For BIS Use Only

BUREAU OF INDIAN STANDARDS

AGENDA

Chemical Methods of Tests, Sectional Committee TXD 05 **36th Meeting**

Date	Time	Venue
22 October 2024 (Tuesday)	1100 h	Video Conference through CISCO Webex

CHAIRPERSON: Dr. Manisha Mathur, Joint Director, SASMIRA, Mumbai

MEMBER SECRETARY: Shri Dharmbeer, Scientist D/Joint Director, 'Textiles', BIS HQ New Delhi

Item 0 WELCOME & INTRODUCTORY REMARKS

Item 1 CONFIRMATION OF THE MINUTES OF THE PREVIOUS MEETING

1.1 The minutes of the 35th meeting of the TXD 05 held on 12 June 2024 were circulated vide BIS DG letter No. TX 05/A2.35 dated 18-06-2024. No comments were received.

1.1.1. The Committee may **APPROVE** the minutes as circulated.

Item 2 SCOPE AND COMPOSITION OF TXD 05

2.1 The present scope and composition of the committee is given in **Annex 1 (Pages 7 to 9).**

2.1.1 The Committee may **REVIEW**.

Item 3 ISSUES ARISING OUT OF PREVIOUS MEETING OF TXD 05

3.1 Summary of actions taken on the various decisions of the 35th meeting of TXD 05 is given in **Annex 2 (Pages 10-16).**

3.1.1 The Committee may **NOTE**.

Item 4 DRAFT STANDARDS FOR FINALIZATION

4.1 As decided by the Committee, the following draft standards were issued in wide circulation vide our letter reference no. TXD 05/Doc: 25855 dated 25 June 2024 for a period of 30 days for eliciting technical comments from stakeholders: -

1) Textiles — Determination of components in flax fibres [TXD 05 (25855)]

2) Textiles — Determination of formaldehyde — Part 3: Free and hydrolysed formaldehyde (extraction method) by liquid chromatography [TXD 05 (25858)]
3) Textiles — Qualitative and quantitative analysis of some bast fibres (flax, hemp, ramie) and their blends — Part 1: Fibre identification using microscopy methods [TXD 05 (25859)]
4) Textiles — Determination of certain preservatives — Part 2: Determination of triclosan residues method using LC-MS/MS [TXD 05 (25860)]
5) Textiles —Test method for accelerated hydrolysis of textile materials and biodegradation under controlled composting conditions of the resulting hydrolysate [TXD 05 (25861)]
6) Textiles — Tests for colour fastness — Part C12: Colour fastness to industrial laundering [TXD 05 (25856)]
7) Textiles — Tests for colour fastness Part B04: Colour fastness to artificial weathering: Xenon arc fading lamp test (First Revision of IS/ISO 105 B04:1994) [TXD 05 (25857)]

The draft standards as issued under wide circulation are given at **Annex 3 (Pages 17 to 43).**

The last date of comment was 24 July 2024. No comments were received.

4.1.1 The committee may **DECIDE**.

Item 5 DRAFT STANDARD FOR APPROVAL FOR WIDE CIRCULATION

5.1 IS 667:1981 Method for identification of textile fibres

In the last meeting of TXD 05, the committee decided the following: -

i) It was requested to provide the latest microscopic images of the fibers to revise the standard.
ii) To incorporate method for identification of silk during the revision of IS 667.
iii) The following experts shall review ISO/TR 11827 : 2012 and IS 667:1981 to share their suggestions within 15 days: -

    a) Smt. Meeta Shingala, Testtex India Laboratories Pvt. Ltd., Mumbai
    b) Smt. Saroj Vairagi, Bombay Textile Research Association, Mumbai
    c) Smt. Leena Mhatre, SASMIRA, Mumbai
    d) Dr. Sujata Saxena, ICAR-CIRCOT, Mumbai
    e) Smt. Mahalakshmi R SGS, Mumbai

f) Shri S. Shivakumar The South India Textile Research Association, Coimbatore

g) Dr. Mrinal Choudhari Wool Research Association, Thane

h) Shri Madhan R Manjushree Spntek Pvt Ltd, Bangalore

i) Shri Milind R. Marathe, Texanlab Laboratories Private Limited, Navi Mumbai

The updated draft revision of IS 667 is given at **Annex 4 (Pages 44 to 64).**

The comments received from SGS Chennai, SASMIRA, Testtex Laboratorty Pvt Limited and BTRA are given at **Annex 5 (Pages 65 to 68).**

5.1.1 The Committee may **DECIDE**.

5.2 In the last meeting, the committee requested following committee members to review the standards of their domain/expertise area and share their suggestion:-

a) Smt. Meeta Shingala, Testtex India Laboratories Pvt. Ltd., Mumbai
b) Smt. Saroj Vairagi, Bombay Textile Research Association, Mumbai
c) Smt. Leena Mhatre, SASMIRA, Mumbai
d) Dr. Sujata Saxena, ICAR-CIRCOT, Mumbai

i)	IS 199 : 1989	Textiles Estimation of moisture total size or finish ash and fatty matter in grey and finished cotton textile materials (third revision)
ii)	IS 200 : 1989	Textiles Determination of copper number of cotton textile materials (second revision)
iii)	IS 244 : 1984	Method for determination of viscosity or fluidity of solutions of cotton and regenerated cellulosic man-made fibres in cuprammonium hydroxide (second revision)
iv)	IS 392 : 1989	Textiles Determination of water absorption and penetration of fabrics using Bundesmann type apparatus third revision
v)	IS 665 : 1989	Textiles Determination of dimensional changes of fabrics containing wool on soaking in water (first revision)
vi)	IS 1299 : 1984	Method for determination of dimensional changes on washing of fabrics woven from rayon and synthetic fibres (second revision)
vii)	IS 2977 : 1989	Fabrics other than wool Method for determination of dimensional changes on soaking in water (first revision)
viii)	IS 1889 (Part 2) : 1976	Method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton Part 2 Cadoxen solvent method
ix)	IS 1889 (Part 3) : 1979	Method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton Part 3 Formic acid zinc chloride
x)	IS 1889 (Part 4) : 1979	Method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton Part 4 Sulphuric acid method (first revision)

xi)	IS 4419 : 1967	Method for determination of dimensional stability of knitted fabrics made of synthetic fibres
xii)	IS 7940 : 1976	Method for determining resistance to penetration by water of fabrics by static pressure head test
xiii)	IS 7941 : 1976	Method for determining the water repellency of fabrics by cone test

The technical inputs/comments are yet to be received.

The draft revisions prepared based on the review performas are given at **Annex 6 (Pages 69 to 164).**

5.2.1 The Committee may **DECIDE**.

Item 6 NEW SUBJECTS FOR FORMULATION OF INDIAN STANDARD

6.1 In the last meeting, the committee requested the following experts to share their technical inputs on Test method for Disperse dye (DIN 54231:2005), Total Lead/Total Cadmium (EPA 3050 B, ICP/MS, EN 16711-1), Nickel release test (EN 12472, EN 1811), Pesticide test based on International Standards and Standard Operating Procedure/In house test method of laboratories: -

i) Smt. Meeta Shingala, Testtex India Laboratories Pvt. Ltd., Mumbai
ii) Shri M. P. Sathinarayaran, Bombay Textile Research Association, Mumbai
iii) Smt. Mahalakshmi R., SGS Mumbai

The technical inputs/comments received from SGS India and Testtex India Laboratories Pvt. Ltd. considered during last meeting are given at **Annex 7 (Pages 165 to 199).**

6.1.1 The committee may **DECIDE**.

6.2 In the last meeting of Textiles Division Council, it was decided to formulate Indian Standard on test method for identification of Bamboo, Banana and other natural fibers.

The technical inputs received from SASMIRA, Mumbai considered during last meeting is given at **Annex 8 (Pages 200 to 204).**

6.2.1 The committee may **DECIDE**.

Item 7 REVIEW OF R&D PROJECT - PROJECT NUMBER: TXD 0065 : DEVELOPMENT AND VALIDATION OF TEST METHOD FOR DETERMINATION OF CHLORINATED ORGANIC CARRIERS IN TEXTILES AND TEXTILE PRODUCTS.

7.1 In the 33rd meeting of TXD, the committee prepared the Terms of Reference (ToR) for the R&D project on 'Development and validation of test method for determination of Chlorinated Organic Carriers in textiles and textile products. The above-mentioned R&D project was then approved by the review committee after Head (TXD) and Member Secretary (TXD 05) apprised the review committee about the project and explained the rationale behind the proposed R&D project. The approved ToR was then made available for public bidding. After receiving bids, the research evaluation committee decided to allocate the project to BTRA, Mumbai under the leadership of Shri M P.Sathianarayanan. The mid-term progress report, Statement of Expenditure and Fund Utilization Report as submitted by Smt. Karishma, Co-investigator, BTRA, Mumbai are given in **Annex 9**. The Term of reference and BIS R &D Guidelines are also given in **Annex 9**.

7.1.1 The committee may **REVIEW**.

Item 8 REVIEW OF PUBLISHED STANDARDS

8.1 As per procedure of BIS, standards which were published/reaffirmed five years ago or earlier are required to be reviewed to assess adequacy of the requirements specified. Review is carried out keeping in view the changes in technology, current industrial practices and the needs/expectations of the consumers/users so as to decide regarding further reaffirmation/revision/withdrawal/amendment of the standards under review.

There are no standards due for review.

8.1.1 The Committee may **NOTE.**

8.2 In the last meeting of TXD 05, the committee requested the following committee members to share their technical inputs and comments to BIS: -

Sl No.	**IS No.**	**Title**	**To be reviewed by committee member/expert**
1.	IS 2010 : 1984	Methods for detection and estimation of damage in jute fabrics due to micro-organisms first revision	IJIRA and IJMA
2.	IS 2011 : 1984	Methods for detection and estimation of damage in jute yarn and cordage due to micro-organisms first revision	-do-
3.	IS 2969 : 1974	Method for determination of oil content of jute yarn and fabrics first revision	-do-
4.	IS 9603 : 1980	Glossary of terms pertaining to textile processing	Dr. Manisha Mathur, SASMIRA Mumbai
5.	IS 9603 (Part 2) : 1985	Glossary of terms pertaining to textile processing Part 2	-do-

6.	IS 9603 (Part 3) : 1986	Glossary of terms pertaining to textile processing Part 3	-do-
7.	IS 12135 : 1987	Method for determination of acetic acid content of acetate or triacetate fibre materials	Smt. Saroj Vairagi, The Bombay Textile Research Association, Mumbai
8.	IS 12170 : 1987	Method for determination of dimensional stability of textile fabric to dry heat	-do-

Sl No.	IS Number	Title
1	IS 5151 : 1969	Method for evaluating the relative efficiency of wetting agents for mercerization
2	IS 4655 : 1968	Method for determination of iron and chromium in textiles
3	IS 4390 : 2001	Textiles – Method for estimation of solvent soluble matter in textile material (first revision)
4	IS 11813 : 1986	Method for determination of soil resistance and soil release efficiency of finished textile fabrics
5 6	IS 1299 : 1984	Method for determination of dimensional changes on washing of fabrics woven from rayon and synthetic fibres (second revision)
7	IS 4419 : 1967	Method for determination of dimensional stability of knitted fabrics made of synthetic fibres
8	IS 1389 : 1984	Methods for testing cotton fabrics for resistance to attack by micro-organisms (first revision)

The working draft/MS Word Soft Copy/Review Performa of above standards are given at **Annex 10 (Pages 205-328).**

The list of remaining pre--2000 standards are given at **Annex 11 (Pages 329-330).**

The comments/information for revision of these Pre-2000 standards are yet to be received.

8.2.1 The Committee may **DECIDE.**

Item 9 DATE AND PLACE OF NEXT MEETING

Item 10 ANY OTHER BUSINESS

ANNEX 1

(*Item 2.1*)

SCOPE AND COMPOSITION OF CHEMICAL METHODS OF TEST SECTIONAL COMMITTEE, TXD 5

Scope: To formulate Indian Standards for (a) Terminology and methods of chemical and physico-chemical tests for textile auxiliaries and pertaining to textile wet- processing (excluding dyestuffs) (b) Specification requirements for colour fastness of all kinds of Textile materials.

Meetings held	**Date and Place**
34th Meeting	13 February 2024, through VC
35th Meeting	12 June, 2024, through VC

SL NO.	ORGANIZATION REPRSENTED	NAME OF THE REPRESENTATIVE PRINCIPAL/(ALTERNATE)	ATTENDANCE
1.	The Synthetics & Art Silk Mills Research Association, Mumbai	Dr. Manisha Mathur (Chairperson)	2/2
2.	Agilent Technology India Pvt. Ltd., New Delhi	Shri Praveen Arya (Dr. Manoj Surwade)	1/2
3.	Ahmedabad Textile Industry's Research Association, Ahmedabad	Smt. Deepali Plawat (Smt. Fahimunnisa Khatib)	2/2
4.	Bidhata Industries Pvt. Ltd., Mumbai	Shri Rohit Pacheriwala (Shri R.K. Pacheriwala)	0/2
5.	Central Coir Research Institute, Kochi	Dr. S Radhakrishan (Smt Sumi Sebastian)	1/2
6.	Central Silk Technological Research Institute (CSTRI), Bengaluru	Dr. Nivedita S. (Smt. Brojeshwari Das)	2/2
7.	Directorate General of Quality Assurance (CQAT &C), Kanpur	Col D.B. Kushwaha (Shri Purushottam De)	2/2
8.	EMC Testing & Compliance LLP, Gurgaon	Shri Vivek Sharma (Shri Satya Ranjan Biswal)	2/2
9.	Eurofins Product Testing India Private Limited, Gurugram	Nomination Awaited	0/0

