IS : 7755 - 1975
(Reaffirmed 1998)

Indian Standard

SPECIFICATION FOR HIGH TENSION INSULATING COTTON TAPE IMPREGNATED WITH BITUMEN-BASED COMPOUND

(First Reprint JULY 1984)

UDC 621.315.61—418:621.315.614.73

INDIAN STANDARDS INSTITUTION
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NEW DELHI 110002

Gr 2

October 1975

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Indian Standard

SPECIFICATION FOR HIGH TENSION INSULATING COTTON TAPE IMPREGNATED WITH BITUMEN-BASED COMPOUND

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 July 1975, after the draft finalized by the Treated Fabrics Sectional Committee had been approved by the Chemical Division Council, Mechanical Engineering Division Council and Textile Division Council.

0.2 Cotton tape impregnated with bitumen-based compound is used for jointing and insulation of conductor fittings for solid type paper insulated cables. Tapes covered by this standard are suitable for voltages up to 11 000 volts.

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

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1. SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for high tension insulating cotton tape impergnated with bitumen-based compounds suitable for jointing and insulation of conductor fittings for solid type paper insulated cables for voltage up to and including 11 000 volts.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2244-1972† shall apply.

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

†Glossary of terms relating to treated fabrics (*first revision*).

3. REQUIREMENTS

3.1 Description — The impregnated tape shall be free from defects, such as bubbles, pinholes, creases and flaws. It shall be flexible and the coating shall not peel, flake or become brittle during storage at a temperature of 30 ± 5°C.

3.2 Base Cotton Tape

3.2.1 *General* — The cotton tape shall be of selvedge type with plain weave but evenly and firmly woven from good quality cotton and shall be free from weaving defects and foreign matters. It shall be calendered and free from size and other loading.

3.2.2 *Count of Yarn* — The yarn from which the tape is made shall be 22 tex × 2 in the warp and 22 tex in the weft.

3.2.3 The tape shall be in nominal widths of 15, 20 and 25 mm and shall comply with the requirements prescribed in Table 1. A tolerance of ± 0·75 mm shall be permissible on width when measured according to 3 of IS : 7016 (Part I) 1973*.

TABLE 1 REQUIREMENTS FOR COTTON TAPE

Sl No.	Characteristic	Requirement for Nominal Width of			Method of Test, Ref to
		15 mm	20 mm	25 mm	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Mass, g/m	1·95 ± 0·10	2·70 ± 0·15	3·95 ± 0·15	4.2 of IS : 7016 (Part I)-1973*
ii)	Thickness, mm	0·28 to 0·38	0·28 to 0·38	0·28 to 0·38	5 of IS : 7016 (Part I)-1973*
iii)	Number of ends per cm, *Min*	12	20	26	5 of IS : 1963-1969†
iv)	Number of picks per cm, *Min*	12	12	12	5 of IS : 1963-1969†
v)	Breaking load in warp direction, kg, *Min*	15	20	27	IS : 1969-1968‡ (with ravelled strips)

*Methods of test for coated and treated fabrics: Part I Determination of roll characteristics.

†Methods for determination of threads per decimetre in woven fabrics (*first revision*).

‡Method for determination of breaking load and elongation at break of woven textile fabrics (*first revision*).

*Methods of test for coated and treated fabrics: Part I Determination of roll characteristics.

3.3 Impregnating Compound

3.3.1 The bitumen-base impregnating compound required for the manufacture of high tension insulating tape shall comply with the requirements prescribed in Table 2.

TABLE 2 REQUIREMENTS FOR IMPREGNATING COMPOUND

Sl No.	Characteristic	Requirement	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Softening point, °C	70 to 90	IS : 1205-1958*
ii)	Penetration at 27°C, *Min*	26	IS : 1203-1958†
iii)	Electric strength (proof) test at 60 ± 1°C, kV (rms)	20	Appendix B of IS : 7084-1973‡
iv)	Mineral matter (ash), percent by mass, *Max*	0·5	Appendix D of IS : 7084-1973‡
v)	Contraction and depth of pipe:		Appendix C of IS : 7084-1973‡
	a) Contraction, percent, *Max*	6·5	
	b) Depth of pipe, mm, *Max*	16·5	
vi)	Solubility (insoluble content), percent by mass, *Max*	0·5	IS : 1216-1958 (Method A)§

*Methods for testing tar and bitumen : Determination of softening point.
†Methods for testing tar and bitumen : Determination of penetration.
‡Specification for bitumen based filling compounds for electrical purposes.
§Methods for testing tar and bitumen : Determination of solubility in carbon disulphide.

3.3.2 The impregnating compound when tested as described in Appendix E of IS : 7084-1973* shall not show more than a slight discoloration of the copper foil.

