

भारतीय मानक ब्यूरो
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भारतीय मानक मसौदा

वस्त्रादि —सिंगल जर्सी, कॉटन, रिब बुना हुआ सिंथेटिक और मिश्रित शॉर्ट्स —विशिष्ट

(Draft Indian Standard)

**TEXTILES — SINGLE JERSEY AND RIB KNITTED, COTTON,
SYNTHETIC, AND BLENDED SHORTS — SPECIFICATION**

Hoisery Sectional Committee,
TXD 10

Last date for receipt of comments
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FOREWORD

(Formal clauses will be added later)

Knitted shorts represent the perfect blend of comfort and style, ideal for both casual and active wear. Designed with soft, breathable fabric, these shorts provide a flexible and snug fit, ensuring ease of movement during any activity. Whether lounging at home, working out, or engaging in outdoor activities, knitted shorts are a wardrobe staple for anyone seeking versatile and durable apparel.

Designed for men and women alike, knitted shorts are available in a variety of styles and colors, seamlessly blending functionality with fashion. Whether for sports, leisure, or every day wear, they embody the perfect balance between comfort and practicality, suited for every occasion.

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 describes the constructional details and other closely related particulars of Single jersey, Cotton, Synthetic and Blended, Shorts.

1.2 This standard does not take into consideration such as appearance, lustre, handle, finish type, whiteness index or shade of the shorts.

2 REFERENCES

2.1 The standard listed in Annex A contains 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 encouraged investigating the possibility of applying the most editions of these standards.

2.2 For the purpose of this standard the definitions of yarn are given in Annex B, shall apply.

2.3 For the purpose of this standard the definitions given in Annex C, shall apply.

3 TERMINOLOGY

3.1 Shorts

Knitted shorts are a type of casual wear made from knitted fabric, which is produced by interlocking loops of yarn. Knitted shorts can vary in style, length, and design, and are often used for activities such as lounging, exercising, or casual outings. They are available in various patterns and materials, including cotton, polyester, and blends, and often feature an elastic waistband for added comfort.

4 MATERIALS

4.1 Yarn

The yarn count for Cotton shall be in the range of 30s Ne – 60s Ne (20 Tex – 10 Tex) and for multifilament synthetic yarn shall be in the range of 150D – 350D or higher depending on the specific fabric requirements. Any other yarn count in compliance with the buyer & seller agreement shall apply for knitting, splicing, and linking of the shorts.

4.2 Identification of Fibers

The materials used for manufacturing shall be tested as per Annex D.

5 MANUFACTURE

5.1 Dimensions

The shorts fabric shall be knitted on circular, flatbed and warp knitting machines of suitable gauge. These shall be neatly tailored out of well and evenly knitted tubular fabric. The fabric shall be of uniform texture and appearance. It shall be of uniform tension throughout its length and free from spirals. It shall be scoured, bleached or dyed. The shorts shall not have any seams or joining along their two outer sides. The wales shall run along the length of the shorts. The fabric shall conform to construction particulars given in Table 4 for plain knitted shorts and Table 5 for rib Knitted Shorts.

5.1.1 The mass of the shorts in grams per square meter shall be determined by the method given in B – 3.

5.1.2 Pockets — if required may also be provided having dimensions and shape as agreed to between the buyer and the seller.

5.2 Waist Band

The waist band should be either plain or rib knitted and the waistband width up to 2.5 - 5.0 cm's or the agreement between the buyer and the seller.

5.3 Elastic Strap

Shorts shall have outer woven elastic strap stitched at the waist band or inner woven elastic strap shall be formed by the folding the raw edges of the fabric to a depth of minimum 25 mm and stitching it with flat stitches. In case of latter, a cotton tape having width of 25 mm preferably conforming to IS 9686: 1980 or a suitable tape made out of same fabric that is used for fabricating the shorts shall be provided in waist fold for tying purposes. It shall be at least 30 cm longer than the corresponding waist girth.

a) Outer Elastic Strap

- 1) Width of strap shall be minimum 25 mm.
- 2) Minimum mass per 100 m of finished strap shall be 1.7 kg.
- 3) Minimum number of ends of covered rubber in the strap shall be 20.

