भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

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भारतीय मानक मसौदा

वस्त्रादि — उपभोक्ता सामानों के लिए बंधक संश्लिष्ट हुक और फंदा टेप — विशिष्टि

(*आई एस* 8156 *का चौथा संशोधन*)

Draft *Indian Standard*

TEXTILES — SYNTHETIC HOOK AND LOOP TAPE FASTENERS FOR CONSUMER GOODS — SPECIFICATION

(*Fourth Revision* IS 8156)

ICS 81.040

Technical Textile for Clothtech Application Including Narrow Fabric and Braid Sectional Committee, TXD 39	Last date for receipt of comments 24 August 2024

FOREWORD

(*Formal clauses will be added later***)**

With the advancement of technology, the synthetic hook and loop tapes are being used in more and diversified fields. These revolutionary fasteners are gentle enough to be used in baby's diapers replacing safety pins and yet sturdy and reliable enough to be used even in aircrafts and space-ships and now as household fasteners.

This standard was originally issued in 1976 and subsequently revised in 1981, 1994 and 2014. This revision is based on the prevalent practice followed by the Indian industry. In the present revision the following modifications have been made:

a) Four classes of tapes manufactured from 100% nylon, 100% polyester, and combinations of polyester/ nylon and polyester/polypropylene as material of manufacture for portions of loop and hook tape have been included.

b) Requirements for hook and loop density and test method have been included.
c) Minimum width of 12 mm has been incorporated
d) Requirements for shrinkage of hook and loop tape have been revised.
e) Requirements for flammability test of hook and loop tapes has been included.
f) BIS certification marking clause has been modified; and
g) References to Indian Standard given in Annex A has been updated.

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 : 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.

1 SCOPE

1.1 This standard covers the dimensions, materials and other requirements pertaining to construction and performance of synthetic hook tape and loop tape fastener.

1.2 This standard also covers the hook tape and loop tape fastener manufactured from 100% nylon, 100% polyester, and combinations of polyester/nylon and polyester/polypropylene as material of manufacture.

2 REFERENCES

The standards listed in Annex A 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 subjected to revision, and parties to agreements based on this standard are encourage to investigate the possibility of applying the most recent editions of these standards.

3 TERMS AND DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

3.1 Hook Tapes

Hook tapes are one side of a fastener system, featuring small, stiff hooks. When pressed against a corresponding loop tape, the hooks catch and bind to the loops, creating a secure closure. Commonly used in fasteners, hook tapes provide a durable and adjustable fastening solution.

3.2 Look Tapes

Loop tapes are the counterpart to hook tapes in a fastener system, consisting of soft, pliable loops. When combined with hook tapes, the loops catch onto the hooks, forming a strong bond. Loop tapes are essential in fasteners, offering a flexible and reusable closure mechanism.

4 CLASSES

4.1 Based on the type of material used for manufacturing, the hook and loop tape fasteners shall be divided into the following classes as given in Table 1.

Table 1 Classification of Hook Tapes and Loop Tapes
(*Clause* 4.1 and 5.1)

Sl No.	Classes	Hook Tapes		Loop Tapes	
		Binder Ground Yarn	**Hook Yarn**	**Binder Ground Yarn**	**Pile Yarn**
(1)	(2)	(3)	(4)	(5)	(6)
i)	Class 1	Nylon 6	Mono Filament Nylon 6.6 of linear density from 390 D to 420 D	Nylon 6	Multifilament Nylon 6
ii)	Class 2	Polyester	Mono Filament Nylon 6.6 of linear density from 390 D to 420 D	Polyester	Multifilament Nylon 6
iii)	Class 3	Polyester	Mono Filament Polyester of linear density from 420 D to 450 D	Polyester	Multifilament Polyester
iv)	Class 4	Polyester	Mono Filament Polypropylene of linear density from 175 D to 195 D	Polyester	Multifilament Polyester
v)	Class 5	Nylon 6	Mono Filament Nylon 6.6 of linear density from 200 D to 220 D	Nylon 6	Multifilament Nylon 6
NOTE — For manufacturing hook and loop tapes with softer hooks, class 5 shall be used.					

5 MATERIALS

5.1 Hook and loop tape fasteners shall be manufactured from the materials specified in Table 1.

5.2 The materials used in manufacturing of Hook and loop tapes shall be tested as per Annex B.

5.3 The linear density of monofilament yarn used in hook yarns shall be as per IS 7703 (Part 1) and shall conform to the requirements specified in Table 1.