10.	Global Organic Textile Standard, Thane	Shri Rahul Bhajekar (Smt. Prachi Gupta)	2/2
11.	ICAR - Central Institute for Research on Cotton Technology, Mumbai	Dr Sujata Saxena (Dr. A.S.M Raja)	2/2
12.	Indian Jute Industries Research Association, Kolkata	Ms. Ishpita Roy	0/2
13.	Manjushree Spntek Pvt Ltd, Bangalore	Shri Madhan R.	2/2
14.	Northern India Textiles Research Association, Ghaziabad	Dr. M. S. Parmar	1/2
15.	Office of the Textile Commissioner, Mumbai	Shri Gaurav Gupta (Shri Rajesh Mahajan)	2/2
16.	Raymonds Ltd, Mumbai	Shri Prabhat Parasher (Shri Saurav Shekhar)	1/2
17.	Regulatory Representatives and Managers Association, Maharashtra	Dr. Jayachandran Nair (Dr. Shilpa Narang)	0/0
18.	SGS, Mumbai	Dr. Karthikeyan K. (Smt. Mahalakshmi R.)	2/2
19.	Sunil Industries, Mumbai	Shri Pradeep Roongta (Shri Ramesh Khanna)	2/2
20.	Testex India Laboratories Pvt Ltd., Mumbai	Smt. Meeta Shingala (Shri Mahesh Sharma)	2/2
21.	Texanlab Laboratories Pvt. Ltd., Navi Mumbai	Shri Milind R. Marathe (Shri Vivek Patil)	2/2
22.	Textile Committee, Mumbai	Shri Kartikeyan Dhanda (Dr. P. Ravichandran)	2/2
23.	The Bombay Textile Research Association, Mumbai	Shri M.P Satyanarayan (Smt. Saroj Vairagi)	2/2
24.	The South India Textile Research Association, Coimbatore	Dr. Prakash Vasudevan (Shri S. Sivakumar)	2/2
25.	The Synthetics & Art Silk Mills Research Association, Mumbai	Smt. Ashwini A. Sudam (Smt. Leena Mhatre)	2/2

26.	U P Textile Technology Institute, Kanpur	Dr. Arun Kumar Patra (Dr Subhankar Maity)	2/2
27.	Wool Research Association, Thane	Dr. Mrinal Choudhari (Dr. Swati Mahadik)	2/2

ANNEX 2

(*Item 3.1*)

SUMMARY OF ACTIONS TAKEN ON THE MINUTES OF 35th MEETING

Item No.	Decision	Action taken
2.1	**SCOPE AND COMPOSITION**	Updated composition is given in **Annex 1**
4.1	**DRAFT STANDARD FOR APPROVAL FOR WIDE CIRCULATION** **IS 667:1981 Method for identification of textile fibres** In the last meeting, the committee decided the following: - i) It was requested to provide the latest microscopic images of the fibers to revise the standard. ii) To incorporate method for identification of silk during the revision of IS 667. iii) The following experts shall review ISO/TR 11827 : 2012 and IS 667:1981 to share their suggestions within 15 days: - j) Smt. Meeta Shingala, Testtex India Laboratories Pvt. Ltd., Mumbai k) Smt. Saroj Vairagi, Bombay Textile Research Association, Mumbai l) Smt. Leena Mhatre, SASMIRA, Mumbai	Coming up for discussion under agenda **Item 5.1.**

	m) Dr. Sujata Saxena, ICAR-CIRCOT, Mumbai n) Smt. Mahalakshmi R SGS, Mumbai o) Shri S. Shivakumar The South India Textile Research Association, Coimbatore p) Dr. Mrinal Choudhari Wool Research Association, Thane q) Shri Madhan R Manjushree Spntek Pvt Ltd, Bangalore r) Shri Milind R. Marathe, Texanlab Laboratories Private Limited, Navi Mumbai The members were requested to give their comments whether ISO/TR 11827 : 2012 can be adopted or not. The committee requested BIS to share the copy of ISO/TR 11827: 2012 and IS 667 with above experts.	
4.2	**DRAFT STANDARD FOR APPROVAL FOR WIDE CIRCULATION** The committee requested the following committee members to review the standards of their domain/expertise area and share their suggestion/comments in 15 days :- a) Smt. Meeta Shingala, Testtex India Laboratories Pvt. Ltd., Mumbai b) Smt. Saroj Vairagi, Bombay Textile Research Association, Mumbai c) Smt. Leena Mhatre, SASMIRA, Mumbai d) Dr. Sujata Saxena, ICAR-CIRCOT, Mumbai	Coming up for discussion under agenda **Item 4.2.**
5.1	**NEW SUBJECTS FOR FORMULATION OF INDIAN STANDARD**	

	The committee considered the list of following ISO Standards: -	
	i) **ISO 17070:2015**, Leather—Determination of tetrachlorophenol-, trichlorophenol- , dichlorophenol-, monochlorophenol-isomers and pentachlorophenol content	Adopted as IS 14575 : 2024/ ISO 17070 : 2015
	ii) **ISO 17072-1:2019**, Leather—Chemical determination of metal content Part 1: Extractable metals	Adopted as IS 582 (Part 6/Sec 1) : 2024/ ISO 17072-1 : 2019
	iii) **ISO 17072-2:2022**, Leather—Chemical determination of metal content Part 2: Total metal content	Adopted as IS 582 (Part 6/Sec 2) : 2024 ISO 17072-2 : 2022
	iv) **ISO 17075-1:2017**, Leather—Chemical determination of chromium (VI) content in leather Part 1: Colorimetric method	Adopted as IS 582 (Part 11/Sec 1) : 2022/ ISO 17075-1 : 2017
	v) **ISO 17075-2:2017**, Leather—Chemical determination of chromium (VI) content in leather Part 2: Chromatographic method	Adopted as IS 582 (Part 11/Sec 2) : 2022/ ISO 17075-2 : 2017
	vi) **ISO 23702-1:2023**, Leather—Per- and polyfluoroalkyl substances Part 1: Determination of non-volatile compounds by extraction method using liquid chromatography	To be adopted
	vii) **ISO 16189:2021**, Footwear—Critical substances potentially present in footwear and footwear components Test method to quantitatively determine dimethylformamide in footwear materials	To be adopted
	viii) **ISO 16186:2021**, Footwear—Critical substances potentially present in footwear and footwear components Determination of dimethyl fumarate (DMFU)	Adopted as IS 16991 : 2018 ISO/TS 16186 : 2012 TXD informed Chemical Department for adoption of

	The committee requested to the Member Secretary to take follow up from CHD Department of BIS to adopt these International standard as they are also applicable to Textile Products.	standards vide email dated 08 August 2024.
5.2	**NEW SUBJECTS FOR FORMULATION OF INDIAN STANDARD** The committee considered the technical inputs/comments received from SGS India and Testtex India Laboratories Pvt. Ltd. on the following new subjects as given in Annex 5 of the agenda. i) Test method for Disperse dye (DIN 54231:2005), ii) Total Lead/Total Cadmium (EPA 3050 B, ICP/MS, EN 16711-1), iii) Nickel release test (EN 12472, EN 1811), iv) Pesticide test After deliberation, the committee requested the following experts to share their technical inputs related to scope, preparation of test specimen, parameters of instrument, testing procedure, chromatogram base on inhouse SOPs and International Practice on the above subjects withing 15 days :- i) Smt. Meeta Shingala, Testtex India Laboratories Pvt. Ltd., Mumbai ii) Shri M. P. Sathinarayaran, Bombay Textile Research Association, Mumbai The committee also given additional time of 15 days for members to review the working document and technical inputs on disperse dyes, heavy metals and pesticides and send their comments for the improvement/modification in the document.	Coming up for discussion under agenda **Item 5.1.**
5.3	**NEW SUBJECTS FOR FORMULATION OF INDIAN STANDARD**	

	The committee considered the technical inputs received from SASMIRA on test method for identification of bamboo, banana and blend with other natural fibers as given in Annex 6 of the agenda. After deliberation, the committee decided the following :- i) It was informed by Testtex India Laboratories Pvt. Ltd., and CIRCOT that they had received few samples in past for testing of banana and bamboo fibre so the committee requested them share their technical inputs to BIS. ii) It was informed by Dr. Nidhi Sisodia that NITRA has been doing research work on identification of banana and bamboo fibre so the committee requested NITRA to share technical inputs to BIS. iii) The committee requested SASMIRA and WRA to send the available samples of banana and bamboo fibre/yarn/fabric/apparels to Testtex India Laboratories Pvt. Ltd, NITRA and CIRCOT for identification and technical inputs on test method. iv) The committee requested BIS to approach the bamboo and banana fibre/yarn/fabric/apparels manufacturer for their technical inputs and availability of 100 percent banana or 100 % bamboo fibre. **v)** It was informed that bamboo fibre is similar in structure and composition with regenerated viscose fibre which may be difficult to distinguish in blend samples. The committee suggested to develop test method for identification of 100 percent banana fiber and 100 percent bamboo fiber in first	Coming up for discussion under agenda **Item 5.2.**

	instance, followed by determining the blend ratio.	
6.1	**INTERNATIONAL ACTIVITIES** The committee decide to adopt the following International/ISO standards as an Indian Standards. i) ISO 105-C12 : 2024, Textiles — Tests for colour fastness Part C12: Colour fastness to industrial laundering ii) ISO 105-B04 : 2024, Textiles — Tests for colour fastness Part B04: Colour fastness to artificial weathering: Xenon arc fading lamp test iii) ISO 5773:2023, Textiles — Determination of components in flax fibres The committee further decided that BIS shall prepare the preliminary draft on above subjects and the same shall be issued in wide circulation for 30 days for eliciting technical comments from stakeholders. BIS may carry out the editorial changes in the draft if required.	Coming up for discussion under agenda **Item 4.1.**
7.1	**REVIEW OF PUBLISHED STANDARDS** The committee considered the List of Standards due for review as given in **Annex 8** and Review Performa as given in **Annex 9** of the agenda. After deliberation, the committee decided that these Indian Standards are based on latest version of ISO and are in line with the latest practice of industry and trade. These standards shall be allocated to member secretary TXD 05 for uploading the review performa on BIS Portal.	The standard were reaffirmed for further period of 5 years.

	The committee also decided to reaffirm these standards for a further period of 5 years.	
7.2.1	**REVIEW OF PUBLISHED STANDARDS** **Pre-2000 Standards** The committee requested the committee members to review the pre-2000 standards of their domain/expertise area and share their suggestion.	Coming up for discussion under agenda **Item 7.2.**
7.2.2	**REVIEW OF PUBLISHED STANDARDS** **Withdrawal of Indian Standards** The committee also recommended the withdrawal of the following Indian Standards.	The standards recommended for withdrawal for approval of Textiles Division Council.
7.2.2	**REVIEW OF PUBLISHED STANDARDS** **Archive of Indian Standards** The committee also decided to keep archiving the remaining standards as given in Annex 10 where inputs were not received.	The standards are being archived.

ANNEX 3

(Item 4.1)

DRAFT STANDARDS FOR FINALIZATION

Draft for Comments Only **[Doc: TXD 05 (25855)]**

BUREAU OF INDIAN STANDARDS

(Not to be reproduced or used as the Indian Standard without the prior permission of BIS)

Last date for comments – 24 July, 2024

Draft Indian Standard

Textiles — Determination of components in flax fibres

Chemical Methods of Test Sectional Committee, TXD 05

NATIONAL FOREWORD

This Indian Standard intended to be adopted is identical with ISO 5773:2023 'Textiles — Determination of components in flax fibres' issued by the International Organization for Standardization (ISO).

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 3696:1987 Water for analytical laboratory use — Specification and test methods	IS 1070 : 2023 Reagent grade water — Specification (*fourth revision*)	Technically Equivalent

ISO 4793, Laboratory sintered (fritted) filters — Porosity grading, classification and designation	IS 12305 : 2018 ISO 4793 : 1980 Laboratory sintered (fritted) filters — Porosity grading, classification and designation (*first revision*)	Identical with ISO 4793 : 1980

The technical committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International/Other Standard	*Title*
ISO 1130:1975	Textile fibres — Some methods of sampling for testing

In reporting the result of a test or analysis made in accordance with this standard, if the final value; observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*).

Extract of ISO 5773:2023 'Textiles — Determination of components in flax fibres'

Foreword

1 Scope

This document specifies the test methods for the quantitative analysis of cellulose, hemicellulose, lignin, pectin, fat and wax content in flax fibres.

This document is applicable to flax fibres and can be used as a reference for testing other bast fibres.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

i) ISO 1130, Textile fibres — Some methods of sampling for testing
ii) ISO 3696, Water for analytical laboratory use — Specification and test methods
iii) ISO 4793, Laboratory sintered (fritted) filters — Porosity grading, classification and designation

3 Terms and definitions

No terms and definitions are listed in this document.

4 Principle

Flax fibres were treated physically and chemically to extract and separate the components which were consequently subjected to gravimetric analysis, titration and spectrophotometry for quantitative determination.

Draft for Comments Only **[Doc: TXD 05 (25858)]**

BUREAU OF INDIAN STANDARDS

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Last date for comments – 24 July, 2024

Draft Indian Standard

Textiles — Determination of formaldehyde — Part 3: Free and hydrolysed formaldehyde (extraction method) by liquid chromatography

Chemical Methods of Test Sectional Committee, TXD 05

NATIONAL FOREWORD

This Indian Standard intended to be adopted is identical with ISO 14184-3:2023 'Textiles — Determination of formaldehyde — Part 3: Free and hydrolysed formaldehyde (extraction method) by liquid chromatography' issued by the International Organization for Standardization (ISO).

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

c) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
d) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted, reference appears to certain International Standard for which Indian Standard also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 3696:1987 Water for analytical laboratory use — Specification and test methods	IS 1070 : 2023 Reagent grade water — Specification (*fourth revision*)	Technically Equivalent

In reporting the result of a test or analysis made in accordance with this standard, if the final value; observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*).

Extract of ISO 14184-3:2023 'Textiles — Determination of formaldehyde — Part 3: Free and hydrolysed formaldehyde (extraction method) by liquid chromatography

1 Scope

This document specifies a method for determining the amount of free formaldehyde and formaldehyde extracted partly through hydrolysis by means of an extraction method. The method can be applied for the testing of textile fibres, fabrics or yarns.

NOTE — This method, based on liquid chromatography (LC), is selective and not sensitive to coloured extracts and is intended to be used for precise quantification of formaldehyde.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

i) ISO 3696, Water for analytical laboratory use — Specification and test methods

3 Terms and definitions

No terms and definitions are listed in this document.

4 Conformity

Compared with ISO 14184-1, the two analytical methods should give similar trends but not necessarily the same absolute result. Therefore, in cases of dispute, the method in this document shall be used in preference to ISO 14184-1 (see Note in Clause 1).

5 Principle

The sample is extracted with extraction solution at 40 °C. The eluate is mixed with 2, 4-dinitrophenylhydrazine (DNPH), whereby formaldehyde reacts to give the respective hydrazone. It is separated by liquid chromatography with ultraviolet detector (LC-UV) or liquid chromatography with diode array detector (LC-DAD) or liquid chromotagraphy with single quadrupole mass detector (LC MS) or liquid chromatography with triple quadrupole mass detector (LC-MSMS) and the amount is quantified.

The process is selective. Formaldehyde is separated and quantified as a derivative from other aldehydes and ketones by LC. Free formaldehyde and formaldehyde which is hydrolysed during extraction to yield free formaldehyde is quantified.