- 4) In 250 mm of finished strap, each covered rubber thread shall have a minimum of 160 mm of rubber core of not less than 0.6 mm diameter.
- 5) The minimum elongation of covered rubber shall be 160 percent under a load of 225 g with respect to specimen length of 100 mm.

b) Inner Elastic Strap:

- 1) Width of strap shall be minimum 25mm.
- 2) Minimum mass per 100 m of finished strap shall be 1.1 kg.
- 3) Minimum number of ends of covered rubber in the strap shall be 15.
- 4) In 250 mm of finished strap, each covered rubber thread shall have a minimum of 160 mm of rubber core of not less than 0.6 mm diameter.
- 5) The minimum elongation of covered rubber shall be 160 percent under a load of 225 g with respect to specimen length of 100 mm.

5.4 Crutch Piece

The fabric used for crutch piece shall be of same type and construction as that of the legging (leg portion). The crutch piece shall be reinforced throughout with cotton calico (IS 1544). The crutch piece and the reinforcement fabric shall be scoured or bleached as the legging.

5.5 Linking

The pieces of shorts shall be securely linked using over-lock and or flat-lock stitch. The stitch type selection must be in compliance with the buyer and the seller. The linking shall be elastic, smooth and free from knots. The length of the free ends of the linking yarn and other loose ends, if any, shall be neither less than 5.0 mm nor more than 15.0 mm. The linking shall not give way when the shorts are stretched without breaking to the full extent of the stretch-ability of shorts. Linking of crutch piece shall be done at right angle i.e. 90° at the intersection to prevent tearing during extension while sitting.

