords - braided and compounded.

1.3 The cables covered in this standard are suitable for use on single-phase or three-phase (earthed or unearthed) system for rated voltages up to and including 1100 volts. These cables may be used on dc system for rated voltages up to and including 1500 volts to earth.

1.4 The cables covered in this standard are suitable for use where the combination of ambient temperature and temperature rise due to load results in conductor temperature not exceeding the following:

Type of Insulation	***Normal Continuous Operation***	***Short-Circuit Condition***

(1)	(2)	(3)
Insulation for general service	60°C	200°C
Heat resisting Insulation	90°C	250°C
Silicon rubber Insulation	150°C	350°C

NOTE — The short-circuit temperatures mentioned above are based on intrinsic properties of the insulating materials. It is essential that the accessories which are used in the above system with mechanical and/or soldered connection are suitable for the temperature.

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 8130 : 2013	Conductors for insulated electric cables and flexible cords - Specification (Second Revision)
IS 6380 : 1984	Specification for elastomeric insulation and sheath of electric cables (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 11) : 1984	Methods of test for cables: Part 11 thermal ageing in air
IS 10810 (Part 16) : 1986	Methods of test for cables: Part 16 accelerated ageing test by oxygen pressure method

IS 10810 (Part 17) : 1986	Methods of test for cables: Part 17 tear resistance test for heavy duty sheath
IS 10810 (Part 28) : 1984	Methods of test for cables: Part 28 water absorption test (Electrical)
IS 10810 (Part 30) : 1984	Methods of test for cables: Part 30 hot set test
IS 10810 (Part 31) : 1984	Methods of test for cables: Part 31 oil resistance test
IS 10810 (Part 43) : 1984	Methods of test for cables: Part 43 insulation resistance
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 56) : 1987	Methods of test for cables: Part 56 accelerated ageing test by air pressure method
IS 4905 : 2015	Random sampling and randomization procedures (First Revision)

3 TERMINOLOGY

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

3.1 Routine Tests - Tests made by the manufacturer on all finished cable length to demonstrate the integrity of the cable.

3.2 Type Tests - Tests required to be made before supply on a general commercial basis on type of cable in order to demonstrate satisfactory performance characteristics to meet the intended application.

Note - These tests are of such a nature that, after they have been made. They need not be repeated unless changes are made in the cable materials or design which might change the performance characteristics

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

3.4 Optional tests - Special tests to be carried out, when required, by agreement between the purchaser and the supplier.

SECTION 2 MATERIALS

4. CONDUCTOR

4.1 Copper Conductor - The conductor shall be tinned annealed copper wires complying with the requirements of IS 8130.

NOTE — The use of plain copper conductor is also permissible for cables with silicone rubber insulation.

4.2 Aluminum Conductor - The conductor shall be composed of aluminum wires complying with the requirements of IS 8130.

4.3 A separator tape made of suitable material may be applied over the conductor.

5. INSULATION

5.1 Insulation for General Service -The insulation shall be of elastomer compound conforming to Type IE 1 of IS 6380.

5.2 Heat Resisting Insulation - The Insulation shall be of elastomer compound conforming to Type IE 2 of IS 6380.

5.3 Silicone Rubber Insulation - The Insulation shall be of Silicone rubber conforming to Type IE 5 of IS 6380.

6 TAPE

6.1 Proofed Tape - The proofed tape shall be closely woven textile, without selvedge, proofed on one Side with rubber. The thickness of tape should be approximately 0.15 mm.

6.2 Polyethylene Terephthalate (PETP) tape or plastic tape or any other suitable tape - The thickness of tape should be 0.0125 mm (minimum).

6.3 Glass Tape - The glass tape shall be of suitable quality.

7. FILLERS

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

8. BRAID

8.1 Textile Braid - The textile braid shall consist of textile material (natural or synthetic), such as cotton, Polyethylene Terephthalate (PET), artificial silk mercerized or rayon (excluding Jute or hemp).
Textile braiding shall be treated with suitable preservative compound.

8.2 Glass Braid - The glass braid shall consist of glass fibre yarn of suitable quality.

9. SHEATH

9.1 General Service Insulated Cables and Flexible Cords

9.1.1 *Cables for Fixed wiring and Flexible Cords* — The sheath shall consist of elastomeric compound/Silicon rubber complying with the requirements of IS 6380.

9.1.2 *Flexible Cables* — The sheath shall consist of elastomeric compound complying with the requirements of Type SE 2 of IS 6380.

9.2 Heat Resisting Insulated Cables

9.2.1 *Cables for Fixed Wiring and Flexible Cords* — The sheath shall consist of elastomeric compound-complying with the requirements of Type SE 3 of IS 6380.