Draft for Comments Only **[Doc: TXD 05 (25859)]**

BUREAU OF INDIAN STANDARDS

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Last date for comments –24 July, 2024

Draft Indian Standard

Textiles — Qualitative and quantitative analysis of some bast fibres (flax, hemp, ramie) and their blends — Part 1: Fibre identification using microscopy methods

Chemical Methods of Test Sectional Committee, TXD 05

NATIONAL FOREWORD

This Indian Standard intended to be adopted is identical with ISO 20706-1:2019 ‘Textiles — Qualitative and quantitative analysis of some bast fibres (flax, hemp, ramie) and their blends — Part 1: Fibre identification using microscopy methods’ issued by the International Organization for Standardization (ISO).

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

e) Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’.

f) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted, reference appears to certain International Standard for which Indian Standard also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 3696:1987 Water for analytical laboratory use — Specification and test methods	IS 1070 : 2023 Reagent grade water — Specification (*fourth revision*)	Technically Equivalent

The technical committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International/Other Standard	*Title*
ISO 20705:2019	Textiles — Quantitative microscopical analysis — General principles of testing

In reporting the result of a test or analysis made in accordance with this standard, if the final value; observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 2022 ‘Rules for rounding off numerical values (*second revision*).

Extract of ISO 20706-1:2019 Textiles — Qualitative and quantitative analysis of some bast fibres (flax, hemp, ramie) and their blends — Part 1: Fibre identification using microscopy

methods

Foreword

This corrected version of ISO 20706-1:2019 incorporates the following corrections:

i) in 8.3, the SEM procedure structure has been corrected;
ii) in 7.2.1, the missing reference to Annex H has been added.

Introduction

Among bast fibres used for textiles, flax and hemp are the most expensive. Flax is grown mainly (85 %) in a small coastal area of Northern Europe; hemp textile products are rare. Ramie is less expensive than flax and hemp: 10 % to 20 % cheaper for medium count yarns — and the difference increases for fine counts.

Flax and other bast fibres, such as hemp and ramie exhibit great similarities in their physical and chemical properties, so that their fibre specie and their blends are difficult to distinguish from each other by both mechanical and chemical methods. In addition, these fibres show nearly resembling fibre morphology. It is very difficult to accurately identify the fibre species and accurately determine the fibre content of such fibre blends by current testing means.

Research works on accurate identification of bast fibre has been a long undertaking.

In order to promote fair labelling of products and anti-counterfeiting protection, The European Confederation of Flax and Hemp (CELC) created the Bast Fibre Authority in 2013, inviting laboratories, research centres and providers of quality and control services to develop a common technical protocol. Five laboratories joined in 2013 and comparison testing were carried out between them on May–June 2014 and January–February 2015.

NOTE — CELC, founded in 1951, is a non-profit organization and an association for reflection, market analysis, industry concertation and strategic orientations. CELC is the only agro-industrial European organization that covers all stages of production and processing of flax/linen and hemp. It is the chosen representative of more than 10,000 firms in 14 European countries, promoting the fibre from plant to finished product (including sections dealing with agriculture, retting/scutching, trading, spinning, weaving and technical uses).

At present, the most widely used and reliable ones include light microscopy (LM) method and scanning electron microscopy (SEM) method. The advantage of LM method is that the internal morphology of fibres can be observed, but some subtle surface structures are not able to be clearly displayed. Decoloration process can be carried out on dark samples for testing, while improper decoloration process will affect the judgment of fibre analyst.

The scanning electron microscopy (SEM) method shows opposite characteristics to those of LM method. Therefore, some types of fibres need to be identified by scanning electron microscope.

When some samples are difficult to be identified, light microscopy method and scanning electron microscopy method should be used together to identify in order to utilize the advantages of both methods.

It is proven in practice that accuracy of fibre analysis is highly related to the ample experience, fully understanding and extreme familiarity of the fibre analyst to the morphology of various types of bast fibres. Therefore, besides text description, a large amount of micrographs of different types of flax, hemp and ramie are given in Annex A, Annex B, Annex C and Annex D of this document

1 Scope

This document specifies methods for the identification of some bast fibres (flax, hemp, ramie) using both light microscopy (LM) and scanning electron microscopy (SEM). This document is also applicable to blends of these bast fibres and products made from them.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ii) ISO 3696, Water for analytical laboratory use — Specification and test methods

iii) ISO 20705:2019, Textiles — Quantitative microscopical analysis — General principles of testing

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20705 and the following apply.

4 Principle

A longitudinal view image and/or cross view image of fibres representative of a test specimen is magnified to an appropriate scale/size under optical light microscope and/or SEM. All bast fibre species found in the test specimens are identified by the difference in fibre morphology among different types of certain bast fibres (flax, hemp, ramie).

Draft for Comments Only **[Doc: TXD 05 (25860)]**

BUREAU OF INDIAN STANDARDS

(Not to be reproduced or used as the Indian Standard without the prior permission of BIS)

Last date for comments – 24 July, 2024

Draft Indian Standard

Textiles — Determination of certain preservatives — Part 2: Determination of triclosan residues method using LC-MS/MS

Chemical Methods of Test Sectional Committee, TXD 05

NATIONAL FOREWORD

This Indian Standard intended to be adopted is identical with ISO 22992-2:2020 'Textiles — Determination of certain preservatives — Part 2: Determination of triclosan residues method using LC-MS/MS' issued by the International Organization for Standardization (ISO).

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian

Standards. Attention is particularly drawn to the following:

g) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

h) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted, reference appears to certain International Standard for which Indian Standard also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 3696:1987 Water for analytical laboratory use — Specification and test methods	IS 1070 : 2023 Reagent grade water — Specification (*fourth revision*)	Technically Equivalent

In reporting the result of a test or analysis made in accordance with this standard, if the final value; observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*).

Extract of ISO 22992-2:2020 'Textiles — Determination of certain preservatives — Part 2: Determination of triclosan residues method using LC-MS/MS.

Foreword

1 Scope

This document specifies a method for determination of triclosan residues in textiles by high performance liquid chromatography — tandem mass spectrometry (HPLC-MS/MS).

This method is applicable to all kinds of textile products

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

iv) ISO 3696, Water for analytical laboratory use — Specification and test methods

3 Terms and definitions

No terms and definitions are listed in this document.

4 Principle

The triclosan is extracted from textile specimen by ultrasonic generator with methanol. After being concentrated and diluted to volume, the residue is determined by HPLC-MS/MS, quantified by external standard method.

Draft for Comments Only **[Doc: TXD 05 (25861)]**

BUREAU OF INDIAN STANDARDS

(Not to be reproduced or used as the Indian Standard without the prior permission of BIS)

Last date for comments – 24 July, 2024

Draft Indian Standard

Textiles —Test method for accelerated hydrolysis of textile materials and biodegradation under controlled composting conditions of the resulting hydrolysate

Chemical Methods of Test Sectional Committee, TXD 05

NATIONAL FOREWORD

This Indian Standard intended to be adopted is identical with ISO 21701:2019 'Textiles —Test method for accelerated hydrolysis of textile materials and biodegradation under controlled composting conditions of the resulting hydrolysate' issued by the International Organization for Standardization (ISO).

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

i) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

j) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 1628-1, Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers — Part 1: General principles	IS 13360 (Part 11/Sec 9) : 2023/ ISO 1628-1 : 2021 Plastics — Methods of test Part 11 Special properties Section 9 Determination of the viscosity of polymers in dilute solution using capillary viscometers — General principles (*second revision*)	Identical with ISO 1628-1:2021.
ISO 14855-1, Determination of the ultimate aerobic	IS/ISO 14855-1 : 2012	Identical with ISO 14855-1:2012.

biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 1: General method	Determination of the Ultimate Aerobic Biodegradability of Plastic Materials Under Controlled Composting Conditions — Method by Analysis of Evolved Carbon Dioxide Part 1 General Method (*first revision*)	

The technical committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International/Other Standard	*Title*
ISO 13885-1:2020	Gel permeation chromatography (GPC) Part 1: Tetrahydrofuran (THF) as eluent

In reporting the result of a test or analysis made in accordance with this standard, if the final value; observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*).

Extract of ISO 21701:2019 'Textiles —Test method for accelerated hydrolysis of textile materials and biodegradation under controlled composting conditions of the resulting hydrolysate.

Introduction

Textile fibres can be classified into natural fibres and man-made fibres according to ISO/TR 11827. Some of man-made fibres manufactured from organic materials are biodegradable and can be divided into three major categories in relation to their origin, i.e. natural material base, biology base and petroleum base. The representative bio-based, man-made biodegradable fibre is polylactide and petroleum based, man-made biodegradable fibres are manufactured from polyethylene terephthalate succinate, polycaprolactone, polypropylene carbonate, polybuthylene succinate or copolymer using them.

The biodegradation of petroleum-based fibres is relatively slow compared to biology-based or natural fibres due to the chemical structure. In addition, the rate of biodegradation of textile materials such as fibres and yarns can also be affected negatively by high molecular weight, degree of crystallinity and orientation occurred during the spinning. Although some standards refer to the instrument analysis, such as gas chromatograph or infrared analysis, the process and calculation method are not standardized. Therefore, it is difficult to determine the biodegradation of petroleum-based textile materials using the existing standards available for natural fibres, biology-based fibres or plastic materials used for packaging.

To overcome these difficulties, the new test method is proposed by a combination of accelerated hydrolysis and biodegradation using instrument analysis for analysis of evolved carbon dioxide.

Under the composting of textile materials both mechanisms, abiotic and biotic processes, operate together and the microorganisms eventually remove the hydrolysate in a synergistic process. It is difficult and time consuming to reproduce this in the laboratory. For convenience, the accelerated hydrolysis, which is an abiotic process, should be carried out followed by biodegradation subsequently. The rate and extent of molecular weight loss is measured as indicative of losses in physical properties from accelerated hydrolysis and then the biodegradability of hydrolysate is estimated by direct measurement of evolved carbon dioxide with a gas chromatograph

1 Scope

This document specifies a test method for the determination of the biodegradability of the hydrolysate of textile materials obtained after accelerated hydrolysis under controlled composting conditions by measurement of the amount of evolved carbon dioxide with a gas chromatography.

This test method can be applied to petroleum-based man-made biodegradable textile materials which are manufactured from polyethylene terephthalate succinate, polycaprolactone, polypropylene carbonate, polybuthylene succinate or copolymer using them.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

i) ISO 1628-1, Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers — Part 1: General principles

ii) ISO 13885-1, Binders for paints and varnishes — Gel permeation chromatography (GPC)

— Part 1: Tetrahydrofuran (THF) as eluent

iii) ISO 14855-1, Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions — Method by analysis of evolved carbon dioxide — Part 1: General method.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4 Principle

The test method determines the ultimate biodegradability of test material after accelerated hydrolysis under conditions simulating an intensive aerobic composting process. It aims to determine the ultimate biodegradability of the hydrolysate by using a small-scale reactor. The degradation rate is periodically measured by determining the amount of the evolved carbon dioxide using gas chromatography.

Firstly, the test material is hydrolysed under the constant temperature and humidity until the substantial loss of molecular weight in order to initiate the biodegradation process shortly.

During the aerobic biodegradation of the hydrolysate, carbon dioxide, water, mineral salts and new microbial cellular constituents (biomass) are the ultimate biodegradation products. The carbon dioxide produced is continuously monitored, or measured at regular intervals, in test and blank vessels to determine the cumulative carbon dioxide production. The percentage biodegradation is given by the ratio of the carbon dioxide produced from the test material to the maximum theoretical amount of carbon dioxide that can be produced from the test material. The maximum theoretical amount of carbon dioxide produced is calculated from the measured total organic carbon (TOC) content.

Last date for comments – 24 July, 2024

Draft Indian Standard

Textiles — Tests for colour fastness — Part C12: Colour fastness to industrial laundering

Chemical Methods of Test Sectional Committee, TXD 05

NATIONAL FOREWORD

This Indian Standard (Part C12) intended to be adopted is identical with ISO 105-C12:2024 'Textiles — Tests for colour fastness — Part C12: Colour fastness to industrial laundering' issued by the International Organization for Standardization (ISO).

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

k) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

l) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted, reference appears to certain International Standard for which Indian Standard also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 105-A01, Textiles — Tests for colour fastness — Part A01: General principles of testing	IS/ISO 105-A01 : 2010 Textiles — Tests for colour fastness Part	Identical with ISO 105-A01:2010.

	A01 General principles of testing (*first revision*)	
ISO 105-A02, Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour	IS/1SO 105-A02 :1993 Textiles — Tests for colour fastness Part A02 Grey scale for assessing change in colour	Identical with ISO 105-A02:1993.
ISO 105-A03, Textiles — Tests for colour fastness — Part A03: Grey scale for assessing staining	IS/ISO 105 - A03 : 2019 Textiles — Tests for colour fastness Part A03 Grey scale for assessing staining (*first revision*)	Identical With ISO 105 -A03 : 2019
ISO 105-A04, Textiles — Tests for colour fastness — Part A04: Method for the instrumental assessment of the degree of staining of adjacent fabrics	IS/ISO 105-A04 :1989 Textiles — Tests for colour fastness Part A04 Method for the instrumental assessment of the degree of staining of adjacent fabrics	Identical With ISO 105-A04 :1989
ISO 105-A05, Textiles — Tests for colour fastness — Part A05: Instrumental assessment of change in colour for determination of grey scale rating	IS/ISO 105-A05 :1996 Textiles — Tests for colour fastness Part A05 Instrumental assessment of change in determination of grey scale rating	Identical with ISO 105-A05:1996.
ISO 105-F02, Textiles — Tests for colour fastness — Part F02: Specification for cotton and viscose adjacent fabrics	IS/ISO 105-F02 : 2009 Textiles — Tests for colour fastness Part F02 Specification for cotton and viscose adjacent fabrics	Identical with ISO 105-F02:2009.
ISO 105-F04, Textiles — Tests for colour fastness — Part F04: Specification for polyester adjacent fabric	IS/ISO 105-F04 : 2001 Textiles — Tests for colour fastness Part F04 Specification for polyester adjacent fabric	Identical with ISO 105-F04:2001.
ISO 105-F10, Textiles — Tests	IS/ISO 105-F10 : 1989	Identical with ISO 105-

for colour fastness — Part F10: Specification for adjacent fabric: Multifibre	Textiles — Tests for colour fastness Part F10 Specification for adjacent fabric multi fibre	F04:2001.
ISO 139, Textiles — Standard atmospheres for conditioning and testing	IS 6359 : 2023 Method for conditioning of textiles (*first revision*)	Technically Equivalent
ISO 3696, Water for analytical laboratory use — Specification and test methods	IS 1070 : 2023, Reagent grade water — Specification (*fourth revision*)	Technically Equivalent

In reporting the result of a test or analysis made in accordance with this standard, if the final value; observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*).