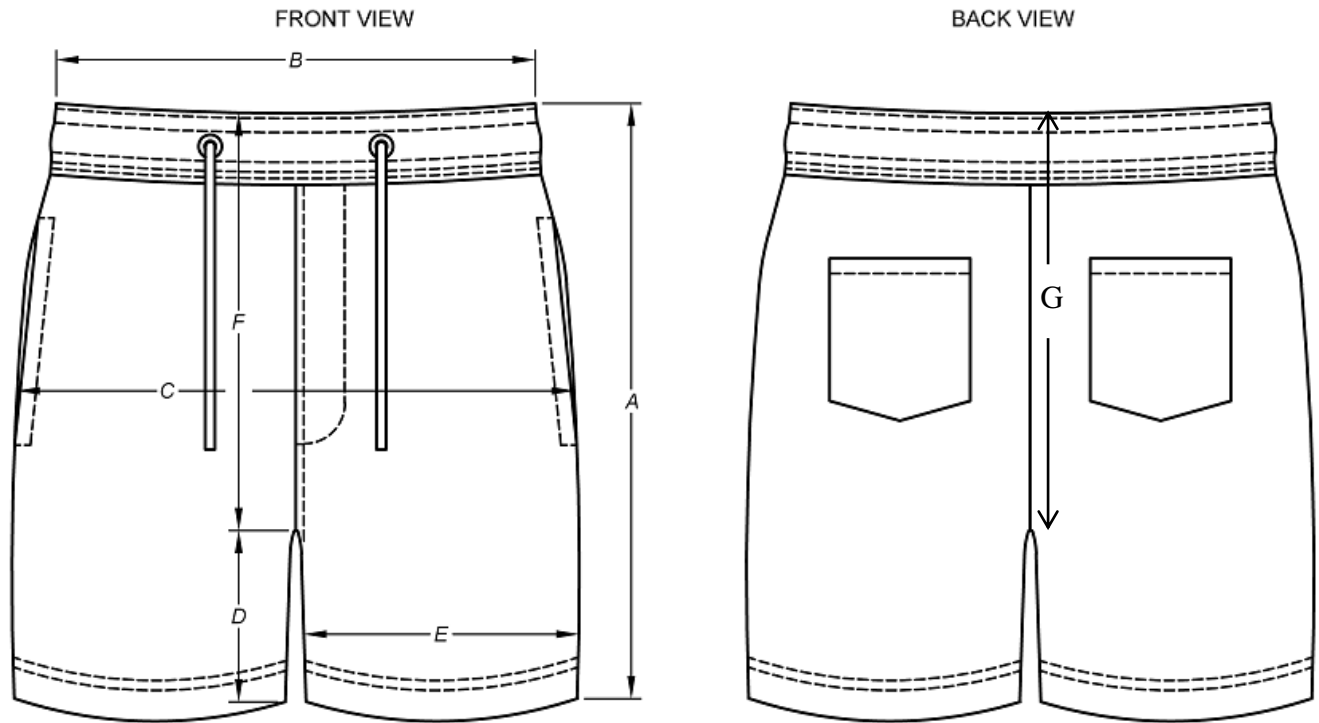


Figure 1 Garment Dimension and Shape for knitted Shorts

Table 3 Constructional Particulars of Plain Knitted Fabric for Shorts
(Clause 5.2)

Sl No.	Gauge of Machine (see Note)	Approximate Count of Yarn - Ne (Tex)	Mass g/m ² , Min
(1)	(2)	(3)	(4)
i)	12 - 18	20s (30.0) – 28s (21.0)	250
ii)	24 - 28	30s (19.5) – 40s (14.5)	230
iii)	28 - 32	34s (17.0) – 50s (12.0)	210
iv)	32 - 36	40s (14.5) – 50s (12.0)	180

NOTE — As determined by the number of needles per 2.54 Cm

Table 4 Garment Measurement and Sizing Chart for Knitted Shorts
(Clause 5.1)

Sl No.	Size (cm)	MEN'S					WOMEN'S				
		Length (cm)	Waist (cm)	Hips (cm)	Inseam (cm)	Thigh (cm)	Length (cm)	Waist (cm)	Hips (cm)	Inseam (cm)	Thigh (cm)
		A	B	C	D	E	A	B	C	D	E
i)	XS	-----	-----	-----	-----	-----		61 - 66	86 - 91	18 - 20	46 - 51

ii)	S	51	71 - 76	86 - 91	20 - 23	51 - 56	36	71 - 76	97 - 102	20 - 23	51 - 56
iii)	M	61	81 - 86	97 - 102	22 - 24	56 - 61	46	81 - 86	107 - 112	22 - 24	56 - 61
iv)	L	66	91 - 97	107 - 112	23 - 25	61 - 66	51	91 - 97	117 - 122	23 - 25	61 - 66
v)	XL	76	102 - 107	117 - 122	24 - 27	66 - 71	61	102 - 107	127 - 132	24 - 27	66 - 71
vi)	XXL	81	112 - 117	127 - 132	25 - 28	71 - 76	76	112 - 117	137 - 142	25 - 28	71 - 76
vii)	XXXL	91	122 - 128	138 - 142	27 - 30	76 - 81	81	122 - 128	147 - 152	27 - 30	76 - 81

NOTE — For sizes above 3XL, a suitable crutch piece can be added as the clause 5.4 and the agreement between the buyer and seller.

Table 5 Body Measurement and Sizing Chart for Knitted Shorts
(Clause 5.1)

Sl. No.	Particulars	Front Rise (CM)		Back Rise (CM)	
		F		G	
(1)	(2)	(3)		(4)	
i)		Women's	Men's	Women's	Men's
ii)	Low Rise Shorts	18 - 20	20 - 23	25 - 28	25 - 28
iii)	Mid Rise Shorts	20 - 24	23 - 27	28 - 30	28 - 32
iv)	High Rise Shorts	24 - 28	27 - 30	30 - 36	32 - 36

NOTE — Measurements Shall Apply to All Sizes

6 FREEDOM FROM DEFECTS

The Shorts shall be reasonably free from the manufacturing defects, such as large mends, ladders, dropped stitches, holes, improper splicing and chemical damages. The dyed and bleached Shorts shall be free from dyeing defects, such as streakiness and uneven dyeing and the white Shorts from blueing agents.

7 REQUIREMENTS

7.1 Dimension, Mass and Tolerances

The shorts shall conform to the requirements of Table 5, and read with Figure - 1 & 2, along with considering the tolerances typically ± 0.5 cm to ± 2.0 cm.