9.2.2 *Flexible Cables* — The sheath shall consist of elastomeric compound complying with the requirements of Type SE 4 of IS 6380.

10 COMPOUND AND VARNISH

10.1 Preservative Compound - Preservative compound shall be free from deleterious action on any part of the cable.

10.2 Varnish - Varnish shall be compatible with the operating temperature of the cable and applied to prevent fraying of glass yarn. It shall be free from deleterious action on any part of the cable.

SECTION 3 CONSTRUCTION

11 CONDUCTOR

11.1 Cables for Fixed Wiring- The construction of conductor for cables for fixed wiring shall be as follows;

Sl. No.	***Nominal Cross Sectional Area (mm)²***		***Solid /Stranded***	***Flexibility Class*** *(Refer to IS 8130)*
	Copper	**Aluminium**		
(1)	(2)	(3)	(4)	(5)
1.	1 and 1.5	1.5	Solid	Class 1
2.	2.5 to 6	2.5 to 10	Solid /Stranded	Class 1 for solid and class 2 for stranded
3.	10 and above	16 and above	Stranded	Class 2

11.1.1 The conductors shall be circular.

11.1.2 The earth continuity conductor shall be constructed from same material as main conductor.

11.2 Flexible Cables and Cords - The conductor formation shall be according to Class 5 of IS 8130.

12 SEPARATOR TAPE

12.1 The separator tape may be applied over the conductor as mentioned in the respective tables.

13 INSULATION

13.1 The conductor, with or without separator, shall be provided with insulation in accordance with respective tables.

13.2 Thickness of the Insulation - The average thickness of the insulation shall be not less than the nominal value specified in respective tables.

13.3 Tolerance on Thickness of Insulation (t_i) - The smallest of the measured value (t_i) specified in respective tables by more than 0.1mm + 0.1 ti

13.4 Application of Insulation - The insulator shall be so applied that it fits closely on the conductor with or without separator but shall not adhere to it. The Insulation, unless applied by the extrusion shall be applied in two or more layers.

14 CORE IDENTIFICATION

14.1 The cores shall be identified either by colour or numbers in accordance with 14.2 using any one of the following methods.

a) Numbered tapes,
b) Coloured insulation
c) Coloured tape and
d) Numbers printed on cores

14.2 The colour or number scheme shall be as given below;

Sl. No.	***Number of Cores***	***Rigid Cables***	***Flexible Cables***	***Flexible Cords***	***Numbers***
(1)	(2)	(3)	(4)	(5)	(6)
1.	Single	Red, black, white, yellow or blue	Red, black, white, yellow or blue	Red, black, white, yellow or blue	---
2.	Twin	Red and black	Red and black	Red and black	1, 2
3.	Three	Red, yellow and blue	Red, yellow and blue	Red, yellow and green*	1, 2, 3

4.	Four	Red, yellow, blue and black	Red, yellow, blue and green	Red, yellow, blue and green*	1, 2, 3, 4
5.	Five	--	Red. yellow, blue, black and green	---	1, 2, 3, 4, 5

*Green for ECC

14.2.1 When numerals are used for Identification, these shall appear at intervals of not greater than 150 mm.

15 TAPE

15.1 Proofed tape or PETP tape or plastic tape or any other suitable tape may be applied over insulation as mentioned in the respective tables. The tape, when provided, shall be applied with an overlap.

16 BRAIDING

16.1 The braiding, as required in the respective tables, shall be applied reasonably close, but not so tight as to damage the insulation.

17 COMPOUNDING AND VARNISHING

17.1 The compounding or varnishing shall be provided as required in the respective tables.

18 LAYING UP OF CORES

18.1 In case of twin and multicore circular cables and cords, the cores shall be laid together with a suitable right hand lay. Fillers in interstices may be used to provide reasonable circularity of laid up cable.

18.1.1 The values of lay for flexible cables and cords shall be maximum 18 times the pitch Circle diameter.

19 BINDER TAPE

19.1 The proofed tape or glass tape or PETP tape or plastic tape or any other suitable tape over laid up cores shall be applied as required in the respective tables with an overlap.

20 SHEATH

20.1 The sheath shall be applied by extrusion wherever required, in the respective tables.

20.2 Thickness of Sheath - The average thickness of the sheath shall be not less than the nominal value (t_s) specified in respective tables.

20.3 Tolerance on Thickness of Sheath - The smallest of the measured values of thickness of sheath shall not fall below the nominal value (t_s) specified in respective tables by more than 0.2 mm + 0.2 t_s.