6 DIMENSIONS

6.1 The sizes of hook tapes and loop tapes and their tolerances shall be as given in Table 2.

Table 2 Sizes for Hook Tapes and Loop Tapes
(*Clause* 6.1)

Sl No.	Characteristics	Classes					Tolerances	Method of Test, Ref to
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Classes	Class 1	Class 2	Class 3	Class 4	Class 5		
ii)	Nominal Width mm (*see* NOTE)	12 to 25 mm					± 1.5 mm	Annex C
		30 to 38 mm					± 1.5 mm	
		50 to 75 mm					± 2 mm	
		80 to 175 mm					± 3 mm	
iii)	Length m (*see* NOTE)	25, 50, 100					+ 1 m − 0 m	Annex D
NOTE — If required for a particular application, the nominal width and length other than those given above may be used as per the agreement between the buyer and the seller.								

6.2 The density of hook and loop shall be as given in Table 3 when tested as per the method given in Annex M

Table 3 Hook and loop Density
(*Clause* 6.2)

Sl No.	Characteristic(s)	Classes					Tolerance(s)	Method of Test, Ref to
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Class 1	Class 2	Class 3	Class 4	Class 5		
i)	Hook Density, Per Square inch	300	260	250	480	300	± 10 Percent	Annex M
ii)	Loop Density, Per Square Inch	535	520	500	500	535	± 5 Percent	

7 MANUFACTURE

7.1 Hooks

The hook fastener tape shall be a woven, warp loop, narrow fabric construction, with multifilament ground ends (including selvages) and picks. Monofilament auxiliary warp ends shall be woven in the form of raised loops which can be heat set to retain their shape and cut near the top of the loop in order to form a free hook engaging section. The hook shall be a leno weave, woven in a staggered order.

7.2 Loops

The loop fastener tape shall be a woven, warp loop, narrow fabric construction, with multifilament ground ends (including selvages) and picks, with leno woven loop warp ends. The loops shall be suitably napped to form a uniformly disoriented surface of uncut loops capable of being engaged by the hooks of the hook fastener tape component. As an alternate, the loop shall be woven of specially treated yarns that provide a uniformly disoriented surface without being napped.

7.3 A selvedge of 1 mm to 3 mm shall be provided in hook and loop tapes along with both the edges to facilitate stitching.

8 PERFORMANCE REQUIRNMENT

8.1 The hook and loop tapes shall conform to the requirements given in Table 4.

Table 4 Requirement for Hooks and Loops Tapes

(*Clause* 8.1)

Sl No.	**Characteristics**	**Requirement**					**Method of Test, Ref to**
		Class 1	**Class 2**	**Class 3**	**Class 4**	**Class 5**	
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
i)	Initial shear strength, g/cm^2, *Min* a) Lengthwise b) Widthwise	 960 960	 860 860	 760 760	 2000 2000	 300 300	Annex E
ii)	Initial peel strength, g/cm, *Min*	255	225	180	700	50	
iii)	Endurance strength, *Min*	675 g/cm2 after being subjected	610 g/cm2 after being subjected	305 g/cm2 after being subjected	—	150 g/cm2 after being subjected	Annex F

		to 5000 cycles	to 3000 cycles	to 500 cycles		to 5000 cycles	
iv)	Dot tear test, N, *Min*	15	25	25	25	15	Annex G
v)	Shrinkage(longitudinal), Percent, *Max* a) For hooks b) For loops	3 4					Annex H
vii)	Colour fastness a) Colour fastness to light (grey scale)	3 or Better					IS/ISO 105 B01 Or IS/ISO 105-B02
	b) Colour fastness to crocking (grey scale) i) Dry crocking ii) Wet crocking	3 or Better					Annex J
	c) Colour fastness to washing C(3) (grey scale)	3 or Better					IS/ISO 105-C10
	d) Colour fastness to sea water (grey scale)	3 or Better					IS/ISO 105-E02

8.2 Flammability Test (Optional requirement)

If agreed to between the buyer and the seller, the hook and loop tapes of Class 1 shall conform to the requirements of flammability test as given in Table 5.

Table 5 Requirement for Flame Resistance of Hooks and Loops Tapes

(*Clause* 8.2)

Sl No.	**Characteristics**	**Requirement**		**Method of Test, Ref to**
(1)	(2)	(3)	(4)	(5)
i)	Vertical flammability test(optional):	Ignition Time (*see* Note)		Annex K
		12s	60s	
	a) Flame time, sec, *Max*	15	15	

	b) Drip flame time, sec, *Max*	5	3	
	c) Burn length vertical, mm, *Max*	200	150	
ii)	Horizontal flammability test (optional) a) Burn rate, mm/ min, *Max*	100		Annex A of IS 15061
NOTE — As agreed to between the buyer and the seller, the ignition time for flammability test shall be either 12 s or 60 s.				

9 DYEING

9.1 The hook and loop tapes shall be dyed suitably. The dyes that are used for the dyeing of the hook and loop tapes shall be azo free dyes and free from formaldehyde.