Extract of ISO 105-C12:2024 'Textiles — Tests for colour fastness — Part C12: Colour fastness to industrial laundering'.

Foreword

This second edition cancels and replaces the first edition (ISO 105-C12:2004), which has been technically revised.

The main changes are as follows:

i) ISO 105-F:1985 was withdrawn and the test conditions of industrial laundering are seldom used for the fabrics mainly made of delicate fibres (for example silk or wool), therefore ISO 105-C12:2004/Cor 1:2007 has not been suitable to be incorporated into this method;

ii) addition of ISO 3696 and replacement of ISO 105-A01:1994 with ISO 105-A01 in Clause 2;

iii) revision of clause title from “Reagents” to “Reagents and materials” in Clause 5 (Former Clause 4);

iv) addition of “Other suitable detergent can be used if agreed upon between interested parties.” in 5.1 (former 4.1);

v) clarification that 30 % is mass fraction in 5.3 (former 4.3);

vi) addition of sodium percarbonate as an optional reagent in 5.6, 8.1.3, Table 1 and A.1 (former 4.6, 7.1.3, Table 1 and A.1);

vii) replacement of “see 8.2 of ISO 105-A01:1994” with “in accordance with ISO 3696” in 5.7 (former 4.7);

viii) movement of “Adjacent fabrics” and “Grey scales” to the clause “Reagent and materials”;

ix) addition of the statement “using either a multifibre adjacent fabric or two single-fibre adjacent fabrics as specified in ISO 105-A01.” in 5.8 (former 5.4);

x) deletion of “Condition the sample for 24 h before assessing to allow for temporary colour change caused by heat.” in 6.6 (former 5.6);

xi) addition of “Balance, with a resolution of 0,01 g.” in Clause 6 (former Clause 5);

xii) addition of the dimension of the multifibre TV adjacent fabric as “80 mm × 100 mm” in 7.2 (former 6.2);

xiii) revision of Figure 1;

xiv) replacement of “mixer” with “mechanical stirrer” in 8.1 (former 7.1);

xv) replacement of “running tap water for 10 min” with “running tap water until being clean” and addition of a NOTE to check the cleanness degree of the rinsed test specimen in 8.2.2 (former 7.2.2);

xvi) revision of the requirement for conditioning the test specimen in 8.2 (former 7.2);

xvii) improvement of the contents in Test report;

xviii) revision of Annex A from “informative” to “normative”;

xix) improvement of the Formula (A.1);

xx) updating of the Bibliography

Introduction

The test method in this document is intended to reflect the effect of comprehensive laundering during industrial laundry procedures, as distinct from the domestic washing test methods as given in ISO 105

C06, ISO 105-C08 and ISO 105-C10. Four test conditions are described, one at (92 ± 2) °C intended for the evaluation of workwear and three, as given below, at (75 ± 2) °C, for the evaluation of bed and table linen and corporate wear:

i) without the addition of peroxy bleach compounds;

ii) with the addition of hydrogen peroxide (for the bleaching of white workwear with coloured trimmings);

iii) with the addition of sodium perborate tetrahydrate (or sodium percarbonate) and tetra-acetylethylene diamine (TAED) (for the bleaching of white workwear with coloured trimmings).

NOTE

The addition of TAED/perborate (or percarbonate) is a conveniently stable way of producing peracetic acid in situ.

This test method does not reflect the effect of optical brightening agents.

This method and the single cycle test methods described in ISO 105-C06 and ISO 105-C08 might not reproduce the effect of coloured fabrics treated with certain dye fixing agents and finishes after multiple (5 to 10) industrial washes.

1 Scope

This document specifies methods for determining the resistance of the colour of textiles of all kinds exposed to all forms of industrial laundering procedures.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

i) ISO 105-A01, Textiles — Tests for colour fastness — Part A01: General principles of testing

ii) ISO 105-A02, Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour

iii) ISO 105-A03, Textiles — Tests for colour fastness — Part A03: Grey scale for assessing staining

iv) ISO 105-A04, Textiles — Tests for colour fastness — Part A04: Method for the instrumental assessment of the degree of staining of adjacent fabrics

v) ISO 105-A05, Textiles — Tests for colour fastness — Part A05: Instrumental assessment of change in colour for determination of grey scale rating

vi) ISO 105-F02, Textiles — Tests for colour fastness — Part F02: Specification for cotton and viscose adjacent fabrics

vii) ISO 105-F04, Textiles — Tests for colour fastness — Part F04: Specification for polyester adjacent fabric

viii) ISO 105-F10, Textiles — Tests for colour fastness — Part F10: Specification for adjacent fabric: Multifibre

ix) ISO 139, Textiles — Standard atmospheres for conditioning and testing

x) ISO 3696, Water for analytical laboratory use — Specification and test methods

3 Terms and definitions

No terms and definitions are listed in this document.

4 Principle

A test specimen of the textiles in contact with specified adjacent fabrics is laundered, rinsed and dried. Test specimens are laundered under appropriate conditions of temperature, alkalinity, bleaching and mechanical action such that the result is obtained in a conveniently short time. The mechanical action is accomplished by the use of an appropriate number of steel balls. The change in colour of the test specimens and the staining of the adjacent fabrics are assessed with reference to the original fabric, either using the grey scale or instrumentally.

One cycle approximates to the colour in change and cross staining resulting from chemical and/or mechanical action achieved after multiple (5 to 10) industrial launderings.

Draft for Comments Only **[Doc: TXD 05 (25857)]**

BUREAU OF INDIAN STANDARDS

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Last date for comments – 24 July, 2024

Draft Indian Standard

Textiles — Tests for colour fastness — Part B04: Colour fastness to artificial weathering: Xenon arc fading lamp test (*first revision* of IS/ISO 105-B04)

Chemical Methods of Test Sectional Committee, TXD 05

NATIONAL FOREWORD

This Indian Standard (Part B04) (First Revision) intended to be adopted is identical with ISO 105-B04:2024 'Textiles — Tests for colour fastness — Part B04: Colour fastness to artificial weathering: Xenon arc fading lamp test' issued by the International Organization for Standardization (ISO).

This standard supersedes IS 6152 : 1985 'Methods for determination of colour fastness of textile materials to weathering by xenon arc lamp (first revision)'.

This Indian standard was originally published in 1994.The first revision of this standard has been undertaken to harmonize it with the latest version of ISO 105-B04 : 2024.

Colour fastness of dyed/printed textile materials to various agencies during their further treatment or actual use is an important performance requirement from the viewpoint of the user or consumer. The various agencies to which textile materials may be subsequently subjected may include water, acids, alkalis, organic solvents, washing, laundering, dry-cleaning, perspiration, light, gaseous fumes, bleaching, rubbing, carbonizing, felting, etc, and the colour of textile materials should be fast to these agencies and should not change considerably. The colour should also not bleed and stain the adjacent fabric which is subjected to these agencies along with coloured fabric. The colour fastness property of coloured textiles is, therefore, measured in terms of colour fastness ratings with respect to change in colour and/or staining of adjacent fabric.

Since colour fastness is one of the most important requirements for export of textiles, it is considered essential that Indian Standards related to colour fastness are completely harmonized with International Standards. The various Indian Standards on colour fastness testing, are, therefore, being published/ revised to align them with the corresponding International Standards published in Parts A to Z.

This standard finds application in measurement of colour fastness of textile materials to the action of weather as determined by exposure to simulated weathering conditions in a cabinet equipped with a xenon arc lamp.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

m) Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’.

n) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted, reference appears to certain International Standard for which Indian Standard also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 105-A01, Textiles — Tests for colour fastness — Part A01: General principles of testing	IS/ISO 105-A01 : 2010 Textiles – Tests for colour fastness Part A01 General principles of testing (*first revision*)	Identical with ISO 105-A01 : 2010.
ISO 105-A02, Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour	IS/ISO 105-A02 :1993 Textiles — Tests for colour fastness Part A02 Grey scale for assessing change	Identical with ISO 105-A02:1993.

	in colour	
ISO 105-A05, Textiles — Tests for colour fastness — Part A05: Instrumental assessment of change in colour for determination of grey scale rating	IS/ISO 105-A05 :1996 Textiles — Tests for colour fastness Part A05 Instrumental assessment of change in determination of grey scale rating	Identical with ISO 105-A05:1996.
ISO 105-B01, Textiles — Tests for colour fastness — Part B01: Colour fastness to light: Daylight	IS/ISO 105-B01 : 2014 Textiles — Tests for colour fastness Part B01 Colour fastness to light : daylight	Identical with ISO 105-B01:2014.
ISO 105-B02: 2014, Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test	IS/ISO 105-B02 : 2014 Textiles — Tests for colour fastness Part B02 Colour fastness to artificial light : Xenon arc fading lamp test	Identical with ISO 105-B02:2014.
ISO 4892-1, Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance	IS 17863 (Part 1) : 2022/ ISO 4892-1 : 2016 Plastics — Methods of exposure to laboratory light sources Part 1 General guidance	Identical with ISO 4892-1: 2016.
ISO 9370, Plastics — Instrumental determination of radiant exposure in weathering tests — General guidance and basic test method	IS 17864 : 2022/ ISO 9370 : 2017 Plastics — Instrumental determination of radiant exposure in weathering tests — General guidance and basic test method	Identical With ISO 9370 : 2017.

The technical committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

International/Other Standard	*Title*
ISO 105-B08:1995	Textiles — Tests for colour fastness Part B08: Quality control of blue wool reference materials 1 to 7

In reporting the result of a test or analysis made in accordance with this standard, if the final value; observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*).

Extract of ISO 105-B04:2024 'Textiles — Tests for colour fastness — Part B04: Colour fastness to artificial weathering: Xenon arc fading lamp test'.

Introduction

ISO 105 was previously published in thirteen "parts", each designated by a letter (e.g. "Part A"), with publication dates between 1978 and 1985. Each part contained a series of "sections", each designated by the respective part letter and by a two-digit serial number (e.g. "Section A01"). These sections are now being republished as separate documents, themselves designated "parts" but retaining their earlier alphanumeric designations.

Foreword

This fifth edition cancels and replaces the fourth edition (ISO 105-B04:1994), which has been technically revised.

The main changes are as follows:

i) the Scope has been refined to differentiate this document from ISO 105-B10;

ii) the description of the test apparatus has been harmonized with ISO 105-B10. This takes into account current technology, but does not discredit the test procedure described in this document;

iii) Type I and Type II daylight filters for xenon-arc lamps have been introduced

1 Scope

This document specifies a method intended for determining the effect on the colour of textiles of all kinds, except loose fibres, to the action of weather as determined by exposure to simulated weathering conditions in a test chamber equipped with a xenon arc lamp. This document focuses on textiles (such as apparel) where the main evaluation criterium is the colour fastness.

This method can be used to determine if a textile is sensitive to the combined effect of light and water.

NOTES

1 General information on colour fastness to light is given in Annex A.

2 ISO 105-B10 provides guidance on testing textiles or technical textiles, which are permanently exposed to an outdoor environment and/or require mechanical testing (such as tensile strength determination).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

i) ISO 105-A01, Textiles — Tests for colour fastness — Part A01: General principles of testing

ii) ISO 105-A02, Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour

iii) ISO 105-A05, Textiles — Tests for colour fastness — Part A05: Instrumental assessment of change in colour for determination of grey scale rating

iv) ISO 105-B01, Textiles — Tests for colour fastness — Part B01: Colour fastness to light: Daylight

v) ISO 105-B02: 2014, Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test

vi) ISO 105-B08, Textiles — Tests for colour fastness — Part B08: Quality control of blue wool reference materials 1 to 7

vii) ISO 4892-1, Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance

viii) ISO 9370, Plastics — Instrumental determination of radiant exposure in weathering tests — General guidance and basic test method

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 105-B02 apply.

4 Principle

Test specimens of the textile are exposed under specified conditions to light from a xenon arc lamp and to water spray. At the same time, eight dyed blue wool references are exposed to light but are protected from water spray by a sheet of window glass. The fastness is assessed by comparing the change in colour of the test specimen with that of the references.

If the method is used to determine if a textile is sensitive to the combined effect of light and water (see 7.2), the simultaneous exposure of references is unnecessary. In this case, the assessment shall be performed by comparison with the grey scale in accordance with ISO 105-A02 or by colour measurement in accordance with ISO 105-A05.

ANNEX 4

(Item 5.1)

DRAFT STANDARD FOR APPROVAL FOR WIDE CIRCULATION

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX) XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि – कपड़ो के रेशों की पहचान की विधि

(आईएस 667 का *दूसरा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Methods for Identification of Textile Fibres

(*Second Revision* of IS 667)

ICS: 59.060.01

Chemical Methods of Test
Sectional Committee, TXD 05

last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

The original standard was published in 1955 and revised in 1981. The committee responsible for the preparation of this standard. In its first revision the committee decided that the scope of IS 667 be enlarged to include various synthetic fibres used commercially in India. Microscopic analysis has been included in last revised version as many of the important natural fibres, such as wool, silk, cotton and best fibres are identified with certainty in the longitudinal view. More information is gained from a cross—section which is especially valuable for the differentiation of the man—made fibres. In a few cases purely microscopic test may fail to give differentiation due to morphological similarity. This applies particularly to a group of almost structure less man—made fibres with round cross—section and to some extent also to the striated fibres for identification of all such fibres which do not give definite information by microscopic examination, chemical and staining methods are of great value. A considerable number of chemical reactions and staining tests have been incorporated for practically every specific case of fibre differentiation.

This second revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) References to the Indian standard have been updated.
iii) Apparatus and reagents has been updated.
iv) Solubility Test has been added.
v) List of suppliers is removed.
vi) Eri Silk, Muga Silk and Tussar Silk has been added.
vii) ICS number is incorporated in place of udc number.
viii) Comments has been added in the latest version of the standard.

Microphotographs are being published separately, till that time photographs available in the references given in foreword should be used.

Producers of man-made fibres intentionally modify the appearance of cross-sections in several ways such as by including varied amounts of delusterants which appear as black specks in a photomicrograph, by making filaments of uniform for varied sizes in a same yarn, by producing modified shapes by the use of irregular shaped spinnerated holes or modified processing techniques. As a consequence fibres of one generic type may be found with more than one typical cross-section and this may change from time to time. It should be noted also that generic types are marketed in varieties showing radically different dyeing characteristics but having the same cross-section; conversely, a difference in cross-section does not necessarily imply any distinct difference in dyeing or other important chemical or physical characteristics.