20.4 Colour - The colour of the sheath shall be black, unless any other is agreed between the purchaser and the supplier.

21. OVERALL DIAMETER

21.1 Overall diameter of flexible cords shall not exceed the values given in the appropriate tables.

SECTION 4 TESTS

22 CLASSIFICATION OF TEST

22.1 Type Tests – Tests required to be made before supply on a type of cable (or cable system) on a general commercial basis in order to demonstrate satisfactory performance characteristics to meet the intended application.
The following shall constitute type tests:

Sl. No.	***Test***	***For Requirements, Refer to***	***Test Methods*** *(Refer to Part No of IS* 10810)
(1)	(2)	(3)	(4)
1.	Persulphate Test (for copper)	IS 8130	4
2.	Annealing test (for copper)	IS 8130	1
3.	Tensile test (for aluminium)	IS 8130	2
4.	Wrapping test (for aluminium)	IS 8130	3
5.	Conductor resistance test	IS 8130	5
6.	Test for thickness of insulation and sheath and overall diameter (where specified)	13, 20, 22 and Tables 1 to 10	6
7.	Physical tests for insulation and sheath (as applicable)		
8.	a) Tensile strength and elongation at break	IS 6380	7
	b) Ageing In air oven	IS 6380	11
	c) Ageing in air bomb	IS 6380	56
	d) Ageing In oxygen bomb	IS 6380	16
	e) Hot set	IS 6380	30
	f) Oil resistance	IS 6380	31
	g) Tear resistance	IS 6380	17
9.	Insulation resistance	IS 6380	43

10.	High voltage (water immersion) test	23.2	45
11.	Flammability test (applicable to cables finished With SE 3 and SE 4 sheaths only)	23.3	53
12.	Water absorption test (for insulation as applicable)	IS 6380	28

22.2 Acceptance Tests - Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.
The following shall constitute acceptance tests:

a) Annealing test (for copper):
b) Tensile Test ((for aluminium):
c) Wrapping test (for aluminium);
d) Conductor resistance test;
e) Test for thickness of insulation and sheath and overall diameter (*where* specified);
f) Tensile strength and elongation at break of insulation and sheath;
g) Hot set test for insulation and sheath (where applicable),
h) High voltage test, and
j) Insulation resistance test

22.2.1 A recommended sampling plan for acceptance tests is given in **Appendix A**.

22.3 Routine Tests - The following shall constitute the routine tests:

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

22.4 Optional tests - The following shall constitute optional test;

a) Flexing test for cords for use with electric irons- see Appendix-B

23 DETAILS OF TEST

23.1 General - Unless otherwise stated in this standard the tests shall be earned out In accordance with appropriate part of IS 10810, taking into account additional information given in this standard.

23.2 High Voltage Test

23.2.1 *Water Immersion Test (Type Test)* — The core (s) shall be carefully removed from a sample approximately 3 meters long taken from the finished cable or cord. They shall be so immersed in a water bath at room temperature that their ends protrude at least 200 mm above the water level. After 24 hours, an a.c voltage of 3 kV (rms) shall be applied between conductor and water. This voltage shall be raised to 6 kV (rms) within 10 seconds and held constant at this value for 5 minutes. If the sample fails in this test. One more sample shall be subjected to this test which shall pass.

23.2.2 *Test on Completed Cables (Acceptance and Routine Test)* — This test shall be carried out between conductors. The test voltage shall be 3 kV a.c (rms) or 7·2 kV d.c. The test shall be carried out at room temperature and the time of application shall be 5 minutes. No failure of insulation shall occur.

23.2.2.1 Single-core cables shall be immersed in water at ambient temperature one hour before the test and the test voltage shall be applied between conductor and water. In case of single core, braided and compounded, and braided and varnished cables. The core shall be subjected to spark test according to IS 10810 (Part 44).

23.2.3 *Spark Test (Routine Test)* — Spark test may be applied as an alternative to the high voltage test specified at **23.2.2.** It shall be made at the core stage during manufacture of cables and the potential difference between the electrode and the conductor shall be as specified below:

Sl. No	***Nominal Thickness of Insulation***		***Test Voltage kV (rms)***
	Above (mm)	Up to and Including (mm)	
(1)	(2)	(3)	(4)
1.	-	1.0	6
2.	1.0	1.5	10
3.	1.5	2.0	15
4.	2.0	2.5	20
5.	2.5	-	25

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

SECTION 5 IDENTIFICATION, PACKING AND MARKING

24 IDENTIFICATION

24.1 Manufacturer's Identification - The manufacturer shall be identified throughout the length of the cable by means of a tape bearing the manufacturer's name or trademark, or by manufacturer's name or trademark being printed, indented or embossed on the cable or cord. 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 printing, indentation or embossing shall be done on sheathed cables. The distance between any two consecutive printings. Indentations or embossing's shall be not more than 1 meter.