NOTE — The short size should be denoted by the number correspond to the length and waist diameter.

7.2 Sewing and stitching Tolerances

i) Seam allowances — Maintain consistent seam allowances (typically 0.6 cm to 1.5 cm) to ensure adequate construction and durability.

ii) Stitch quality — Specify acceptable variations in stitch length, tension, and type such as; Lockstitch, Over-lock, or Cover-stitch; to ensure seams is secure and aesthetically pleasing.

7.2.1 Sewing

The sewing details of the shorts shall be as under:

Sl No.	Portion to be Stitched	Type of Stitch	Sewing Thread
(1)	(2)	(3)	(4)
i.)	All Joining's	Flat – Lock	Three threads of 60s/3 count (100 dtex x 3) or 40s/2 count (145 dtex x 2) in the needle and one strand of the same threads in the each loopers.
ii.)	Flap at the front opening (For Men's Only)	Lock Stitch	One strand of cotton sewing thread of 60s/3 count (100 dtex x 3) or 40s/2 count (145 dtex x 2) in each of the needle and the looper.
NOTE — Sewing thread of 60s/3.0 (100 dtex) count may be used in place of 40s/2 (145 dtex x 2)			

7.3 The shorts shall also conform to the requirements in Table 1, 2, 3, 4, 5, 6.

7.4 Sealed Sample

If in order to illustrate or specify general appearance, lustre, handle, type of finish and whiteness sample has been agreed upon and sealed, the supply shall be in conformity with the sample in each respect.

8 MARKING

8.1 Each pair of short shall be marked with the following:

- a) Size (marked toward the waistband);
- b) Manufacturer's name, initials or trademark, if any (marked on the waistband);
- c) fibre blend compositions must be given;
- d) suitable washing instruction must be given;
- e) Any other information as required by the law in force.

Table 6 Other Requirements of Leggings
(Clause 5.2)

Sl. No.	Characteristic	Requirements	Method of Test Ref to
(1)	(2)	(3)	(4)
i)	Total number of Wales/dm	200 - 350	B-4
ii)	Total number of Courses/dm	250 - 400	B-4
iii)	Dimensional Change (due to relaxation) Percentage, <i>Max</i>	5.0	B-5
iv)	pH value	6 - 10	IS 1390
v)	Colour fastness ratings of dyed stockings, <i>Min</i>		
	I. Light	3 - 4	IS/ISO 105 – B02 OR IS/ISO 105 – B01
	II. Washing		
	a) Change in colour	4	IS/ISO 105 – C10
	b) Staining of Adjacent fabric	4	
	III. Perspiration		
	a) Change in Colour	3	IS/ISO 105 – E04
	b) Staining of adjacent fabric	3	
	IV. Rubbing		
	a) Change in colour	4	IS/ISO 105 – X12: 2016
	b) Staining of adjacent fabric	3	
	V. Piling (Martindale Pilling Box-14400 Rev)	4 - 5	BIS ISO 9943 : 2009
vi)	Fibre Blend composition	---	<i>see</i> Table 2

9 BIS CERTIFICATION

The Product(s) conforming to the requirements of this standard may 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.

10 PACKING

The shorts shall be packed as per the agreement between the buyer and seller.

11 SAMPLING

11.1 Lot

In any consignment, all the pairs of shorts of the same size manufactured from the same quality of yarn shall constitute a lot as per (IS 2500).

11.2 The conformity of a lot to the specification shall be determined on the basis of the test carried out on the pairs of shorts selected from the lot.

11.3 Unless otherwise agreed to between the buyer and the seller, number of pairs of shorts depending on the lot size, shall be selected at random according to the Col 1 and 2 of Table 8 & Table 9.