9.2 The tapes shall conform to the requirements of this standard prior to the application of the adhesive backings.

9.3 The hook and loop tape fasteners may be supplied in any colour as desired by the purchaser. The shade shall be uniform throughout on both the hook and loop tapes.

10 COATING

10.1 Coating shall be Polyurethane based for all classes. The precoats may be activated with water or solvents like Ethyl Acetate, methyl ethyl ketone, as agreed to between the purchaser and the supplier.

10.2 The hook and loop tapes shall be stabilized as necessary and pre-shrunk to ensure maximum flatness, evenness and dimensional stability. The back of the tape shall be coated with an elastomeric coating. The coating shall be properly cured.

10.3 The back of the tapes may be coated with a flame-retardant coating instead of elastomeric coating, if agreed to between the buyer and the seller.

11 TOXICITY (Optional Requirement)

11.1 The hook and loop fasteners shall meet the requirements for the toxic chemicals as given in Table 6.

Table 6 Toxic Chemicals

(*Clause* 11.1)

Sl No.	Chemical Substance	Requirements	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Allergenic and carcinogenic disperse dye	< 1 mg/l	IS 16914 (Part 2) and IS 16914 (Part 3)
ii)	Aromatic amines released from Azo dyes	< 20 mg/kg	IS 15570 and IS 582 (Part 5/Sec 1) and IS 582 (Part 5/Sec 2)
iii)	Dimethyl fumarate (DMFU)	< 0.1 mg/kg	IS 16991
iv)	Formaldehyde	Adults: < 100 mg/kg (*see* Note 1) < 75 mg/kg (*see* Note 2) Children: < 20 mg/kg	IS 14563 (Part 1)
v)	Organotin compounds	*see* Annex L	IS 16981
vi)	pH	Not less than 3.5 and in case it is less than 3.5, the difference of pH on dilution by a factor of 10 (differential number), shall not be more than 0.6.	IS 1390
vii)	Phthalates (each individual phthalate)	< 500 mg/kg (for each)	IS 16915

NOTES

1 Not in direct contact with skin.

2 Direct contact with skin.

12 SAMPLING

12.1 Unless otherwise agreed to between the supplier and the purchaser, the procedure given in IS 2500 (Part 1) shall be followed for sampling and inspection. The inspection level and sampling plan as given in **12.1.1** and **12.1.2** shall be followed.

12.1.1 The scale of sampling shall be corresponding to 'Inspection Level III' given in Table 1 of IS 2500 (Part 1).

12.1.2 The sampling plan to be followed shall be single sampling plan corresponding to Acceptable Quality Level (AQL) value of 2.5 percent given in Table 2A of IS 2500 (Part 1).

13 MARKING

13.1 Each package of roll(s) of the tapes shall be legibly and indelibly marked with the following:

a) Name or trade-mark indicating source of manufacture;
b) Width and length of the tapes;
c) Class of the tapes;
d) Batch number;
e) Flame resistance of tapes; and
f) Month and year of manufacture;

13.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

14 PACKING

14.1 The packing of hook and loop tape fasteners shall be as per agreement between the purchaser and the manufacturer.

14.2 The hook and loop tape fasteners shall be packed in rolls of 25m, 50m or 100m as agreed to between the buyer and the seller. The hook and loop tape fasteners shall also be packed in rolls of any other desired length if agreed to between the buyer and the seller.

14.3 The end of the hook or loop tape shall be ultrasonically sealed.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 582 (Part 5/Sec 1): 2018 ISO 17234-1: 2015	Methods of Chemical Testing of Leather Part 5 Determination of Certain Azo Colorants in Dyed Leathers Section 1 Determination of certain aromatic amines derived from azo colorants
IS 582 (Part 5/Sec 2): 2018 ISO 17234-2: 2011	Methods of Chemical Testing of Leather Part 5 Determination of Certain Azo Colorants in Dyed Leathers Section 2 Determination of 4-aminoazobenzene
IS 1390 : 2022 ISO 3071 : 2020	Textiles — Determination of pH of Aqueous Extract (*third revision*)
IS 1481 : 1970	Specification for metric steel scales for engineers (*first revision*)
IS 2500 (Part 1): 2000 ISO 2859-1:1999	Sampling procedures for inspection by attributes: Part 1 sampling schemes indexed by acceptance quality limit (AQL) for lot - By - Lot inspection (*third revision*)
IS 7703 (Part 1): 1990	Methods of Test For Man-Made Fibres Continuous Filament Flat Yarn — Part 1 Linear density (*first revision*)
IS 14563 : 2021 ISO 14184 -1 : 2011	Textiles — Determination of Formaldehyde Part 1 Free and Hydrolysed Formaldehyde (Water Extraction Method) (*first revision*)
IS 15061 : 2002	Automotive Vehicles — Flammability Requirements
IS 15570 : 2005	Textiles — Method of test — Detection of banned azo colorants in coloured textiles
IS 16914 (Part 2) : 2018 ISO 16373-2 : 2014	Textiles — Dyestuffs Part 2 General Method for the Determination of Extractable Dyestuffs including Allergenic and Carcinogenic Dyestuffs (Method using Pyridine-Water)
IS 16914 (Part 3) : 2018 ISO 16373-3 : 2014	Textiles — Dyestuffs Part 3 Method for Determination of Certain Carcinogenic Dyestuffs (Method using Triethylamine / Methanol)
IS 16915 : 2018 ISO/TS 16181 : 2011	Footwear — Critical Substances Potentially Present in Footwear and Footwear Components — Determination of Phthalates in Footwear Materials