24.2 Cable Identification - Cables or cords shall be identified throughout the length of the cable or cords by the legends shown below, either printed or indented or embossed on the cable.

Type of Cable Insulation	***Legend***
(1)	(2)

Heat resisting rubber	HR 90
Silicon rubber	HR 150

NOTES
1 Single tape bearing manufacturers, name or trademark and the legends mentioned above, if provided, shall also be acceptable against the requirements of **24.1** and **24.2**.
2 No legend is required for general purpose rubber Insulation.

24.3 Cable Code – The following code shall be used for designating the cable:

Constituent	Code letter
Aluminum conductor	A
Elastomer Insulation	R
Braiding, compounding or varnishing	B
Elastomer Sheath	R
Earth continuity conductor	ECC

Note- When conductor material is copper, no code letter is required for conductor

25. PACKING AND MARKING

25.1 The cables and cords shall be either wound on drums (*see* IS 10418) or reels or supplied in coils and packed,

25.2 The cable shall carry the following information either stenciled on the drum or contained in a label attached to it.

a) Reference to this Indian Standard, IS 9968 (Part 1);
b) Manufacturer's name, brand name or trademark;
c) Type of cable and voltage trade,
d) Number of cores:
e) Nominal cross-sectional area of conductor;
f) Cable code;
g) Length of cable on the drum/reel/coil
h) Number of lengths on the reel, drum or coil (if more than one),
J) Direction of rotation of drum (by means of arrow).
k) Approximate gross weight:
m) Country of manufacture, and
n) Year of manufacture

25.2.1 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 there under. 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.

TABLE 1

ELA.STOMER INSULATED SINGLE – CORE TAPED OR UNTAPED TEXTILE BRAIDED AND COMPOUNDED CABLES

(*Clause* 12.1, 13, 15.1, 16.1 *and* 17.1)

Construction a) Tinned annealed copper or aluminium conductor (*see* **4** and **11.1**)
b) Optional separator tape (*see* **4.3**)
c) General Service insulation (*see* **5.1**)
d) Optional tape (*see* **6**)
e) Textile braiding (*see* **8.1**)
f) Textile braiding shall be treated with Preservative compound (*see* **10**)

Sl. No.	***Nominal Cross-Sectional Area of Conductor*** ***mm^2***	***Nominal Thickness of Insulation (t_1)*** ***mm***
(1)	(2)	(3)
1.	1	1.0
2.	1.5	1.0
3.	2.5	1.0
4.	4	1.0
5.	6	1.0
6.	10	1.2
7.	16	1.2
8.	25	1.4
9.	35	1.4
10.	50	1.6

TABLE 2
ELASTOMER INSULATED SINGLE- CORE, CIRCULAR TWIN-CORE, THREE-CORE AND FOUR-CORE ELASTOMER SHEATHED CABLES

(*Clause* 12.1, 13, 15.1, 19.1 *and* 20)

Construction a) Tinned annealed copper or aluminium conductor (*see* **4** and **11.1**)
b) Optional separator tape (*see* **4.3**)
c) Insulation;
1) General Service elastomeric (*see* **5.1**) or
2) Heat resisting elastomeric (*see* **5.2**)
d) Optional proofed tape (*see* **6**)

Single - core cables	***2, 3 and 4-core cables***
e) General Service sheath (*see* **9.1.1**) in case of general service insulation and heat resisting	e) 2, 3 and 4-core cables (*see* **18.1**) f) Optional fillers (*see* **7.1**)

sheath (*see* **9.2.1**) in case of heat resisting insulation.	g) Optional binder tape (*see* **6**) h) General service sheath (*see* **9.1**) in case of general service insulation and heat resisting sheath (*see* **9.2.1**) in Case of heat resisting insulation.