3.3.3 When tested as described in Appendix F of IS : 7084-1973*, not more than 4 mg of potassium hydroxide shall be required to neutralize 1 g of impregnating compound.

3.4 Finished Tape

3.4.1 *Thickness* — The thickness of the impregnated tape when measured in accordance with 5 of IS : 7016 (Part I)-1973† shall be 0·6 ± 0·1 mm.

*Specification for bitumen based filling compounds for electrical purposes.
†Methods of test for coated and treated fabrics: Part I Determination of roll characteristics.

3.4.2 *Width* — The width of the tape shall be within the appropriate limits prescribed in **3.2.3.**

3.4.3 *Breaking Load* — The breaking load of the finished tape in the warp direction shall be not less than the values specified in Table 1.

3.4.4 *Electric Strength (Proof) Test (for the Tape)*

3.4.4.1 *Electric strength test without pre-conditioning* — The impregnated cotton tape shall withstand 4 kV for one minute without failure when tested according to the method prescribed in IS : 2584-1963*.

3.4.4.2 *Electric strength test after heat ageing* — The impregnated cotton tape (30 cm in length) when tested within 3 minutes, after exposure to dry air at 9. ± 1°C for 120 hours, according to the method prescribed in IS : 2584-1963* shall withstand 4 kV for one minute without failure.

3.4.5 *Form of Supply* — The standard lengths of tape per roll shall be 15, 30, 60 and 120 m. Other lengths per roll may be supplied subject to agreement between the purchaser and the supplier.

4. PACKING

4.1 The tape shall be wound on circular cardboard centres which have sufficient strength to withstand the pressure of tightly wound tape without deformation. The internal diameter of the centres shall be between 0·95 to 1·25 cm and the width shall not exceed the width of the tape.

4.1.1 The tape shall be wound uniformly and sufficiently tightly to ensure that when a roll is dropped on the floor the cardboard does not fall out. Pin shall not be used for fastening the ends of a roll nor for jointing tape. The rolls of tape shall be free from breaks. Not more than 5 percent of the rolls in a lot shall contain more than one joint per roll.

4.2 Individual rolls shall be placed immediately after manufacture in polyethylene bags and hermetically sealed. These polyethylene bags containing individual rolls of tape shall be packed in circular tin containers or special type of cardboard packs and sealed properly such that there is no chance of moisture ingress or contamination with dirt during storage or transit.

5. MARKING

5.1 Each roll or package or both shall be marked with the following information:

a) Name of the material;
b) Length, width and thickness of the material;

*Method of test for electric strength of solid insulating materials at power frequencies.

c) Manufacturer's name or trade-mark, if any; and

d) Month and year of manufacture.

5.1.1 Each roll or package or both 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 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.

6. CONDITIONING OF TEST SAMPLES

6.1 All test samples of tapes unless specified otherwise shall be conditioned prior to testing in an atmosphere of 65 ± 2 percent relative humidity and 27 ± 2°C temperature for 24 hours.

7. SAMPLING AND CRITERIA FOR CONFORMITY

7.1 Lot — In any consignment, all the rolls of the same width and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

7.1.1 The conformity of the lot to the requirements of this specification shall be ascertained for each lot separately. The number of rolls to be selected for testing from each lot shall be in accordance with Table 3.

7.1.2 The rolls shall be selected at random from the lot and to ensure randomness of selection, use shall be made of a random number table. In case such a table is not available, the following procedure is recommended for use:

Starting from any roll, count them as 1, 2, 3,....., etc, up to r and so on, where r is the integral part of N/n (N being the number of rolls in the lot and n the number of rolls to be selected for testing). Every rth roll thus counted shall be withdrawn to constitute the sample.

7.1.3 If, however, the rolls in a lot are packed in packages, then a suitable number of packages subject to a minimum of 2 shall be selected at random and then an equal number of rolls shall be taken from them at random according to the procedure given in **7.1.2** so as to make up the number required.

TABLE 3 SCALE OF SAMPLING

(*Clause* 7.1.1)

Lot Size	Number of Rolls to be Selected
N	*n*
(1)	(2)
Up to 25	2
26 ,, 50	3
51 ,, 100	5
101 ,, 300	8
301 and above	13

7.2 Number of Tests

7.2.1 Each roll selected in **7.1.2** or **7.1.3** shall be fully examined for requirements given in **3.1**, **3.4.1**, **3.4.2** and **3.4.5**.

7.2.2 For tests regarding all other requirements of this specification, specimens shall be cut from each roll individually.

7.2.3 When cutting the specimens from rolls not less than two turns of tape shall be removed from the roll before specimens are taken.

7.2.4 The sizes and number of the specimens shall be as specified under the relevant clauses and test methods of this standard.

7.3 Criteria for Conformity

7.3.1 The lot shall be declared to be in conformity with requirements of this specification, if each of the selected rolls satisfies all the requirements of this standard.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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