11.4 The number of pairs of shorts to be inspected and criterion for conformity for each characteristic shall be as follows:

Table 7 Performance Assessment criteria for Shorts
(Clause 12.3)

Sl. No.	Characteristic	Number of pairs of Shorts to be Inspected	Criterion for Conformity
(1)	(2)	(3)	(4)
i)	Visual inspection dimensions and number of wales and course	According to the col 3 of Table 8	Non-conforming pairs of shorts shall not exceed the corresponding number given in col 4 of the Table 8
ii)	Mass	Sets of 10 pairs of legging obtained from those selected according to col 3 of Table 8	All the observations shall satisfy the relevant requirements
iii)	Dimension change, scouring loss, pH value, ash content and colour fastness	According to col 5 of Table 8	All the test results shall satisfy the relevant requirement

Table 8 Sample Size and Permissible Number of Non-Conforming pairs of Shorts
(Clause 9.3 and 9.4)

Sl No.	Number of pairs of Shorts In The Lot	For Dimensions and visual Inspection		Testing
		Number of pairs of Shorts to be Inspected	Number of permissible Non-Conforming Pairs	Number of pairs of Shorts to be tested for Chemical Characteristics
(1)	(2)	(3)	(4)	(5)
i)	Up to 100	10	0	3
ii)	100 – 300	20	1	3
iii)	301 – 500	30	2	5
iv)	501 – 1000	50	3	5
v)	1001 and above	80	5	8

ANNEX A
(Clause 4.1, 4.2, 4.3)

LIST OF REFERRED STANDARDS

<i>IS No.</i>	<i>Title</i>
IS 199 : 1989	Textiles — 007Asac0073 Estimation of moisture, total size or finish, ash and fatty matter in grey and finished cotton textile materials.
IS 1390 : 2022	Textiles — Determination of pH of aqueous extract (<i>third revision</i>)
IS 3086 : 1965	Code for seaworthy packaging of cotton hosiery yarn and goods
IS 3325 : 1965	Code for inland packaging of cotton hosiery yarn and goods
IS 3456 : 2022	Method for determination of water-soluble. matter of textile materials
IS 3596 : 1967	Glossary of terms relating to hosiery
IS 6359 : 2023	Method for conditioning of textiles
IS/ISO 105 – B01: 2014	Textiles — Tests for colour fastness — Part B01 colour fastness to light: Daylight
IS/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 w with soap or soda and soap
IS/ISO 105 – E04: 2008	Textiles — Tests for colour fastness – Part E04 colour fastness to perspiration
ISO 16373-3	Textiles — Dyestuffs — Method for determination of certain carcinogenic dyestuffs (method using tri-ethylamine/methanol)
BS EN ISO 14362- 1,2,3	Textiles — Methods for determination of certain aromatic amines derived from azo colorants —Textile testing; Amines (aromatic) ...
ISO 105 – NO2	Textiles — Test for colour fastness Part NO2: Colour fastness to bleaching — Peroxide
IS/ISO 105 – X12: 2016	Textiles — Method for determination of colour fastness of textile materials to rubbing.
IS 667: 1981	Textiles fibers — Methods for identification of textile fibres.
ISO 1833-1:2020	Textiles — Quantitative chemical analysis — Part 1: General principles

	of testing
IS-10971 (P-2) : 2022 ISO 12945-2:2020	Textiles — Determination of Fabric Propensity to Surface Fuzzing and to Pilling, Part 2: Modified Martindale Method
ISO 6989:1981	Textile fibres — Determination of length and length distribution of staple fibres (by measurement of single fibres)
IS 15336: 2003	Textiles — Acrylic Yarn for Hosiery — Specification
IS 13719:2003	Textiles — Spun cotton regenerated cellulosic fiber blended grey yarn - Specifications
IS 9543:2019	Textiles — Spun polyester sewing thread — Specifications
ISO/TR 11827:2012	Textiles — Composition testing — Identification of fibres
ISO 10132:1993	Textiles — Textured filament yarn — Definitions
ISO 5688:2024	Textiles — Synthetic filament yarns — Test methods for crimp properties of Textured yarn
ISO 7211-5	Textiles — Methods for the determination of linear density of yarn removed from fabric.
IS 13003: 1991	Textiles — Fabric, cotton, interlock knitted - Specification
IS 9469 : 2003	Textiles — Fabric, cotton, plain (Single jersey) knitted – Specification
IS 834 : 2006	Textiles — Ring Spun Grey Cotton Yarn for Textiles
ISO 8559 - 1	Textiles — Size designation of clothes – Anthropometric definitions for body measurement
ISO 8559 - 2	Textiles — Size designation of clothes Part 2: Primary and secondary dimension indicators
ISO 8559 - 3	Textiles Size designation of clothes Part 3: Methodology for the creation of body measurement tables and intervals
IS 1966-1 (2009)	Textiles — Bursting Properties of Fabrics - Determination of Bursting Strength and Bursting Distension, Part 1: Hydraulic Method
IS 1670 (1991)	Textiles — Yarn — Determination of breaking load and elongation at break of single strand [TXD 1: Physical Methods of Tests]
IS/ISO 16322 (1-3)	Determination of spirality of knitted fabrics post laundering.
ISO 6330	Textiles — Domestic washing and drying procedures for textile testing
IS 10099 : 2020 ISO 3759 : 2011	Textiles — Preparation marking and measuring of fabric specimens and garments in tests for determination of dimensional change.
IS 9686:2022	Textiles — Specification For Elastic Tape
IS 3100:2023	Textiles — Men’s Wool — Cotton Short Drawers — Specification
IS 2500	Part 4,5 & 6 Sampling Procedures for inspection by attributes.
IS 4376: 2013	Textiles — Gents Cotton Short Drawers (Trunks) — Specification