IS 16981 : 2018 ISO/TS 16179 : 2012	Footwear — Critical Substances Potentially Present in Footwear and Footwear Components — Determination of Organotin Compounds in Footwear Materials
IS 16991 : 2018 ISO/TS 16186 : 2012	Footwear — Critical Substances Potentially Present in Footwear and Footwear Components — Test Method to Quantitatively Determine Dimethyl Fumarate (DMFU) in Footwear Materials
IS/ISO 105-B01: 2014 ISO 105-101 : 2014	Textiles — Tests for Colour Fastness — Part B01 Colour Fastness to Light: Daylight
IS/ISO 105-B02: 2014 ISO 105-B02 : 2014	Textiles — Tests for Colour Fastness — Part B02 Colour Fastness to Artificial Light: Xenon Arc Fading Lamp Test
IS/ISO 105-C10 : 2006	Textiles — Tests for Colour Fastness — Part C10 Colour Fastness to Washing With Soap Or Soap And Soda
IS/ISO 105-E02 : 2013	Textile — Tests for Colour Fastness — Part E02 Colour Fastness to Sea Water

ANNEX B

(*Clause* 4.1)

METHOD FOR DETERMINATION OF NYLON 6.6, POLYESTER AND POLYPROPYELENE YARNS

B-1 IDENTIFICATION OF NYLON 6 AND NYLON 6.6

The material used for manufacture is dipped in any one of the following reagents:

a) Formic Acid at temperatures of 70°C.
b) Trifluoroacetic Acid (TFA) at temperatures of 70°C.
c) Sulfuric Acid at temperatures of 100°C.
d) m-Cresol at temperatures of 80°C.

B-1.1 If the material used for manufacture is nylon 6.6, it shall dissolve in any one of the above mentioned reagents.

B-2 IDENTIFICATION OF POLYESTER

The material used for manufacture is dipped in any one of the following reagents:

a) Solution of crystallized trichloroacetic acid/chloroform reagent, prepared at a mass ratio 1:1.
b) Benzyl Alcohol at temperatures of 150°C.
c) m-Cresol at boil.

B-2.1 If the material used for manufacture is polyester, it shall dissolve in any one of the above mentioned reagents.

B-3 IDENTIFICATION OF POLYPROPYLENE

The material used for manufacture is dipped in the following reagents:

a) Boiling xylene at temperatures of 145°C.

B-3.1 If the material used for manufacture is polypropylene, it shall dissolve in the above mentioned reagents.

ANNEX C
(*Table* 2)

DETERMINATION OF WIDTH

C-1 Select at least five sample tape rolls. From each tape roll, draw enough length of tape specimen and render the tape flat on a table and free from any twist or wrinkles. Take steel scale with graduation up to 0.5 mm which shall be used to measure the width of the tape. The steel scale shall be placed on the table and the sample tape shall be laid flat perpendicular to the scale. Width reading shall be taken up to the accuracy of 0.5 mm. Readings shall be taken from 5 different samples (one from each sample) and the average shall be taken to calculate the width of the sample. A tolerance of ± 0.5 mm on average of 5 values of tapes shall be permissible.

ANNEX D
(*Table* 2)

DETERMINATION OF LENGTH

D-1 Select 3 sample tape roll. Unroll the tape from one of the sample roll and lay it flat on the table marked with 5 m of length on it. Measure the tape by placing between marks of 5 m length on the table (measurement shall be made in the multiples of 5 m). Repeat this process on the complete length of the roll until a length less than 5 m is left at the end of the tape. Measure the remaining length with a steel scale of graduation up to 1 cm. Measure other tape rolls with the same process. Average of all the 3 values of length shall be taken. A tolerance of $\frac{+1\ m}{-0\ m}$ on average length of tapes shall be permissible. The length shall confirm as per **6.1**.