Considerable assistance has been derived from the following publications:

AATCC test method 20-2021 Test Method for Fiber Analysis: Qualitative (revised edition)
AATCC test method 20 A-2021 Test Method for Fiber Analysis: Quantitative (revised edition)
ISO/TR 11827:2012 Textiles Composition testing Identification of fibres

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values’ (*second revision*).

1 SCOPE

1.1 This standard prescribes methods of tests for identification of textile fibres. Some of them which are included in this standard are listed below:

1.1.1 Group 1—Natural Fibres

a) Vegetable Fibres

- 1) Seed Fibres—Cotton, Akund and Kapok
- 2) Bast Fibres:
  - i) Low Lignin Content — Linen or Flax (raw and bleached) — Ramie
  - ii) High Lignin Content — Jute, Mesta, Rosella, True Hemp and Sunn Hemp
- 3) Leaf Fibres — Manila, Hemp and Sisal
- 4) Fruit or Nut Fibres—Coir

b) Animal Fibres (Natural Protein Fibres)

- 1) Wool and Chlorinated
- 2) Silk
  - i) Mulberry silk
  - ii) Tasar or Tussar silk
  - iii) Muga silk
  - iv) Eri or Endi silk

c) Mineral Fibres

- 1) Asbestos

1.1.2 Group 2 — Man-Made Fibres

a) Regenerated Fibres

- 1) Cellulosic — Viscose, Cuprammonium, Cellulose Acetate (secondary and triacetate), Polynosic, High-Wet Modulus Fibres (HWM)
- 2) Protein — Casein, Groundnut Fibre, Zein

b) Synthetic Fibres

1) Polyamides — Nylon 66, Nylon 610, Nylon 6, etc.

2) Polyester — Terylene, Terene, Dacron, etc.

3) Polyvinyl Derivatives

- i) Polyvinyl Chloride — Pe Ce, Rhovyl, etc

    ii) Polyvinyl Chloride Acetate — Vinyon ST, Vinyon HH
    iii) Polyvinyl Chloride — Acrylonitrile — Vinyon N, Dyne1
    iv) Polyvinyl nitrile (Acrylic fibres) — Orlon , Acrilan
    v) Polyvinyl Alcohol — Vinylon, Kuralon
    vi) Polystyrene and Copolymers — Styroflex, Polyfil, etc.
    vii) Polyvinylidene Chloride and Copolymers — Saran, Velon

4) Polyolefins

    i) Polythylene — Polythene
    ii) Polypropylene — Reevon

1.1.3 Group 3—Inorganic Fibres

a) Glass
b) Metal

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 9068 : 2021 ISO 1833-1 : 2020	Textiles — Quantitative Chemical Analysis — General Principles of Testing (*First Revision*)
IS 1070:2023	Reagent Grade Water — Specification (*Fourth Revision*)

3 PREPARATION OF TEST SPECIMEN

3.1 If the sample consists of more than one kind of fibres, separate by dissection the different kinds, teasing them apart by dissecting needles.

3.2 In order to avoid interference with proper identification of fibres, remove the non-fibrous matter by following the procedures recommended in IS 9068.

4 APPARATUS

4.1 The apparatus for microscopic examination shall consist of a compound microscope, dissecting needles, glass slides, cover glasses and a cross sectioning device. The microscope should be equipped to permit examination from 100X to 500X.

5 REAGENTS

5.1 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (see IS: 1070) shall be used where the use of water or distilled water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the experimental results.

5.2 Zinc Chlor-Iodide Solution — Dissolve 20 g of zinc chloride in 10 ml of water. To this solution, add a solution of 2.1 g of potassium iodide and 0.1 g iodine in 5 ml of water. Filter or decant the mixture when settled and add a crystal of iodine before storing the mixture in a dark bottle.

5.3 Phloroglucinol and Hydrochloric Acid Solution — Dissolve 2 g of phloroglucinol in 100 ml of alcohol. When required for use, mix with equal volume of concentrated hydrochloric acid.

5.4 Cuprammonium Hydroxide Solution

5.4.1 *Solution A* — Dissolve 502 g of copper sulphate (analytical quality) in 1000 ml of hot distilled water and cool the solution until crystallization begins. Add 250 g of ice and 450 ml of ammonia of specific gravity 0.880. Make up the volume to 2 700 ml.

5.4.2 *Solution B* — Prepare a solution of 7.5 ml of 76° TW caustic soda solution free from carbonate and 72.5 ml of ammonia of specific gravity, 0.880.

5.4.3 When required for use, mix 150 ml of Solution A and Solution B.

5.5 Alkaline Lead Acetate Solution — Dissolve 2 g of sodium hydroxide in 30 ml of water and add this to a solution of 2 g of lead acetate in 50 ml of water. Boil the mixture until it becomes clear, cool, make up the volume to 100 ml and filter, if necessary.

5.6 Sulphuric Acid — 80 percent *(m/m)*.

5.7 Sodium Hydroxide — (i) 5 percent (*m/m),*
(ii) 15 percent (*m/m)*.

5.8 Nitric Acid — (i) concentrated,
(ii) 5 percent (*m/m)*,
(iii) 25 percent (*m/m)*.

5.8 Hydrochloric Acid — concentrated.

5.10 Acetone

5.11 Phenol — 90 percent *(m/m).*

5.12 *m*—Cresol

5.13 Carbondisulphide

5.14 Tetrahydrofuran

5.15 Dimethylformamide
5.16 Benzene

5.17 Cyclohexanone

5.18 Hydrofluoric Acid

5.19 Calcium Hypochlorite Solution — 3.5 g/l available chlorine.

5.20 Alcohol Solution — 92 percent ethyl alcohol solution *(m/m)*.

5.21 Ammonia Solution

5.22 Methyl Salicylate

5.23 Iodine - Potassium Iodide Solution — prepared by dissolving 20 g iodine in 100 ml of saturated potassium iodide solution (about 150 g of potassium iodide in 100 ml of distilled water).

5.24 Sodium Hypochlorite — 5.25 percent.

5.25 Formic Acid — concentrated.

5.26 Methylene Chloride

5.27 Chlorobenzene

5.28 Toluene

5.29 Glacial Acetic Acid

5.30 Decalin

6 TESTS

6.1 Burning Test — A small tuft of fibres is held by forceps in the frame of a micro—burner for about 10 seconds and is then removed. It is noted whether the tuft burns or not; whether it forms any bead or whether the ash skeleton is retained; the type of smell emitted during burning is also noted. The test is carried out in daylight.

NOTE — The burner should be set up away from draughts as far as possible, but no elaborate screening of the flame is necessary.

6.2 Twist on Drying — One end of a single fibre is held between the fingers and the free end is directed towards the observer. This free end is then moistened and the direction of twist during drying is noted, that is, whether movement is in a clockwise or counter clockwise direction.

6.3 Floatation Test—A small sample of the fibre after degreasing in benzene-methanol mixture (3:2) is placed in the test liquid and pushed below the surface by means of a glass rod. The liquid should be illuminated transversely and viewed against a black background to observe whether the sample floats on the surface or sinks.

6.4 Swett's Test — The sample is degreased and immersed in nascent chlorine water for 30 seconds, washed in water and alcohol, and then exposed to fumes from strong ammonia; the colour developed is noted.

6.5 Microscopic Analysis

6.5.1 *For Longitudinal Examination* — Place a small number of fibres on a glass slide in a suitable mounting medium, cover the fibres with a covering glass. Examine the fibres at a specified magnification under microscope (see Fig).

6.5.2 *For Cross—Section Examination* — Take a tuft of fibres and prepare the specimen with the cross-sectioning device, place it on a glass slide in a suitable mounting medium and cover it with a covering glass. Examine the fibres at a specified magnification under microscope (see Fig).

6.6 Staining Test — Dye a small of fibre with a mixture of dyestuffs (for example, Shirlastain A, Detex, Fibre Stain, etc) for 3 to 5 minutes and wash thoroughly. The colour developed may be viewed carefully or compared with the known dyed samples.

NOTES

1 The sample is immersed in Detex for about 5 minutes at room temperature with occasional stirring. It is then rinsed several times in water at 50°C until the water remains clear.

2 The sample is thoroughly wetted and washed free from wetting agent, if any and then immersed in Shrilastain A at room temperature for one minute. It is then thoroughly washed in cold water.

3 The sample is wetted in alcohol, washed and immersed in Neocarmine W for 3 to 5 minutes at room temperature. It is then thoroughly rinsed in running water, immersed in dilute ammonia and rinsed again.

4 Various staining agents are marketed by various manufacturers. For the colours produced by the staining agents on various fibres the literature given by the manufacturers should be seen. The list given in Annex E is for information and guidance only.

6.7 Solubility Test—

6.7.1 Sample Preparation— Very small quantity of degummed silk sample i.e. in the range of 0.1 to 0.2 grams to be taken for testing. The material should be in the opened form (Unravel fabrics and untwist the yarns to open out the material completely). The quantity of chemical solution to be taken is 200 times the weight of the material, i.e., material to solution ratio is 1:200. Take the required quantity of solution in a beaker and place the silk material in very loose form (all fibres in open form) into it.

a) **1% Calcium chloride solution in 100% Conc. Formic acid—**

Mulberry silk dissolves instantaneously in this solution, whereas Tasar, Muga and Eri silks do not dissolve. After putting the material in the solvent, observe for two mins, if the fibres structure is intact then the fibres are of Tasar, Muga or Eri silk.

b) **5% NaOH solution—**

All four varieties of silk fibres, dissolve in 5% NaOH solution at boil, but the time of dissolution differs, time requires for dissolution provides an idea of the silk type.

Variety of silk	Time Taken (min) for dissolution in 5% NaOH sol. at boil.
Mulberry	2-3
Tasar	8-10
Eri	13-15
Muga	8-10

c) 60% H_2SO_4—

All 4 varieties of silk fibres, dissolve in 60% H_2SO_4 at room temperature, but the time of dissolution differs, time requires for dissolution provides an idea of the silk type.

Variety of silk	Time Taken (min) for dissolution in 5% NaOH sol. at boil.
Mulberry	1-2
Tasar	8-10
Eri	13-15
Muga	> 20

NOTES

1 All four natural silk fibres show a fairly wide variation in typical cross section. No specimen will look exactly as the pictures provided. A sufficient number of fibres should be examined to cover the range of appearance in any specimen.

2 Successful identification of fibres depends upon experience and familiarity with the fibres. The identification is best made by comparison with properly identified fibres used as reference standards.

3 All the tests listed above need to be performed and results should not be based on any one or two tests only.

7 PROCEDURE

7.1 For preliminary identification of fibres, follow the scheme given in **Annex A**. Also examine the sample for staple length to distinguish continuous filament silk and rayon from staple fibres such as viscose staple fibre.

7.2 For confirmation of the indication given by tests as prescribed under **7.1**, follow the scheme prescribed for individual fibre in **ANNEX B, C** or **D.**

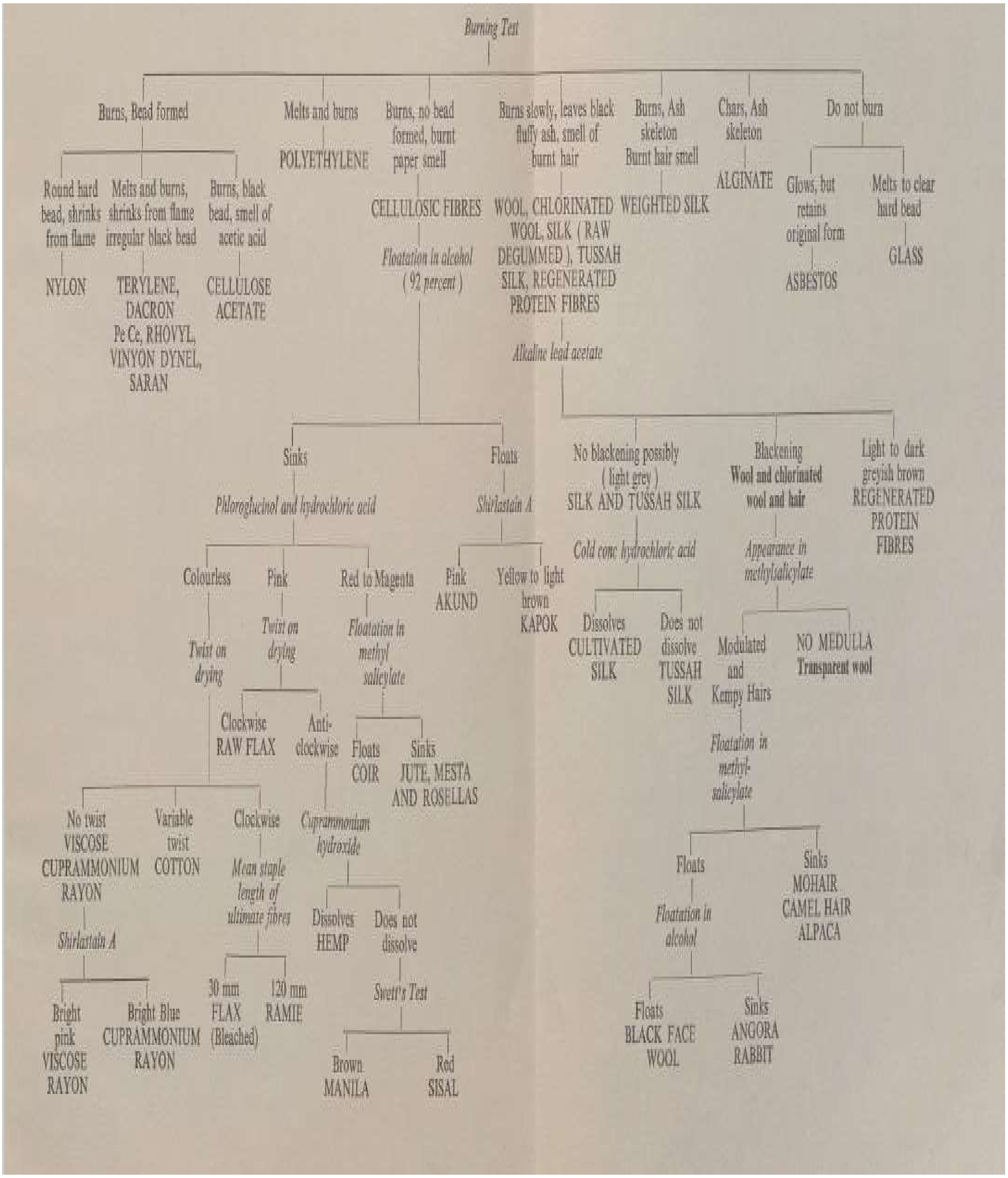
7.3 For ultimate identification of the fibre under test, repeat the relevant tests, side by side, on both, its specimen and on authentic specimen of the fibre indicated by **7.1** and **7.2**.