Sl. No.	**Nominal Cross Sectional area of conductor**	**Nominal Thickness of Insulation (t_i)**	**Nominal Thickness of Sheath (t_s)**			
			Single-core	**Twin - core**	**Three- core**	**Four- core**
	$(mm)^2$	(mm)	(mm)	(mm)	(mm)	(mm)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	1	1.0	1.0	1.0	1.0	1.1
2.	1.5	1.0	1.0	1.0	1.1	1.1
3.	2.5	1.0	1.0	1.1	1.1	1.1
4.	4	1.0	1.0	1.2	1.2	1.2
5.	6	1.0	1.0	1.2	1.2	1.3
6.	10	1.2	1.1	1.3	1.4	1.4
7.	16	1.2	1.1	1.4	1.4	1.5
8.	25	1.4	1.2	1.5	1.6	1.7
9.	35	1.4	1.2	1.6	1.7	1.8
10.	50	1.6	1.3	1.8	1.8	2.0
11.	70	1.6	1.4	1.9	2.0	2.1
12.	95	1.8	1.4	2.1	2.2	2.4
13.	120	1.8	1.5	2.2	2.3	2.5
14.	150	2.0	1.6	2.4	2.5	2.7
15.	185	2.2	1.7	2.6	2.7	2.9
16.	240	2.4	1.8	2.8	3.0	3.2
17.	300	2.6	1.9	3.0	3.2	3.5
18.	400	2.8	2.0	3.2	3.4	3.8
19.	500	3.0	2.2	-	-	-
20.	630	3.0	2.3	-	-	-

TABLE 3
ELASTOMER INSULATED, FLAT TWIN-CORE CABLES (WITH AND WITHOUT ECC) AND FLAT THREE- CORE (WITHOUT ECC) ELASTOMER SHEATHED CABLES

(*Clause* 12.0, 13 *and* 20)

Construction a) Tinned annealed copper or aluminium conductor (*see* **4 and 11.1**)
b) Optional separator tape (*see* **4.3**)
c) General Service elastomeric insulation (*see* **5.1**)

Cables without ECC	***Cable with ECC***
d) Two or three insulated cores laid side by side so as to form flat twin or flat three as the case may be optional worming or filling (*see* **7.1**)	d) Two insulated cores laid side by side : the earth continuity conductor (bare centrally placed between cores in the same plane)
e) Elastomeric sheath (*see* **9**)	e) Elastomeric sheath (*see* **9**)

Sl. No.	**Nominal Cross Sectional area of conductor**	**Nominal Thickness of Insulation (t_1)**	**Nominal Thickness of Sheath (t_1)**		**Nominal Cross Sectional area of Earth Continuity Conductor**
	$(mm)^2$	(mm)	(mm)	(mm)	$(mm)^2$
(1)	(2)	(3)	(4)	(5)	(6)
1.	1	1.0	1.0	1.0	1
2.	1.5	1.0	1.0	1.1	1.5
3.	2.5	1.0	1.1	1.1	1.5
4.	4	1.0	1.2	1.2	1.5
5.	6	1.0	1.2	1.2	2.5
6.	10	1.2	1.3	1.4	4
7.	16	1.2	1.4	1.4	6

TABLE 4
ELASTOMER INSULATED, SINGLE-CORE, TWIN-CORE, THREE-CORE AND FOUR-CORE GLASS FIBRE BRAIDED AND VARNISHED CABLES AND CORDS

(*Clauses* 12.1, 13, 16.1 *and* 17.1)

Construction: a) Tinned annealed copper or aluminum conductor for cables for fixed wiring and tinned annealed copper for flexible cables and cords **(***see* **4, 11.1** and **11.2**).
b) Optional separator tape **(***see* **4.3)**
c) Silicone rubber insulation (*see* **5.3)**

Single-Core Cables	***2, 3 and 4 - Core Cables***
d) Glass braid (*see* **8.2**)	d) 2, 3 and 4 cores laid up (*see* **18.1**) with optional fillers (*see* **7.1**)
e) Treated with suitable varnish (*see* **10.2**)	e) Glass braid (*see* **8.1**) g) Treated with Suitable varnish (*see* **10.2**)

Sl. No.	**Nominal Cross Sectional area of conductor**	**Nominal Thickness of Insulation (t_i)**	
		Cables for Fixed Wiring	**Flexible Cables and Cords**
	$(mm)^2$	(mm)	(mm)
(1)	(2)	(3)	(4)
1.	0.5	-	1.0

2.	0.75	-	1.0
3.	1	1.0	1.0
4.	1.5	1.0	1.0
5.	2.5	1.0	1.0
6.	4	1.0	1.0
7.	6	1.0	1.0
8.	10	1.2	1.2
9.	16	1.2	1.2
10.	25	1.2	1.2
11.	35	1.4	1.4
12.	50	1.6	1.6
13.	70	-	1.6
14.	95	-	1.8
15.	120	-	1.8
16.	150	-	2.0
17.	185	-	2.2
18.	240	-	2.4
19.	300	-	2.6
20.	400	-	2.8
21.	500	-	3.0
22.	630	-	3.0

NOTE — The use of plain copper conductor is also permissible for cables with silicone rubber insulation.