ANNEX E
(*Table* 4)

TEST FOR SHEAR, PEEL AND TENSILE STRENGTH

E-1 The apparatus shall be as follows:

E-1.1 A pendulum type tester with cam drive shall be used for the tests to minimize the possibility of slipping as well as for the ease of putting the samples in the jaws.

E-1.2 A constant power-driven tensile testing machine having a constant rate of traverse type shall be used.

E-1.2.1 The rate of traverse shall be constant. The jaw separation speed should be 300 mm / min ± 5 mm / min.

E-1.3 A steel roller having a diameter of 121 mm and 57 mm wide weighing 5 kg for mating the tape components. (*see* NOTE)

E-2 REQUIREMENTS OF TEST SPECIMEN

E-2.1 The test specimen shall be as follows:

Sl No.	**Type of Test**	**Size of Hook and Loop Tape** mm	
(1)	(2)	(3)	
		Length	**Width**
i	Peel strength	175	Full width
ii	Shear strength (length-wise)	125	
iii	Shear strength (width-wise)	100	50 (*see* NOTE)
NOTE — The shear strength (width-wise) shall be only tested on hook and loop tapes of width greater than or equal to 50 mm.			

E-3 PREPARATION OF THE TEST SPECIMEN FOR PEEL AND SHEAR STRENGTH TEST

E-3.1 Mating the Components

Select the width and length of hook and loop tape as specified in **E-2.1**. Place the hook tape (hook side down) evenly and without pressure on tape of a corresponding equal width of loop tape (loop side up). Mesh the two tapes by traversing the steel roller back and forth across the overlap for 5 times in each direction. The pressure shall be applied evenly across the full width of the combined tapes in a smooth and continuous way. The hand pressure shall not be applied. The roller alone shall exert the required pressure.

E-3.2 If the width of the hook and loop tape is greater than the width of the steel roller, the hook shall be laid out evenly with hook side down on tape of a corresponding equal width of loop tape with loop side up and parallel vertical lines shall be marked on full length of the tape at a distance of 57 mm from one edge of the tape until a length less than 57 mm is remaining. The hook and loops tapes shall then be meshed by traversing the steel roller back and forth across the overlap for 5 times in each direction. The pressure shall be applied evenly across those sectors marked with length of 57 mm each.

E-4 PROCEDURE FOR PEEL AND SHEAR STRENGTH TEST

E-4.1 Grip one end of the free hook or loop tape in the upper jaw and the other end in the lower jaw of the machine. Apply a continuous increase in load to the specimen longitudinally until the specimen is loosened and separated. Note down the reading.

E-4.2 The peel strength (longitudinal) shall be conducted in the same way as mentioned in **E-4.1**.

E-4.3 The shear strength (longitudinal) shall be conducted in the same way as mentioned in **E-4.1**.

E-4.4 The shear strength (width-wise) may be conducted if specifically required by the buyer.

NOTE — If the width of the hook and loop tape is greater than the width of steel roller as given in **E-1.3**, a suitable steel roller of appropriate width and weight shall be used.

ANNEX F
(*Table* 4)

METHOD FOR ENDURANCE TEST

F-1 This machine consists of two drums mounted one on top of the other (schematic arrangement is shown in Fig. 1) the bottom drum is driven at 60 rev/min with the direction of rotation reversed every 30s. The machine is fitted with a counter which counts the number of cycles regardless of direction of rotation. The drive from the bottom drum is imparted to the top drum through the physical contact of the hook and loop tape fastener under test.

F-2 The bottom drum is 160 mm in diameter and 180 mm wide with a slot 175 mm long cut into the rim for mounting the sample. The loop tape sample is mounted onto this drum free from any wrinkles and creases with the stitching of the loop being used to clamp the specimen in place.

NOTE — If the length of and loop tape is greater than the width of steel roller as given in **F-2**, a suitable steel roller of appropriate width shall be used.

F-3 The top drum is 162.5 mm in diameter and 180 mm wide with a slot 175 mm long cut into the rim and can rotate freely. The hook tape is mounted onto this drum free from any wrinkles or creases and clamped in place through the slot using the stitching of the loop. The drive from the bottom drum is imparted to the top drum contact between the hook tape and the loop tape. This drum has a means of loading the drum with 1 kg/cm width of fastener.

NOTE — If the length of and hook tape is greater than the width of steel roller as given in **F-3**, a suitable steel roller of appropriate width and weight shall be used.

F-4 If necessary, it is allowable to mount two narrow tapes, side by side on the drums provided the top drum is still loaded with 1 kg of total width of tapes in cm.

F-5 If due to stretching of the tape during cycling it becomes difficult to adjust the fastener to the correct tension and position, it is permissible to stick the tapes to the drum using double sided adhesive tape.