NOTE—It is necessary that before concluding the final identity of the fibres, the inferences given on various tests should be considered.

ANNEX A

(*Clause* **7.1**)

PRELIMINARY IDENTIFICATION OF FIBRES



ANNEX B

(*Clause* **7.2**)

NATURAL RUBBERS

Sl No. (1)	Fibre (2)	Burning Test (3)	Twist on Drying (4)
B-1	CELLULOSIC FIBRES		
B-1.1	COTTON	Burns with smell of burnt paper, leaves delicate black or greyish ash skeleton	Variable
B-1.2	KAPOK	do	do
B-1.3	AKUND	do	No twist
B-1.4	JUTE	Burns with smell of burnt paper, leaves delicate black ash smouldering to blue colour	Counter clockwise
B-1.5	MESTHA AND ROSELLA	do	do
B-1.6	TRUE HEMP	Burns with smell of burnt paper, leaves delicate white ash skeleton	do
B-1.7	SUNN HEMP	do	do
B-1.8	FLAX	Burns with smell of burnt paper, leaves delicate black or grey ash skeleton (if well bleached — no ash)	Clockwise
B-1.9	RAMIE	do	do

Staning Test

Zinc-Chloriodide (5)	Phloroglucinol Hydrochloric Acid (6)	Alkaline Lead Acetate (7)	Detex (8)	Shirlastain A (9)	Neocarmine W (10)	Texchrome (11)
Raw : reddish violet mercerized or bleached : Deep reddish violet	—	—	Raw : Grey Bleached : Slight greenish grey Bleached and Mercerized : Blue	Pale purple to purple	Raw : Light blue Bleached and/or Mercerized : Deep blue	Very pale blue
yellow	Java : Pink Indian : Reddish	—	Red	Java : Golden yellow Indian : Yellow	Dull yellow	Pale blue
do	Pink	—	—	Pink	—	Yellowish green
Yellow to Yellowish brown	Red to magenta	—	Yellowish red to bordeaux	Golden brown	Olive brown	Pinkish violet
do	Pink	—	—	do	Violet blue with red dots	—
Violet or turbid purple	Light pink to light red	—	Specky red violet	Dark purplish grey	Specky violet	—
Brownish purple	do	—	Reddish blue	Violet blue	Dull deep blue	—
Yellow to brownish purple	do	—	Raw : Reddish blue grey Bleached; dull greenish blue	Brownish purple	Bluish grey	—
Brownish purple	—	—	Reddish violet	Lavender	Blue to bluish violet	—

Microscopical Examination

Longitudinal	Cross-Section

(12)	(13)
Raw & Bleached : Ribbon like with frequent convolutions, sometimes changing direction; distinct but small lumen (immature fibres, very thin cell wall & few convolutions), Mercerized : For greater part cylindrical smooth, ribbon like fibres and fibres regions more or less in frequent (depending on degree of mercerization) lumen very small or disappeared	Raw & Bleached : Kidney bean shaped seldom round or oval: lumen as a line or oval; Mercerized: Most fibres round or oval (depending) on degree of mercerization) very small or no lumen
Cylindrical, smooth and structure less, thin walled containing air bubbles	Thin walled, round, some flattened
Cylindrical, smooth and structure less, very thin wall often with transverse bends but no twist; very broad lumen containing air additional netlike thickening	Round, partly flattened very thin wall
Fibre bundles but no marking	Polygonal with defined angles
do	do
Fibre bundles with cross marking nods, fissures but otherwise smooth	Mainly sharply polygonal with narrow, round or oval lumen, often as a mere line and indistinct
Fibre bundles with cross marking similar to flax	Polygonal but no so sharp as jute, walls lamented
Fibre bundles with cross marking or dislocation marks often in form of a cross	Mainly sharply polygonal with narrow, round or oval lumen, also rounded oblong forms of lumen
Large singly fibre with cross markings and many with longitudinal striations	Large thick walled, flattened tubes often laminated

SOLUBILITY TEST			**MISCELLANEOUS**
Sulphuric Acid 80%	Cuprammonium Hydroxide	Sulphuric Acid 80%	
(14)	(15)	(16)	(17)
Dissolves	Dissolves	Swells	With iodine-potassium iodine solution; 1) Raw-brownish shades, 2) Mercerized-blue to black
Java - Finally Dissolves; India - Does not dissolve	Does not dissolve	-	Iodine - sulphuric acid and glycerine - yellow
Dissolves leaving yellow residue	do	-	
Dissolves partly	Marked swelling without dissolution	-	1) With hot dilute nitric acid becomes brownish yellow; 2) with iodine potassium iodide solution-yellow to brown (1) and (2) Same as jute
do	Mostly dissolves occasionally leaves a small residue	-	
dissolves partly and slowly	Mostly dissolves occasionally leaves a small reside	-	1) With hot dilute nitric acid brownish; 2) with iodine potassium iodide solution-light to dark grey brown
Dissolves almost completely	Dissolves almost completely	-	
do	do	-	1) With hot dilute nitric acid - yellowish; 2) with iodine potassium iodide solution-light to dark grey brown
Dissolves	Dissolves slowly	Swells	

Sl No.	Fibre	Burning Test	Twist on Drying
(1)	(2)	(3)	(4)
B-1.10	MANILA HEMP	Burns with smell of burnt grass, leaves delicate greyish ash skeleton	Counter clockwise
B-1.11	SISAL	Burns with smell of burnt paper, leaves delicate white ash skeleton	do
B-1.12	COIR	Burns with smell of burnt paper, no bead formation or ash skeleton	Clockwise
B-2	PROTEIN FIBRES		—
B-2.1	WOOL	Burns with smell of burnt hair, forms a black bead	—
B-2.2	CHLORINA-TED WOOL	do	—
B-2.3	SILK (RAW)	do	—
B-2.4	SILK (DEGUMMED)	do	—
B-2.5	SILK (WEIGHTED)	Burns with smell of burnt hair, retains shape as ash skeleton	—
B-2.6	TASAR OR TUSSAH SILK	Burns with smell of burnt hair	—

Staning Test

Zinc-Chloriodide	Phloroglucinol Hydrochloric Acid	Alkaline Lead Acetate	Detex	Shirlastain A	Neocarmine W	Texchrome
(5)	(6)	(7)	(8)	(9)	(10)	(11)
Light to deep brown	Reddish brown	—	Pink	Brown	—	—
Light to deep golden yellow	Deep pink	—	Light scarlet	Deep brown	Greenish yellow with blue markings	—
Yellow to brown	Red to magenta	—	—	Brown	Light brown	—
Yellow	—	Light or dark greyish brown	Pink	Cold : Bright yellow Boil : Copper brown	Yellow	Dark yellow
do	—	Blackening	Deep pink	Cold : Golden yellow to orange Boil : Dark brown to black	Dark yellow	—
do	—	No blackening possibly light grey	Dark bordeaux	Dark brown	Dull dark green	Moderate yellow brown
Golden brown	—	do	Deep bright pink to red	Golden brown	Dull golden	—
Yellow	—	No blackening	—	Cold : orange red to bluish red (if the	—	—

				amount of weighting substance is 29 to 57 percent red to bordeaux)		
do	—	No blackening possibly light grey	Brownish red	Chestnut brown	Turbid yellow green	—

Microscopical Examination

Longitudinal	**Cross-Section**
(12)	(13)
Smooth cross marking rare but possible fibre ends pointed or rounded tips	Roundish slightly indented also round to elliptical ultimate fibre — polygonal cell wall medium to thickness cells with thin curved walls
Fibre bundles, thin walled on making with occasional peculiar spiral vessel	Polygonal in outline with round edges
Smooth, fibre ends blunt or rounded	Round, mostly with cavity, ultimate fibre polygonal to round also oblong
Fairly cylindrical cutical of overlapping scales	Round, also oval or eliptical, sometimes modullated
Similar to wool but scales not so obvious	do
Continuous double thread with irregular masses adhering	Mostly triangular with rounded corner
Structure less filament	do
Structure less filament, usually continuous	Majority triangular with rounded corner
Ribbon like occasionally, twisted, frequently fine but distinct internal longitudinal striations	Mostly very long triangular with rounded corners (wedge-shaped)

SOLUBILITY TEST			**MISCELLANEOUS**
Sulphuric Acid 80%	Cuprammonium Hydroxide	Sulphuric Acid 80%	
(14)	(15)	(16)	(17)
-	-	-	The oil free fibres are boiled with nitric acid (5 percent) for two minutes and treated with calcium hypochlorite (3.5 g available chlorine/1) manila fibre — deep orange, sisal fibres-lemon yellow

Does not dissolve	Does not dissolve	-	do
do	do	-	-
do	Does not dissolve(Stain blue)	Dissolves in 1 minute	Sodium hypochlorite (5.25 percent)- dissolves
do	Dissolve partially (stain blue)	do	
Disintegrates and dissolves	Partly dissolves (slowly) stain yellow	Dissolves in 2 minutes	1) Nitric acid(cone) — disintegrates and dissolves 2) Nitric acid (dil) - at 70°C, the fibre stains yellow, 3) Hydrochloric acid (cone) - dissolves
Dissolves	dissolves slowly	do	Sodium hypochlorite (5.25 percent) — dissolves
Does not dissolve	Stain yellow	Dissolves Slowly	-
Dissolves slowly	Dissolves slowly	Dissolves slowly to pulp	-

ANNEX C
(*Clause* **7.2**)

MAN-MADE FIBRES

Sl No.	Fibre	Burning Test
(1)	(2)	(3)
C-1	REGERATED FIBRES	
C-1.1	Viscose rayon	Burns with smeil of burnt papers, leaves fine grey or black ash
C-1.2	Cup ammonium rayon	do
C-1.3	Cellulose acetate rayon	Melts and burns with smell of acetic acid, forms black irregular bead
C-1.4	Protein fibres (casein, Ardil Zein, etc)	Burns slowly, leave black fluffy ash, smell like burning hair or feathers
C-2	SYNTHETIC FIBRES	
C-2.1	Polyamides (Nylon 6, Nylon 6.6 Nylon 11 etc0	Melts and shrinks from flame, gives round hard bead
C-2.2	Polyesters (Terylene,Darcon kodel, etc)	Melts and burns, shrinks from flame, black hard irregular bead
C-2.3	Polyacrilonitrile (Acrilan, Cresian Orlon, Zefran etc)	Melts and burns black round bead

Staining Test

Zinc-Chlor-iodide	Alkaline Lead Acetate	Detex	Shirlastain	Neocarmine W	Texchrome
(4)	(5)	(6)	(7)	(8)	(9)
Red to violet	—	Bluish to red violet	Bright pink lavender	Red violet	Very pale blue
do	—	Deep Blue	Bright blue	Deep blue	—
yellow (dissolves)	—	Yellow	Secondary-bright greenish yellow, Tri-slightly yellow	Greenish yellow	Yellow green
Yellowish to yellow	Light or dark greyish brown	Casein Zein red, purplish red	Yellow to orange	Casein, Zein-yellow greenish yellow	Zein Strong yellowish green
Yellowish to brown	—	White ivory salmon (cream)	Cold- golden yellow, Hot - Orange brown	Nylon 6, Nylon 66 Yellow Nylon 11-pale greenish yellow	Nylon 6: Copper brown(hot) Nylon 66; Light yellow green
Faintly yellowish	—	—	Cold : pale purple, Hot : pale fawn	Faintly soiled	very pale blue
Yellow to orange, swellls	—	Light pink	Acrilan:Cold-pink Boli-khaki Creslan:Cold-faint yellow Boil orange brown Orion: Cold-Pink (hardly detectable) boil-Pale dull yellow	Faintly soiled yellowish green	Acrilan:pale green Cresian:dark greenish blue Orion:pale yellow green Zefran:greyish blue

Microscopical Examination	Cuprammonium Hydroxide at Room Temperature for 30 Minutes

Longitudinal	Cross-Section	
(10)	(11)	(12)
Striated	Highly servated (nearly round for polynosic)	Dissolves
Featureless	Round occasionally oval	do
do	three lobes occasionally 2 and 1 lobes	Does not dissolve
Faint Striations	Round with pittings	Stains blue slightly lateral swelling does not dissolve
Featureless	Round (circular0 occasionally with triangular/or 3 lobes	Does not dissolve
Smooth	do	do
Featureless : Striations in case of Acrilan and Orlon	Round dogbone(Orlon)	do

Solubility Test				**Other Miscellaneous Tests**
80% H_2SO_4 (m/m) at room Temperature for 15 minutes	HNO_3 (cone) at Room Temperature for 15 minutes	Acetone at Room Temperature for 20 minutes	90 Percent Phenol or *m*-Cresol at Room Temperature	
(13)	(14)	(15)	(16)	(17)
Dissolves	Does not dissolve (unstained)	Does not dissolve	Does not dissolve	Con HCI — soluble Formic acid 85% (boil) — soluble
do	do	Does not dissolve	do	—
Dissolves (Yellow colouration)	Dissolves	Secondary-dissolves Tri-insoluble in 80 and 100% acetone	Swells, dissolves slowly(secondary acetate)	Methylene chloride(cold)-Tri-soluble Secondary-insoluble
Insoluble, con H_2SO_4-diamonds appear along the longitudinal axis of fibre within 1 minute, phenomenon transient	Swells, slightly stained yellow	—	—	5% NaOH — Ardil-insoluble Casein fibre very largely soluble
Dissolves	Dissolves(Rilosan gets fused)	Does not dissolve	Dissolves	Dimethylformamide (boil) Nylon 6 — soluble nylon 6.6 — insoluble Formic acid 85° (cold) Nylon 11 — insoluble

Con H_2SO_4-dissolves	—	—	Dissolves at boil	Dimethylformamide (boil) soluble
Con H_2SO_4 Zofran dissolves to form orange coloured solution	Dissolves	Does not dissolve	Does not dissolve	Dimethylformamide Acrilan — dissolves slowly at 27°C, Cresian — Dissolves at 27°C, Orion and Zefran dissolve at boil