TABLE 5
ELASTOMER INSULATED SINGLE-CORE, CIRCULAR, TWIN-CORE, THREE-CORE, FOUR CORE AND FIVE-CORE ELASTOMER SHEATHED FLEXIBLE CABLES

(*Clauses* 12.1, 13, 19.1 *and* 20)

Construction:
a) Tinned annealed copper Conductor (*see* **4** and **11.2**)
b) Optional separator tape (*see* **4.3**)
c) Insulation
  1) General Service elastomeric (*see* **5.1**), or
  2) Heat resisting elastomeric (*see* **5.2**)
d) Optional tape (*see* **6**)

Single-Core Cables	***2, 3, 4 and 5 - Core Cables***
e) Heavy duty sheath (**9.1.2**) in case of general purpose rubber insulation and heavy duty HFFR sheath (**9.2.2**) in case of heat resisting rubber insulation.	e) 2, 3, 4 and 5 cores laid up (**18.1**) optional fillers (**7.1**). f) Optional binder tape (**6**)

	g) Heavy duty sheath (**9.1.2**) in case of general purpose rubber insulation and heavy duty HFFR sheath (**9.2.2**) in case of heat resisting rubber insulation.

Sl. No.	**Nominal Cross Sectional area of conductor**	**Nominal Thickness of Insulation (t_i)**	**Nominal Thickness of Sheath (t_s)**				
			Single-core	Twin-core	Three-core	Four-core	Five-core
	$(mm)^2$	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	6	1.0	1.6	2.0	2.1	2.5	2.5
2.	10	1.2	1.8	2.4	2.5	2.7	2.9
3.	16	1.2	1.9	2.5	2.7	2.9	3.2
4.	25	1.4	2.0	3.2	3.3	3.4	-
5.	35	1.4	2.2	3.3	3.4	3.5	-
6.	50	1.6	2.4	3.5	3.6	3.7	-
7.	70	1.6	2.6	3.6	3.7	3.9	-
8.	95	1.8	2.8	3.8	4.0	4.1	-
9.	120	1.8	3.0	4.0	4.1	4.3	-
10.	150	2.0	3.2	4.2	4.3	4.5	-
11.	185	2.2	3.4	4.3	4.5	4.8	-
12.	240	2.4	3.5	4.6	4.8	5.1	-
13.	300	2.6	3.5	4.9	5.1	5.4	-
14.	400	2.8	3.8	5.2	5.4	5.8	-
15.	500	3.0	4.0	-	-	-	-
16.	630	3.0	4.1	-	-	-	-

TABLE 6
ELASTOMER INSULATED SINGLE-CORE, CIRCULAR, TWIN-CORE, THREE-CORE AND FOUR CORE ELASTOMER SHEATHED AND BRAIDED FLEXIBLE CORDS

(*Clauses* 12.1, 13, 19.1 *and* 20)

Construction:

a) Copper conductor (*see* **4** and **11.2**).
b) Optional separator tape (*see* **4.3**).
c) Insulation:
    1) General Service elastomeric (*see* **5.1**), or
    2) Heat resisting elastomeric (*see* **5.2**). or
    3) Silicon rubber elastomeric (see 5.3),

d) Optional tape (*see* **6**).
e) Braiding shall be textile braid or glass braid
f) General service sheath (*see* **9.1.1**) in case of general service insulation and heat resisting sheath (*see* **9.2.1**) in case of heat resisting insulation.
g) 2, 3 and 4 cores laid up (*see* **18.1**) optional fillers (*see* **7.1**) for 2,3 and 4 core cords.

Sl. No.	**Nominal Cross Sectional area of conductor**	**Nominal Thickness of Insulation (t_i)**	**Nominal Thickness of Sheath (t_s)**				**Overall Diameter (*Max*)**			
			Single-core	Two-core	Three-core	Four-core	Single-core	Two-core	Three-core	Four-core
	$(mm)^2$	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1.	0.5	0.6	0.8	0.8	0.9	0.9	5.8	8.3	8.9	9.5
2.	0.75	0.6	0.8	0.8	0.9	0.9	6.0	8.7	9.4	10.0
3.	1.0	0.6	0.9	0.9	0.9	0.9	6.3	9.3	9.7	10.5
4.	1.5	0.8	1.0	1.0	1.0	1.1	7.3	10.9	11.5	12.6
5.	2.5	0.9	1.1	1.1	1.1	1.2	8.0	12.4	13.0	14.3
6.	4.0	1.0	1.2	1.2	1.2	1.3	9.0	14.2	15.0	16.5

Table 7
Elastomer Insulated, Textile Braided, Single and Twisted Twin Flexible Cords
(*Clause* 12.1, 13 *and* 16.1)

Construction: a) Tinned annealed copper conductor (*see* **4** and **11.2**).
b) Optional separator tape (*see* **4.3**).
c) General Service elastomeric insulation (*see* **5.1**).
d) Braided with artificial silk mercerized or cotton (*see* **8.1**).
e) In case of twisted twin flexible cord, two such braided cores shall be twisted together.