F-6 When removing the samples from the machine it is important to mark where the fastener passes through the slot to ensure that only those areas worn by cycling are subsequently tested for shear strength and peel strength.

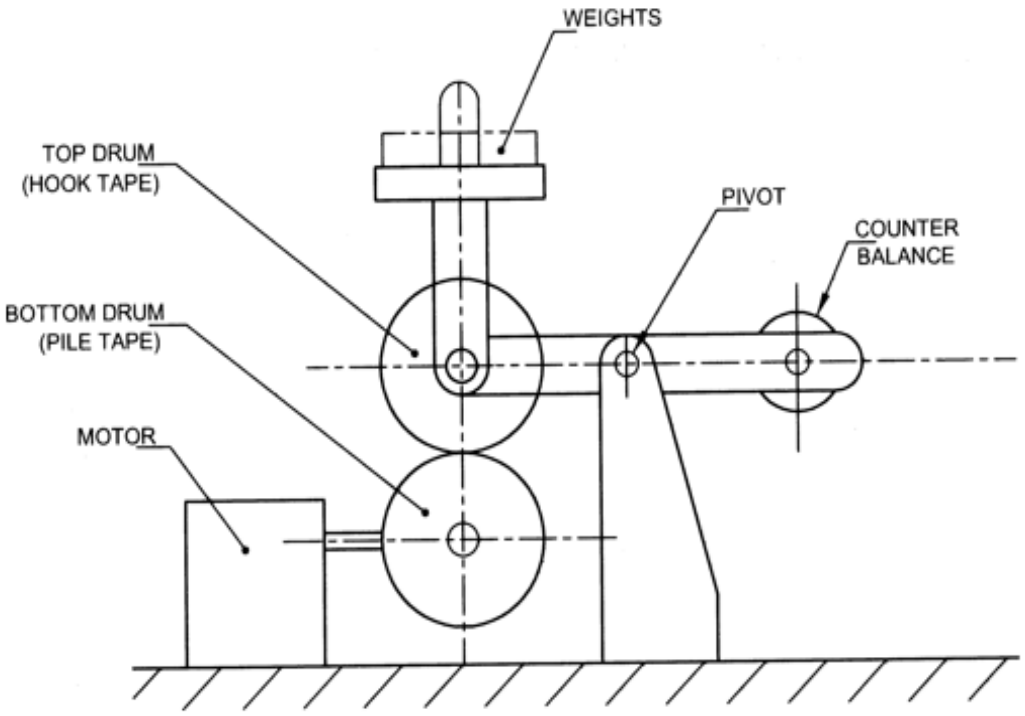

Fig 1. Schematic arrangement of endurance tester.

ANNEX G
(*Table* 4)

METHOD FOR DOT TEAR TEST

G-1 PROCEDURE

G-1.1 Take a sample, hook or loop (120 mm to150 mm in length) and full width.

G-1.2 Mark a horizontal line at a distance of 50 mm from one end of the sample.

G-1.3 Cut the sample in between upto 50 mm mark.

G-1.4 Fix one end of the sample in the upper jaw and other end in the lower jaw of the tensile strength testing machine.

G-1.5 Set the rate of extension of the tensile-testing machine to 300 mm/min ± 15 mm/min.

G-1.6 Set the machine to zero and start machine.

G-1.7 Perform the extension until the specimen is loosened and separated. Record the maximum reading of dot tear force in newtons.

ANNEX H
(*Table* 4)

METHOD FOR DETERMINATION OF SHRINKAGE

H-1 OUTLINE OF THE METHOD

H-1.1 Shrinkage is determined by finding the difference in longitudinal measurement before and after washing the specimen. The shrinkage shall be expressed in percentage.

H-1.2 Apparatus

H-1.2.1 A suitable washing machine with a cylinder 535 mm in diameter rotating at 60 rev/min shall be used. The water temperature of washing machine shall be maintained at 70°C ± 2°C by means of an electric pad. The machine shall be able to run continuously in the wash cycle for this test.

H-2 TEST SPECIMEN

H-2.1 Cut about 560 mm long, full width hook and loop tapes of the same size and thickness. Make two marks 500 mm apart on the back of the tapes using the laundry mark.

H-2.2 PROCEDURE

H-2.2.1 Put the sample into the washing machine with enough household detergent to form a thin layer of suds and wash for 4 h. Rinse and dry the specimen.

H-2.2.2 Recondition the specimen at 27°C ± 2°C temperature, and 65 ± 4 percent relative humidity until it reaches a constant mass (a constant mass is considered to be achieved when measurements made at 1h intervals do not show a change in mass greater than 0.25 percent).