Sl No.	Fibre	Burning Test
(1)	(2)	(3)
C-2.4	Polyvinyl Chloride (Rhovyl, Dynel peCe, Vinyon, etc)	Melts and burns (self-extinguishing forms irregular black bead)
C-2.5	Polyvinylidene Chloride (Saran, Rovana Velon, etc)	Melts and burns (self-extinguishing) from flame, forms irregular black bead
C-2.6	Polyvinyl alcohol (Vinyl on, Kura Lon, etc)	Melts and burns with sweet smell
C-2.7	Polytetrafluoro-ethylene (Teflon)	fibre is carbonized and confused by hot Bunsen flame
C-2.8	Polyvinylidene dinitrile (Darvan, Darlan, etc)	Melts and burns readily with sweet smell
C-2.9	Polystyrene (Styroflex, Polyfil, Shalon, Durabass, etc)	Melts and burns with production of great deal of soot
C-2.10	Polyolefin a) Polyethylene (Polythene Couriene, etc)	Melts and burns with a smell of paraffin deal of soot
	b) Polypropylene (Reevon,etc)	Melts ignites with difficulty

Staining Test

Zinc-Chlor-iodide	Alkaline Lead Acetate	Detex	Shirlastain	Neocarmine W	Texchrome
(4)	(5)	(6)	(7)	(8)	(9)

Dynel — Yellowish to brown, PeCe — yellowish	—	Rhovyl — light pink to lavender	Rhovyl (Cold) — unstained (hot) — faint yellow, Vinyon Dynet — Unstained	Vinyon pale yellow PeCe — faintly soiled grey	Rhovyl very light blue Dynel — pule green
—	—	—	—	—	—
—	—	—	—	—	Kuralon—violet
—	—	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—
—	—	—	—	—	—

Microscopical Examination		**Cuprammonium Hydroxide at Room Temperature for 30 Minutes**
Longitudinal	Cross-Section	
(10)	(11)	(12)
Rhovyl—featureless vinyon — usually fine tube, lumen may be seen PeCe—one or two longitudinal line Dynel — isolated longitudinal line	Rhovyl : strongly indented, Vinyon — dumbbell shape, PeCe — dumbbell shape, Dynel — sometimes T,V,Y—shaped	Does not dissolve
Featureless	Round to oval smooth edge	—
vinylon:most fibres dark except thin skin; some with apparent lumen	Dog-bone, bent to various shapes edge smooth thick dark core	Does not dissolve
Featureless	Round	do
do	Lima bean to irregular	do
—	—	—
Rod like smooth surface	Flat to round or oval	do
do	—	—

Solubility Test				**Other Miscellaneous Tests**
80% H_2SO_4 (m/m) at room Temperature for 15 minutes	HNO_3 (cone) at Room Temperature for 15 minutes	Acetone at Room Temperature for 20 minutes	90 Percent Phenol or *m*-Cresol at Room Temperature	
(13)	(14)	(15)	(16)	(17)
Does not dissolve	Does not dissolve	Dynel — swelts and dissolve	Dynel — dissolve and	Chlorobenzene (boil) Rhovyl

		Rhovyl — dissolves, Vinyon — dissolves on boiling	dissolve, Rhovyl — dissolves on boiling, Vinyon — dissolves on boiling	dissolve, Dimethylformamide (cold) Rhovyl — dissolves, Toluene (Cold) PeCe — dissolves Cyclohexanone (cold) Dynel — dissolves
—	—	—	—	Chlorobenzene (boil) — dissolve
Does not dissolve	Dissolve	Does not dissolve	Does not dissolve	Fomeic Acid 85% (cold) dissolves glacial acetic acid (boil) — does not dissolve
do	Does not dissolve	do	do	Cyclohexanone (boil) 5 minutes — dissolves
do	Partially dissolves	do	do	Dimethylformamide (27°C) 5 minutes — dissolves
—	—	—	—	40% NaOH (boil) dissolves Benzene (boil) 5 minutes dissolves
do	Does not dissolve	—	do	Cyclohexanone (boil) 15 to 20 minutes — dissolves polypropylene dissolves rapidly decalin (boil) 15 to 20 minutes — dissolves (melts at temp of 120° C or less) Decalin (boil) 5 minutes — Dissolves (Melts at temp near 150°C)
—	—	—	—	—

ANNEX D

(Clause **7.2***)*

MINERAL AND GLASS FIBRES

Sl No.	FIBRE	BURNING TEST	MICROSCOPICAL EXAMINATION		OTHER TESTS
			Longitudinal	Cross-Section	
(1)	(2)	(3)	(4)	(5)	(6)
D-1	Asbestos	glows, does not burn	Very—fine fibre-like crystal, of varying diameter (easily separated), fairly regular over fibre length	—	—
D-2	Glass	do	Cylindrical strucreless, transparent, very regular over length; normally very fine (0.5 micron or less)	Circular edge smoth	Hydrofluoric acid - dissolves

ANNEX 5

(Item 4.2)

DRAFT STANDARD FOR APPROVAL FOR WIDE CIRCULATION

COMMENTS ON IS 667:1981 METHOD FOR IDENTIFICATION OF TEXTILE FIBRES

a) **Smt. Mahalakshmi R, SGS, Chennai**

Since IS 667 is going for the revision to include the some of the protein fibers as discussed during the meeting. ISO/TR 11827 can be added end to end along with the new modification in IS 667.

S. No	IS 667	ISO/TR 11827 : 2012
1.	Scope of fibers- Limited	Scope of fibers- synthetic : added the current/ latest fibers /bicomponent fibers and carbon fibers in use are mentioned Polylactide.Elastane,Elastodiene,Elastolefin,Melamine,Polycarbamide,Trivinyl, Elastomultiester, Polypropylene, Polyamide bicomponent, Other fibres
2.	Identification Techniques : Microscopic, Burning, solubility, coloration	Additional identification techniques are used. • Solubility • Light absorption or transmission by IR • Burning behaviour • Thermal behaviour • Colouration • Optical behaviour • Elemental composition
	Apparatus used. Microscope	Additional and advance techniques are mentioned Light Microscope, using transmitted light Scanning Electron Microscope Bunsen Burner or other flame source Infrared Spectrometer Attenuated Total Reflection (ATR) spectroscopy device Fourier Transform Infrared (FT-IR) spectrometer Melting Point device (heated block) Differential Scanning Calorimeter (DSC) Thermal Gravimetric Analysis (TGA) device (thermobalance)

		Gravimetric device (density gradient column) Energy Dispersive X-ray (EDX) device Procedure to use the above with the eg images are provided
	Images: few are provided	Additional fibers images with clarity and colour images are available

b) **Smt. Leena Mhatre, SASMIRA, Mumbai**

After comparing IS667 & ISO 11827 following suggestions are given:
1) IS 667 does not give identification of fibres like regenerated cellulose- Modal ,lyocell
Protein fibre the microscopic slides of animal fibres mohair, alpaca, angora should be included
Synthetic fibres like aramid, elastane (lycra), bastodiene, alginate
Inorganic fibres like carbon , ceramics
These should be included & the LS & CS latest photos can be added
ISO 11827 does not have identification for cellulosic fibres mesta, sunn, manila different types of silk, Poly vinyl derivatives, polystyrene which should be retained in IS 667
2) Methods such as twisting test, floation test, sweets test are not used in labs & may be excluded.
3) Additional methods of melting point, DSC, Infra red spectroscopy, density can be included in IS 667 which are given in ISO 11827
4) The values of melting point, density & the standard spectras of fibres can be included in IS 667.
5) Refractive index given in ISO 11827 need not be included in the revised IS 667
Conclusion: IS 667 may be revised instead of adopting ISO 11827
Regards

c) **Smt. Meeta Shingala, Testtex India Laboratories Pvt. Ltd., Mumbai**

Find below comments for Identification of Textile fibres.

A new IS test method need to be made (Written) using complete method as per ISO/TR 11827:2012 (E) with addition of our IS 667 method clause 5. , 6. , and Appendix A Preliminary Identification of fibers (As this is not included in ISO test method) along with addition of Identification of different varieties of silk received from B.T.M . From IS 667 clause 5. clause 5.2(Twist on drying), 5.3 (Floatation test) 5.4 Swett's test can be included. , clause 5.1 Burning test and 5.5 Microscopic analysis can be either taken from ISO/TR 11827:2012 (E) or IS 667 , so the same will not be repeated in new method.

This new method will have then maximum information and guidelines for different techniques and more numbers of fibers and blends

d) **Smt. Saroj Vairagi, Bombay Textile Research Association, Mumbai**

IS 667

We can adopt the method ISO 11827, but IS 667 is also necessary for some specifications.

IS 12135

Clause 4.2 Instead of Desiccator **with Blue Gel Filling**, only Desiccator.

According to me any other changes are not required.

This method is simple and useful.

IS 12170

We use this method regularly for some IS specifications of suiting and shirting.

According to me any changes are not required.

We use following test methods regularly and my suggestion is that we can adopt them as it is:

IS 199

IS 244

IS 392

IS 665

IS 2977

IS 1889 part IV

IS 4419

IS 7941

We do not use the following methods:

IS 200

IS 7940

IS 1889 Part II Cadoxen solvent is not a common solvent, which should be used in this method.

IS 1889 Part III Not using this method, because repeatability of the method is not very good as we get it good by IS 1889 Part IV.

IS 1299 There should be clarity for soap solution concentration. 5gpl on dry wt. basis generates lot of foam and it comes out of the machine while running.

Annex 10

We use following test methods regularly and my suggestion is that we can adopt them as it is:

IS 2969

IS 2977

We do not use the other methods of Annex 10.

ANNEX 6

(Item 5.2)

DRAFT STANDARD FOR APPROVAL FOR WIDE CIRCULATION

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024

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***भारतीय मानक* मसौदा**

वस्त्रादि – धूधर और तैयार सूती वस्त्रादि सामग्रियों में नमी, कुल माडी अथवा फिनिश, राख और वसीय पदार्थ का मूल्यांकन

(आई एस 199 का *चौथा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Estimation of Moisture, Total Size or Finish, Ash and Fatty Matter in Grey and Finished Cotton Textile Materials

(*Fourth Revision* of IS 199)

ICS:

Chemical Methods of Test
Sectional Committee, TXD 05

last date for receipt of comments is
XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard, first published in 1956, was revised in 1957, 1973 and 1989. In third revision, the Procedure for estimation of starch, fatty matter and ash has been modified.

This fourth revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) Apparatus and reagents has been updated.
iii) ICS number is incorporated in place of udc number.

The size used for spun textile yarns may consist of an adhesive, a lubricant, an antiseptic, or hygroscopic and weighting materials. The adhesive is generally starch or soluble starch, but certain other carbohydrates, for example, locust-bean gum, may be used alone or in mixtures with starch. The filling applied to fabric in finishing may contain starch or dextrins with or without lubricant, and sometimes substantial proportion of weighting materials, such as, china clay. The procedure described for estimation of starch is for use where test specimens of about 2 g are available; weighting materials, if present, are mainly removed along with the starch; the residual filling may be determined by ashing the desized specimen and, provided that the amount of residual mineral matter is small, changes in its mass produced during ashing may be neglected. Unsized grey cotton loose mass in desizing process and a correction factor for the loss, has to be applied to the mass of the residual. The correction can be determined if a specimen of the corresponding unsized yarn is available. In the absence of such a specimen, the values for the correction factor are assumed.

The oils, fats and waxes present in cotton may be derived either from the cotton itself, or from sizing and finishing compositions added during manufacture. With some exceptions, these materials are removed by extraction with suitable solvent. Dichloromethane (methylene chloride) has been found as suitable solvent for grey, scoured and bleached cotton if the extraction time does not exceed six hours, but it is unsuitable for dyed or printed materials containing vat or azoic dyes or colourants for which the use of light petroleum (boiling range 40 to 60°C) is recommended. The amount of natural fat or wax extracted from cotton materials by light petroleum is smaller than that extracted by dichloromethane. The method prescribed does not purport to remove natural fats and waxes completely. It gives a result that may be low by about 0.2 g per 100 g of cotton or raw cotton, and low by less than this amount on partly purified cotton but which is nevertheless, reproducible and serves to characterize the cotton sufficiently for practical purposes.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes methods for estimation of (a) moisture, (b) total size or finish, (c) ash and (d) fatty matter in grey and finished cotton textile materials.

1.2 The method prescribed for estimation of starch is not applicable in cases where the starch has been insolubilized as in formaldehyde-containing finishes and is not intended for use in determining small amounts of residual starch and fatty materials. The method prescribed for determination of fatty matter is not applicable to textile materials containing oxidized unsaturated oils, waterproofing or softening preparations derived from cetylpyridinium halides. Rot-proofing agents, synthetic resins and other substances that would interfere.

2 SAMPLING

2.1 Samples from the lot for testing shall be selected so as to be representative of the lot.

2.2 Samples drawn in accordance with the procedure laid down in the material specification or as agreed to between the buyer and the seller shall be held to be representative of the lot.

3 QUALITY OF REAGENTS

Unless specified otherwise, pure chemicals shall be employed in the tests and distilled water shall be used where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

4 ESTIMATION OF MOISTURE

4.1 Apparatus

4.1.1 *Drying Oven*, capable of maintaining a temperature of 105°C ± 3°C

4.1.2 *Weighing Balance*

4.2 Procedure

From the sample under test (*see* **2)** draw at least 2 test specimens each weighing approximately 3 g.

4.2.1 Take one test specimen drawn as in **4.2** and weigh it accurately in a clean and dry tared weighing bottle. Place the weighing bottle containing the test specimen in the drying oven and dry the specimen at 105 ± 3°C to constant mass (*see* Note) and determine the oven-dry mass of the test specimen.

NOTE —The mass may usually be regarded as constant if the loss between two successive weighing, taken at an interval of 20 minutes, does not exceed by 0.1 percent of the first of the two values.

4.2.2 Similarly test the other test specimen(s).

4.3 Calculations

Calculate the percentage of moisture content in the test specimen by the following formula:

Moisture content, percent = $\frac{(a-b)}{a} \times 100$

Where,

a = original mass in g of the test specimen, and

b = oven-dry mass in g of the test specimen.

4.3.1 Determine the mean of all values, obtained in **4.3** and express it as moisture content of the material in the lot.

4.3.2 Corrected invoice mass of cotton textile materials may be calculated by the following formula:

$$L_1 = \frac{L\,(b \times 1.085)}{a}$$

where

L_1 = corrected invoice mass in g of the lot,

L= original mass in g of the lot,

h = oven-dry mass in g of the test specimen, and

a = original mass in g of the test specimen.

5 ESTIMATION OF TOTAL SIZE OR FINISH

5.1 Apparatus

5.1.1 *Soxhlet Extractor*

5.1.2 *Drying Oven*, capable of maintaining a temperature of 105°C ± 3°C.

5.1.3 *Sintered Disc Filter Crucibles*, of at least 60 ml capacity, fitted with ground glass stopper or other suitable cover.

5.1.4 *Suitable Ignition Crucibles and Covers*.