Sl. No.	**Nominal Cross- Sectional Area of Conductor**	**Nominal Thickness of Insulation**	**Overall Diameter of each braided core (*Max*)**
	$(mm)^2$	(mm)	(mm)
(1)	(2)	(3)	(4)
1.	0.5	0.6	4.7

2.	0.75	0.6	4.9
3.	1.0	0.6	5.1
4.	1.5	0.8	5.8
5.	2.5	0.9	6.4

TABLE 8
ELASTOMER INSULATED CIRCULAR, TWIN-CORE, AND THREE-CORE, TEXTILE BRAIDED FLEXIBLE CORDS
(*Clauses* 12.1, 13 *and* 16.1)

Construction:

a) Tinned annealed copper conductor (*see* **4** and **11.2**).
b) Optional separator tape (*see* **4.3**).
c) General Service elastomeric insulation (*see* **5.1**).
d) Two or three cores shall be twisted together (*see* **18.1**).
e) Optional fillers (*see* **7.1**).
f) Braided with artificial silk mercerized or cotton (*see* **8.1**).

Sl. No.	**Nominal Cross-Sectional Area of Conductor**	**Nominal Thickness of Insulation (t_i)**	**Overall Diameter (*Max*)**	
			Two-core	**Three-core**
	$(mm)^2$	(mm)	(mm)	(mm)
(1)	(2)	(3)	(4)	(5)
1.	0.5	0.6	7.3	7.7
2.	0.75	0.6	7.7	8.1
3.	1.0	0.6	8.0	8.5
4.	1.5	0.8	9.4	10.0
5.	2.5	0.9	10.7	11.3
6.	4	1.0	12.3	13.1

Table 9
Elastomer Insulated Twin-Core or Three-Core Unkinkable Flexible Cords

(Workshop Type)

(*Clauses* 12.1, 13, 16.1, 17.1 *and* 19.1)

Construction:

a) Tinned annealed copper conductor (*see* **4** and **11.2**).
b) Optional separator tape (*see* **4.3**).
c) General Service elastomeric insulation (*see* **5.1**).
d) Two or three cores shall be twisted together (*see* **18.1**).
e) Optional fillers (*see* **7.1**).
f) Binder tape (*see* **19.1**).
g) Textile braiding (*see* **8.1**).
h) Textile braiding shall be treated with preservative compound (*see* **10.1**).
i) Glass braiding

Sl. No.	**Nominal cross sectional Area of Conductor**	**Nominal thickness of Insulation**	**Overall Diameter (*Max*)**	
			Two- core	**Three- Core**
	$(mm)^2$	(mm)	(mm)	(mm)
(1)	(2)	(3)	(4)	(5)
1.	0.5	0.6	7.6	8.0
2.	0.75	0.6	8.0	8.4
3.	1.0	0.6	8.3	8.8
4.	1.5	0.8	9.7	10.3
5.	2.5	0.9	11.0	11.6
6.	4	1.0	12.6	13.4

Table 10
Elastomer Insulated Twin-Core or Three-Core Unkinkable Flexible Cords
(Domestic Type)

(*Clause* 12.1, 13, 16.1, 17.1 *and* 19.1)

Construction: a) Tinned annealed copper conductor (*see* **4** and **11.2**).
b) Optional separator tape (*see* **4.3**).
c) General Service elastomeric insulation (*see* **5.1**).
d) Two or three cores shall be twisted together (*see* **18.1**) with filler of natural or synthetic fibres (*see* **7.1**).
e) Elastomeric sheath (*see* **9.1.1**).
f) Cotton braided being semi embedded in the sheath (*see* **8.1**).

Sl. No.	**Nominal Cross Sectional Area of Conductor**	**Nominal Thickness of Insulation (t_1)**	**Nominal Thickness of Sheath (t_s)**		**Overall Diameter (*Max*)**	
			Two - Core	**Three - Core**	**Two- core**	**Three - Core**
	$(mm)^2$	(mm)	(mm)	(mm)	(mm)	(mm)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	0.5	0.8	1.3	1.4	11.3	12.0
2.	0.75	0.8	1.3	1.4	11.7	12.4
3.	1.0	0.8	1.3	1.4	12.1	12.8
4.	1.5	0.8	1.5	1.6	13.0	13.8
5.	2.5	0.9	1.7	1.8	14.7	15.6
6.	4	1.0	1.8	1.9	16.8	17.6

APPENDIX A
(*Clause* 22.2.1)
SAMPLING OF CABLES

A-1 LOT

A 1.1 In a consignment, the cables of the same size manufactured under essentially similar conditions of production shall be grouped together to constitute a lot.