H-2.2.3 Measure the distance between the marks on the back of the tapes in the length-wise direction. This shall be the laundered length.

H-2.2.4 Calculate the percentage shrinkage as follows:

$$\text{Percentage shrinkage} = \frac{(Original\ Length)-(Laundered\ length)}{Original\ length.} \times 100$$

ANNEX J

(*Table* 4)

TEST FOR COLOUR FASTNESS

J-1 FASTNESS TO LIGHT

J-1.1 The colour of the hook and loop tapes shall be fast to light and when tested by the method prescribed in IS/ISO 105-B02, its colour fastness to light shall be of rating 3 or better. The test specimen shall be of full width and 100 mm ± 2 mm in length.

J-2 FASTNESS TO SEA WATER

J-2.1 The tapes shall be fast to sea water and when tested by the method prescribed in IS/ISO 105-E02, its colour fastness to sea water shall be rating 3 or better. The test specimen shall be of full width and 100 mm ± 2 mm in length.

J-3 FASTNESS TO WASHING

J-3.1 The tapes shall be fast to washing and when tested by the method prescribed in IS/ISO 105-C10, its colour fastness for washing shall be rating 3 or better. The test specimen shall be of full width and 100 mm ± 2 mm in length.

J-4 CROCKING TEST

J-4.1 Dry and Wet Crocking

A crockmeter shall be used in this test along with a 50 mm × 50 mm square of bleached, unsized cotton fabric piece. Cut a piece of hook or loop tape 180 mm long. Place the tape face up on the abrasive area of the crockmeter, fasten ends with suitable adhesive tape and/ or rubber band. Fasten 5 cm × 5 cm square cotton fabric piece on the fingertip with a rubber band. Turn the crank so that the cloth on the finger is rubbed over the tape a total of 10 times in each direction. Turn the tape over and attach new 50 mm × 50 mm square cotton fabric piece. Again, turn the crank so that the cloth is rubbed over the tape a total 10 times in each direction. Soak two square cloth pieces in distilled water, lay them between blotters and squeeze by finger. Repeat the test as above on face and back using moistened cloth pieces.

Evaluate the amount of staining on the 5 cm × 5 cm square numerically.
The rating shall be 3 or better.

5 — No staining
4 — Slight staining

3 — Definite staining
2 — Bad staining
1 — Very bad staining

ANNEX K
(*Table* 5)

METHOD FOR DETERMINATION OF VERTICAL FLAMMABILITY OF HOOK AND LOOP TAPES

K-1 OUTLINE OF THE METHOD

K-1.1 This method is intended for use in determining the resistance of hook and loop tapes to flame when tested according to the 12 s or 60 s vertical burner test.

K-2 DEFINITIONS

K-2.1 Ignition time

Ignition time is the duration of time the burner flame is applied to the specimen. It can be either 12 s or 60 s for this test.

K-2.2 Flame Time

Flame time is the time in seconds that the specimen continues to flame after the burner flame is removed from beneath the specimen. Surface burning that results in a glow but not in a flame is not included.

K-2.3 Drip Flame Time

Drip flame time is the time in seconds that any flaming material continues to flame after falling from the specimen to the floor of the chamber.

K-2.4 Burn Length

Burn length is the distance from the original specimen edge to the farthest evidence of damage to the test specimen due to that area's combustion including areas of partial consumption, charring, or embrittlement but not including areas sooted, stained, warped, or discolored nor areas where material has shrunk or melted away from the heat.

K-3 TEST APPARATUS

K-3.1 Test Cabinet

An incombustible box 305 mm × 305 mm × 760 mm open at the top, and provided with a vertical transparent front. An opening, 25 mm deep and 125 mm long is left at the bottom of the front, to allow manipulation of the gas burner.

K-3.2 Clip

A suitable clip for suspending the test specimen above the flame.

K-3.3 Gas Burner

A bunsen burner about 150 mm high with an internal diameter of 9 mm.

K-3.4 Specimen Holder

Consisting of two U-shaped metal plates between which the specimen can be held in such a way that the fabric specimen is free at the bottom and is held at the top and sides so that the total exposed area is 50 mm x 305 mm. The specimen holder will be positioned in the draught-free box vertically so that the igniting flame strikes the specimen centrally and 19 mm above the bottom edge of the specimen.

K-3.5 Clamps

These may be plain or serrated spring clips or small clamps. When made of smooth material, it may be necessary to insert emery paper to increase friction.

K-3.6 Stenter Pin Plates

Two stenter pin plates, each consisting of a flat plate carrying pointed pins attached to one side of its broad surface, to prevent movement of the lower end of the test specimen during the application of the test flame. Each plate is secured at one end to the side of the shield in the horizontal position.