ANNEX B METHODS OF TEST

B-1 CONDITIONING OF THE TEST SPECIMEN AND ATMOSPHERIC COMDITIONS FOR TESTING

B - 1.1 The test specimen shall be tested in prevailing atmospheric conditions. In case of dispute, the specimen shall be conditioned and tested in the standard atmosphere as given in IS 6359.

B - 2 DIMENSIONS

B - 2.1 Take a legging from the test sample. Lay flat on a horizontal surface. Remove by hand all creases and wrinkles without distorting it. Measure dimensions correct to the nearest centimetre, as given in Table 8.

B - 3 MASS

B - 3.1 Take a set of 10 pairs of legging from the test sample. Condition them for moisture equilibrium for 24 hours (*see B-1.1*).

B - 4 WALES AND COURSES

B - 4.1 Take shorts from the test sample. Lay it flat on a horizontal surface. Remove by hand all creases and wrinkles without distorting it.

B - 4.1.1 Count the number of wales including any fraction on one side of the shorts. Similarly count the number of wales including any fraction on other side of the short and add the two values.

B - 4.1.2 Count the number of courses in 10 cm including any fraction on both sides of the shorts and calculate the average courses per decimetre.

B - 5 DIMENSIONAL CHANGE (Due To Relaxation)

B-5.1 Marking the Test Specimens. Take a legging from the test sample. Mark centrally on it, by means of indelible ink or fast dyed cotton sewing, a set of three points, namely, *X*, *Y* and, *Z* so that,

- a) All the three points are on the same wale,
- b) point *X* is on the top portion;
- c) point *Y* is on the heel gore line; and
- d) Point *Z* is on the toe portion.

B-5.2 Procedure

B - 5.2.1 Place the test specimen on a glass plate. Remove by hand all the creases and wrinkles without stretching the specimen. Place another glass plate on the specimen. Measure separately, correct to the nearest millimetre, the distance between *X* and *Y* and that between *Y* and *Z*.

B - 5.2.2 Laid the test specimen flat in a tray of suitable size, having a depth of 10 cm. Soak the specimen under the head of 25mm of water containing 0.5 % of suitable wetting agent at room temperature for two hours. Drain out the water and remove the test specimen carefully so that it is not stretched. Lay the specimen flat on a smooth surface, remove the excess water by absorbent material and dry it at room temperature.

NOTE — Removal of excess water by wringing the test specimen is not permitted

B - 5.2.3 After drying, conditioned the test specimen to moisture equilibrium at room temperature, place it on the glass plate, carefully remove wrinkles and creases and place another glass plate on it. Measure correct to the nearest centimetre, the distance between *X* and *Y* and that between *Z*.