A-2. SCALE OF SAMPLING

A-2.1 Samples shall be taken and tested from each lot for ascertaining the conformity of the lot to the requirements of the specification.

A-2.2 The number of samples to be selected shall depend on col l and 2 as indicated below. These samples shall be taken at random:

Sl. No.	**No. of Drums cords reels in the Lot**	**No. of Drums cords reels to be Taken as sample**	**Permissible No. of Defectives**
	(N)	(n)	(a)
(1)	(2)	(3)	(4)
1.	UP to 25	3	0
2.	26 to 50	5	0
3.	51 to 100	8	0
4.	101 to 300	13	1
5.	301 and above	20	1

A-2.2.1 In order to ensure the randomness of selection, procedure given in IS 4905 may be followed.

A-3. NUMBER OF TESTS AND CRITERION FOR CONFORMITY

A-3.1 Suitable lengths of test samples shall be taken from each of the drums selected. These test samples shall be subjected to each of the acceptance tests (*see* **22.2**). A test sample is called defective if it fails in any one of the acceptance tests. If the number of defectives is less than or equal to the corresponding permissible number given in col 3 under **A-2.2,** the lot shall be declared as conforming to the requirements of acceptance tests, otherwise not.

APPENDIX B
(*Clause* 23.4)

FLEXING TEST FOR CORDS FOR USE WITH ELECTRIC IRONS

B-1 The part of the iron comprising the cable entry fitted with the cord guard and the flexible cable or cord for which the iron is designed, is fixed to the oscillating member of an apparatus similar to that shown in **Fig. 1**

B-2 The sample is so mounted that the axis of oscillation is tangential to the outer surface of the part in which the cord guard is secured, and when the oscillating member is at the middle of its travel, the axis of the cable or cord, where it leaves the cord guard, is vertical.

B-3 A load having a mass equal to that of the iron but not less than 2 kg or more than 6 kg is attached to the cable or cord.

B-4 The oscillating member is moved backwards and forwards through an angle of 90°C (45°C on either side of the vertical) member of flexing, the sample is turned through 90°C about the center line of the cord guard.

B-5 After the test, the cord guard shall not have worked loose and neither the cord guard nor the flexible cable or cord shall allow any damage within the meaning of this specification except that and give then 10 percent of the total number of conductor strands may have been broken.

Note— A flexing is one movement either backward or forward.

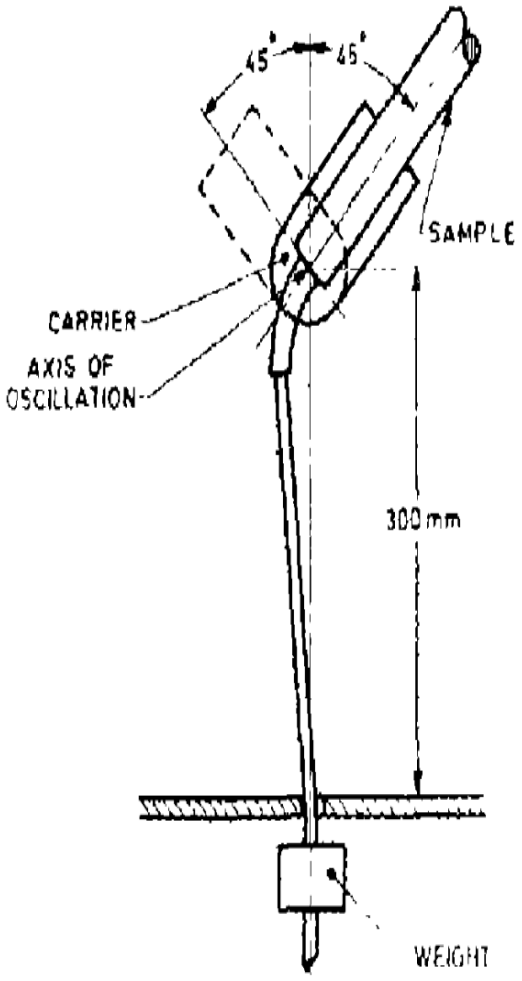

FIG. 1 FLEXING TEST APPARATUS