K-3.7 Stopwatch

A stopwatch calibrated to the nearest 0.1 second, will be used to measure the time of application of the burner flame, the flame time, and the drip flame time.

K-3.8 Ruler

A ruler or scale graduated to the nearest 0.1 cm will be provided to measure the burn length.

K-4 TEST SAMPLE

K-4.1 The test specimen of hook or loop shall be of full width and 120 mm to180 mm in length.

K-4.2 Each separate set of specimens prepared for testing shall consist of minimum three specimens.

K-4.3 If the shape and dimensions of a product do not permit taking a sample of the given size, the material is tested in the product's width.

K-5 PROCEDURE

K-5.1 Keep the apparatus in a substantially draught-free room or enclosure having 27°C ± 2°C of temperature, and 65 ± 4 percent relative humidity. Suspend the test specimen from the clip so that it hangs vertically, with its lower end held by the horizontal stenter pin plates in such a way that the bottom 6 mm of the specimen is attached to the horizontal stenter pins thereon. The plates shall be so fixed that not more than 9 mm of the specimen on either side is covered by them.

NOTE — The test specimen should not have loose threads or any form of fringe along its edges, that might affect the ease of ignition, cause initial flaring or flashing and thus prejudice the test.

K-5.2 Shut off the air supply to the gas burner completely and adjust to give a luminous flame 38 mm in length. Place the gas burner such that the base of the flame is 19 mm below the middle of the lower edge of the specimen. Apply the flame for a period of 12 s or 60 s to the mid-point of the lower edge of the specimen and then withdraw the flame.

K-5.3 If flaming material falls from the test specimen, determine the drip flame time for the specimen.

K-5.4 Determine the flame time for the specimen.

K-5.5 After all flaming ceases, open the cabinet door slowly, Remove the specimen and determine the burn length. To aid in determining the burn length, a dry soft cloth or tissue, or a soft cloth or tissue dampened with a moderate solvent, such as methyl, ethyl, or isopropyl alcohol (which does not dissolve or attack the specimen material), may be used to remove soot and stain particles from tested specimens.

K-6 Test Results

K-6.1 Ignition Time

Report whether the ignition time was 12 s or 60 s.

K-6.2 Flame Time

Report the flame time for each specimen tested. Determine and record the average value for flame time.

K-6.3 Drip Flame Time

Report the drip flame time for each specimen tested. Determine and record the average value for the drip flame time. If no material falls from the specimen, the drip flame time is reported to be 0 seconds, and the notation “No Drip” is also reported. If there is more than one drip, the drip flame time reported is that of the longest flaming drip. If succeeding flaming drips reignite earlier drips that flamed, the drip flame time reported is the total of all flaming drips.

K-6.4 Burn Length

Report the burn length to the nearest 1 mm for each specimen tested. Determine and record the average value for burn length.

ANNEX L

(*Table* 6)

LIST OF ORGANOTINS AND PRESCRIBED LIMITS

Sl No.	Substance(s)	CAS No.	Limit
(1)	(2)	(3)	(4)
i)	Dibutyltin	14488-53-0	< 5.0 mg/kg
ii)	Dibutyltin dichloride	683-18-1	< 5.0 mg/kg
iii)	Dioctyltin	250252-87-0	< 5.0 mg/kg
iv)	Monobutyltin	78763-54-9	< 5.0 mg/kg
v)	Tributyltin	36643-28-4	< 1.0 mg/kg
vi)	Triphenyltin	668-34-8	< 1.0 mg/kg
vii)	Monoctyltin	94410-07-8	< 5.0 mg/kg
viii)	Bis(tributyltin)oxide	56-35-9	< 1.0 mg/kg

ANNEX M
(*Table* 5)
DETERMINATION OF HOOK AND LOOP DENSITY

M-1.1 Select 5 samples of hook and loop tape roll, discard the initial one meter of tape from the sample packages.

M-1.2 From hook and loop tape roll, draw 150 mm length of tape specimen and cut the specimen into 5 sub-specimen of one square inch area each.

M-1.3 Place each of the specimen under pick glass and count pick per inch of the sample

M-1.4 The density of hook and loops shall be calculated as follows:

Hook Density = (No. of picks/2) × No. of hooks per row of the marked area.
Loop Density = (No. of picks/2) × No. of loops per row of the marked area.

M-1.5 The hook and loop density shall be the average of the 5 specimen taken from 5 rolls.

M-1.6 For 25 mm and below width hook and loop tapes (where specimen area is less than one square inch) hook and loop density can be measure as follows:

Hook Density = Density of hook in ½ inch area × 2

Loop Density = Density of loop in ½ inch area × 2.

NOTE – if the width of the hook and loops is lesst that half inch, full width shall be taken.