B-5.3 Calculation

B - 5.3.1 calculate separately, correct to one place of decimal, the percentage change between the points *X* and *Y* and that between *Y* and *Z* by following formula:

$$S = \frac{a - b}{a} \times 100$$

Where;

- a) *S* = dimensional change (due to relaxation) percent;
- b) *a* = distance between the two points *X* and *Y*, or *Y* and *Z*, before soaking; and
- c) *b* = distance between the same points after soaking.

B-5.3.2 Calculate the average dimensional change.

Table 1 100% Cotton Carded & Combed Hosiery Yarn
(Clause 4.1)

Test Parameters	20CH	24CH	30CH	32CH	36CH	40CH	50CH	60CH
Count(Ne)	20s	24s	30s	32s	36s	40s	50s	60s
	20KH	24KH	30KH	32KH	36KH	40KH	-----	-----
Count(Ne)	20s	24s	30s	32s	36s	40s	----	----
Count CV%	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
KH – Carded Yarn, CH – Combed Yarn								

Table 2 Blended Yarns Used Commercially in Hosiery
(Clause 4.1)

Sl. NO.	Blend Type	Blend %	Count Range (Ne)	Yarn Ply
	(1)	(2)	(3)	(4)
i)	Cotton	100%	20s – 60s	1 Ply, 2 Ply
ii)	Cotton/Polyester	60/40, 65/35, 50/50, 52/48, 33/67, 70/30, 80/20,	20s – 60s	1 Ply, 2 Ply
iii)	Cotton/Viscose	55/45, 65/35 70/30, 85/15, 40/60, 50/50,	20s – 60s	1 Ply, 2 Ply
iv)	Polyester/Viscose	50:50, 90:10, 75:25, 65:35	20s – 50s	1 Ply, 2 Ply
v)	Cotton/Acrylic	75/25, 60/40 50/50, 40/60	20s – 60s	
vi)	Cotton/Spandex	50/50, 90/10, 95/5	20s – 60s	140 GSM Fabric
vii)	Viscose Jersey Fabric	—————	20s, 24s, 30s, 34s, 40s.	220 GSM
viii)	Cotton/Viscose/Spandex		20s – 60s	160 GSM

ANNEX C
(Clause 4.2)

IDENTIFICATION OF FIBRES

C-1 IDENTIFICATION OF POLYESTER

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

- a) Solution of crystallized tri-chloro-acetic acid/chloroform reagent, prepared at a mass ratio 1:1.
- b) Benzyl Alcohol at temperatures of 150°C.

C -1.1 If the material used for manufacture is polyester; it shall dissolve in the above mentioned reagents.

C - 2 IDENTIFICATION OF COTTON

C – 2.1 The material used for manufacture is dipped in any one of the following reagents:

- a) Cotton dissolves in Schweitzer's Reagent ($\text{Cu}(\text{OH})_2$ in ammonia), a specific test for cellulose.
- b) Cotton will dissolve in concentrated sulfuric acid, indicating the presence of cellulose.
- c) Boil the fabric sample in a 5% NaOH solution. Cotton will degrade and lose its structure in strong NaOH solutions.

C -2.2 If the material used for manufacture is cotton; it shall dissolve in the above mentioned reagents.

C – 3 IDENTIFICATION OF SPANDEX

C -3.1 The material used for manufacture is dipped in any one of the following reagents:

- a) Spandex will dissolve in DMF (Dimethyl-Formamide) or DMAc, unlike many other fibers.

- b) Spandex is resistant to formic acid, while some other fibers may dissolve or degrade.
- c) Spandex will degrade but not dissolve completely in sulfuric acid, often swelling and losing elasticity.

C – 3.2 Spandex shows specific thermal transitions, such as a melting point around 240-270°C.

C – 4 IDENTIFICATION OF VISCOSE RAYON

C - 4.1 The material used for manufacture is viscose rayon, it shall either dissolve or swell in the above mentioned reagents.

- a) **Procedure:** Immerse a small sample in a solution of sodium hydroxide (NaOH). Viscose rayon will swell and may dissolve, while cellulose fibers like cotton will remain largely unchanged.
- b) **Procedure:** Soak the fiber in concentrated acetic acid for a few minutes. Viscose rayon will dissolve in acetic acid, while most other fibers will not.