5.1.5 *Muffle Furnace*, or other equipment for heating crucibles to a temperature of about 750°C.

5.1.6 *Scissors*

5.1.7 *Weighing Balance*

5.1.8 *Stopwatch*

5.1.9 *Graduated Cylinder*

5.1.10 *Buchner Flask*

5.2 Reagents

5.2.1 *Dichloromethane* (*Methylene Chloride*), redistilled.

5.2.2 *Diastase or other Suitable Desizing Enzyme*

5.2.3 *Sodium Chloride*

5.2.4 *Soap-Soda Solution*

It shall contain 20 g of soap and 10 g of anhydrous sodium carbonate per litre. The soap shall contain not more than 5 percent moisture and shall comply with the following composition on dry mass basis:

Free alkali (as Na_2Co_3), *Max*	0.3 percent
Free alkali (as NaOH), *Max*	0.1 percent
Combined fatty acids (as sodium salt), *Min*	85 percent
Titre of mixed fatty acids pre-pared from the soap, *Max*	30°C
Iodine value of fatty acids, *Max*	50

5.3 Procedure

From the sample under test (see **2)**, draw at least 2 test specimens each weighing approximately 2 g.

5.3.1 If the sample under test is yarn, cut each test specimen, into pieces of 15 cm long, form into separate bundles and tie each bundle loosely round the middle.

5.3.2 If the sample under test is fabric, trim each test specimen parallel to the directions of wrap and weft and pull out 5 threads all round to form a fringe.

5.3.3 Determine the moisture content of the sample by the method prescribed in **4**, using separate test specimens. Weigh accurately one test specimen in a tared crucible drawn as in **5.3** and calculate its oven-dry mass. Place the crucible with specimen in a Soxhlet apparatus, with its rim above the level of the siphon and extract it in a Soxhlet extractor for one hour with dichloromethane adjusting the rate of boiling to at least six hot extractions per hour.

5.3.4 Remove the crucible from the extractor and allow the solvent to evaporate. Attach the crucible to a Buchner flask and wash the extracted specimen by drawing about 100 ml of water through it. Drain and remove the crucible and transfer the contents to a flask of 150 ml capacity.

5.3.5 Treat the extracted specimen in the manner prescribed in **5.3.5.1**, **5.3.5.2** or **5.3.5.3** depending on the type of the ingredients used in the size or finish.

5.3.5.1 In case it is known that the material is sized or finished with a mixing containing starch but not tamarind kernel powder, add to the flask 50 ml of bacterial diastase solution containing 5 g/l of active diastase, 10 g/l sodium chloride and 0'1 percent (m*/m*) of a non-ionic wetting agent at 70°C and at a *p*H of 6.5 to 7.5 (see Note). Maintain this temperature for 30 min and shake the contents of the flask by any convenient means continuously or at intervals of 5 min during this time. Decant the solution through the filter crucible, add a fresh portion of bacterial diastase solution at 70°C and at a *p*H of 6.5 to 7.5 to the flask and repeat the desizing treatment. Take precaution to ensure that the temperature in any part of the solution does not exceed 70°C or the limiting temperature specified by the manufacturer of enzyme. After decanting the second portion of the solution, add water to the flask and boil for 5 min. Finally transfer the desized material to the crucible, drain and wash with three successive 100 ml portions of hot water while stirring the contents with a glass rod, and drain with suction after each wash. If the washings are opalescent with mineral filling, continue washing until they are clear.

NOTE — The temperature and pH given for the desizing solution are the optimum for bacterial diastase. If any other type of desizing enzyme is used, then the temperature and pH should be modified to that recommended by the supplier. As many enzymatic desizing agents slowly deteriorate in storage, care should be taken to see that the sample of desizing agent, at the time of test, has still satisfactory desizing efficiency.

5.3.5.2 In case it is known that the material is sized or finished with a mixing containing tamarind kernel powder but not starch, boil the specimen in the soap-soda solution (weighing 20 time the mass of the specimen) for 45 minutes. Wash it thoroughly first in hot water and then in cold water.

5.3.5.3 In case it is known that the material is sized or finished with a mixing containing both starch and tamarind kernel powder or in case the ingredients used in the size or finish are not known desize the specimen as prescribed in **5.3.5.1** and treat it further as prescribed in **5.3.5.2**.

5.3.6 Dry the specimen treated as above (see **5.3.3** to **5.3.5**) in the drying-oven at 105 ±3°C to Constant mass *(*see Note under **4.2.1**) accurately.

5.3.7 *Residual Mineral Filling*

If the sample originally contained a substantial amount of insoluble mineral filling, for example, china clay, transfer the desized specimen to an ignition crucible, previously ignited with its lid at 750°C (*see* Note **3** under **6.2.1**), cooled and its mass determined. Place the open crucible at the front of the muffle furnace and burn off the fibre while manipulating the crucible lid to prevent the fibre from inflaming. Move the crucible to the interior of the furnace, replace 'the lid, and continue the combustion at 750°C until no carbonaceous residue remains. Cool and determine the mass of the crucible and its content and calculate the mass of ash. Correct the mass of the desized specimen by subtracting the mass of the ash.

5.3.8 Similarly repeat the test with other test specimens.

5.4 Calculations

Calculate the percentage of total dry size or finish expressed on the oven-dry mass of the unsized material by the following formula:

$$X = \frac{a - kb}{kb} \times 100$$

Where,

X = total size or finish, percent by mass;

a = oven-dry mass (calculated) in g of the test specimen containing the size or finish;

$K = \frac{c}{d}$, that is, the correction factor determined experimentally (on unsized or blanks) for adjusting the value of b, due to loss of natural constituents sustained by the test specimen during treatment as prescribed in **5.3.3** and **5.3.4**;

b = oven-dry mass in g of the test specimen determined as in **5.3.6** or **5.3.7**, if necessary;

c = oven-dry mass in g of unsized or unfinished blanks; and

d = oven-dry mass in g of blank after treatment as prescribed in **5.3.3** to **5.3.7**.

NOTE — Normally *k* cannot be determined experimentally as a comparable unsized or unfinished control blank is usually not available, particularly so in the case of fabric. In the absence of a control blank, *k* shall be taken as equal to 1.05 in the case of grey yarn and fabric; and equal to 1.00 in the case of scoured bleached, dyed, mercerized and printed material. The prescribed values of k for unsized grey cotton material may vary from actual value, particularly if Indian cottons are involved. Therefore, some slight inaccuracy may be expected when the prescribed values are used.

5.4.1 Determine the mean of all values as obtained in **5.4**.

5.4.2 Total size or finish of cotton textile material expressed as a percentage of:

a) original mass of the material,
b) conditioned mass of the material, and
c) corrected invoice mass of the material, may be calculated by the following formula:

$$X_1 = \frac{a-kb}{a_1} \times 100$$

$$X_2 = \frac{a-kb}{a_2} \times 100$$

$$X_3 = \frac{a-kb}{kb \times 1.085} \times 100$$

Where,

X_1 = total size or finish as a percentage by mass of the original mass of the material,

X_2 = total size or finish as a percentage by mass of the conditioned mass of the material,

X_3 = total size or finish as a percentage by mass of the corrected invoice mass of the material,

a = oven-dry mass (calculated) of the test specimen containing the size or finish,

k = correction factor for b (see **5.4**),

b = oven-dry mass of the test specimen determined as in **5.3.5**,

a_1 = original mass in g of the test specimen, and

a_2 = conditioned mass in g of the test specimen.

6 ESTEMATION OF ASH

6.1 Apparatus

6.1.1 *Silica and Porcelain Crucible*, of about 40 ml capacity.

6.1.2 *Muffle Furnace*, capable of being heated to 750°C.

6.1.3 *Drying Oven*, controlled at 105°C ± 3°C.

6.1.4 *Weighing Bottle*, of suitable size and shape to contain the crucible.

6.1.5 *Desiccator* (Vacuum *Type*), containing anhydrous calcium chloride.

6.1.6 *Pastille Press*, one, suitable for making pastilles of 15 mm diameter.

6.2 Procedure

6.2.1 Compress a suitable mass of the material (*see* Note 1) into pellets from 0.5 to 1.0 g each and heat in an open, tared, weighing bottle at 105 ± 3°C overnight (*see* Note 2). Place the stopper in the bottle and after cooling in a desiccator, determine the mass of the bottle and its contents. Transfer the pellets to the crucible which has previously been ignited, cooled in desiccator and its mass accurately determined in the weighing bottle. Burn the pellets cautiously at the front of the open furnace, taking care to avoid draughts and when the material has reached the glowing stage, move the crucible towards the rear of the furnace, close the front door, and complete ashing at about 750°C (*see* Note 3). Transfer the dish after it has been allowed to cool in the desiccator, to the weighing bottle and finally determine its mass (*see* Note 3).

NOTES

1 The mass of material used is governed by the anticipated ash, for example, for grey cottons a 5 g specimen is generally used; for a well-scoured or bleached cotton material, a 10 g specimen is needed to give an amount of ash that can be determined with reasonable accuracy.

2 For many purposes, the initial drying of the specimen may be neglected and an average figure assumed for the moisture content of the fibre.

3 Certain metals can be lost under these conditions of heating. Mercury is lest readily and zinc is lost above 450°C. Temperatures in excess of general ashing temperature may occur locally in large specimens and the general ashing temperature in such cases may have to be considerably reduced to avoid loss of certain metals Leas is also lost under the specified conditions of heating unless sulphate ion is present.

4 Considerable loss in ash may occur due to draught. It is particularly necessary to exercise caution in opening the desiccator in which the ash has been cooled since a partial vacuum is created during cooling. The safest procedure to press a piece of filter paper against the outlet whilst cautiously opening the tap.

5 Silica and porcelain crucibles become etched during heating and cooling cycles over a prolonged period and it is recommended that crucibles should be renewed fairly frequently.

6.2.2 Similarly repeat the test with at least one more test specimen.

6.3 Calculation

calculate the percentage of ash by the following formula:

Ash content, percent = $\frac{a}{b} \times 100$

Where,

a = mass in g of the residue (ash), and

b = oven-dry mass (calculated) in g of the test specimen.

6.3.1 Determine the mean of all values as obtained in **6.3**.

7 ESTIMATION OF FATTY MATTER

7.1 Apparatus

7.1.1 *Soxhlet Extractors*, of capacity 200 to 250 ml.

7.1.2 *Flat-Bottomed Extraction Flasks*, of capacity 250 to 300 ml.

7.1.3 *Double-Surface Reflux Condensers*

7.1.4 *Suitable Solvent Removal Apparatus*, all glass wire shall be fitted with interchangeable ground glass joints.

7.1.5 *Drying Oven*, controlled at 105°C ± 3°C.

7.1.6 *Thimbles*, previously extracted with the solvent

7.2 Regents

7.2.1 *Dichloromethane* (Methylene *Chloride*), redistilled.

7.2.2 Light Petroleum, redistilled, boiling range 40 to 60°C.

7.3 Procedure

7.3.1 From the sample under test, draw at least two test specimens each weighing about 5 g.

7.3.2 Take one test specimen drawn as in **7.3.1** and weigh it accurately in a clean dry, tared weighing bottle. Place the weighing bottle containing the test specimen in the drying-oven maintained at 105°C ± 3°C and dry the specimen to constant mass (see Note under **4.2.1**) and note the mass to an accuracy of 0.05g.

7.3.3 If the material contains size or finish based on starch in which oil, fat or wax has been incorporated treat the specimen in 0.4 N hydrochloric acid for 30 minutes under reflux at the boil, rinse thoroughly in water and dry at a temperature not exceeding 55°C. Place the specimen in a thimble in a Soxhlet extractor. Dry an extraction-flask at 95°C to 100°C, cool in a desiccator and determine its mass. Assemble the apparatus and pour the solvent (see Note) slowly through the condenser until the siphon operates. Add a further 10 to 20 ml of solvent. Heat the flask on a water-bath or electric hot plate so that the solvent siphons at least six times per hour for three hours, keeping the volume of solvent fairly constant by adding enough of it to make up for any loss due to evaporation.

NOTE — The choice of solvent should be as agreed to between the buyer and the seller.

7.3.4 Disconnect the apparatus and remove the bulk of the solvent by means of the removal apparatus. Evaporate the extract carefully to dryness in the flask on a steam bath, removing the last traces of solvent by means of a jet of clean air. Further dry the contents in the drying oven at 105 ± 3°C to constant mass (*see* Note under **4.2.1**), cool in a desiccator and determine the mass of the specimen to an accuracy of 0.05 g.

7.3.5 Similarly repeat the test with the remaining test specimen(s).

7.4 Calculation

Calculate the percentage of fatty matter by the following formula:

Fatty matter, percent, on dry basis $= \frac{b}{a} \times 100$

Where,

b = mass in g of the extract (see **7.3.4**),

a = oven-dry mass in g of the test specimen (see **7.3.2**)

7.4.1 Determine the mean of all values as obtained in **7.4**.

8 REPORT

8.1 The report shall include the following information:

a) Average moisture content, percent;
b) Average size or finish, percent.
c) Average ash content, percent;
d) Average fatty matter, percent; and
e) Solvent used in the extraction of fatty matter.

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि — सूती वस्त्रादि सामग्रीयों का कॉपर नम्बर ज्ञात करना

(आई एस 200 का *तीसरा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Determination of Copper Number of Cotton Textile Materials

(*Third Revision* of IS 200)

ICS:

Chemical Methods of Test Sectional Committee, TXD 05 — last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1950 and revised in 1969 and 1989. It has been revised to incorporate modifications in the apparatus, preparation of test specimens and reagents and procedure on the basis of experience gained during its use. For better accuracy, another method called the micro method has also been included. For this method, considerable assistance has been derived from' the method given in BS Handbook 11-1974, 'Methods of test for textiles', issued by the British Standards Institution, UK.

This Third revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

iv) The Title of the standard has been updated.
v) Reference to Indian Standard has been updated.
vi) ICS number is incorporated in place of udc number.

Textile materials are liable to deterioration by the action of acids, oxidizing agents, heat, light and Micro-organisms during processing, wear and storage. The need for estimating the nature and degree of deterioration arises from the fact that such deterioration lowers the quality of affected materials. The estimation of copper number is recognized as a useful test but from the point of view of judging the degree of deterioration of the textile materials, the value becomes of significance only when considered in conjunction with other tests, particularly that of cuprammouium fluidity (*see* IS 244).

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

This standard prescribes two methods for the determination of copper number of cotton textile materials. The standard method is normally used for routine testing while the micro method is used for testing cotton textile materials when better accuracy is required.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 199:1989	Estimation Of Moisture, Total Size Or Finish, Ash And Fatty Matter In Grey And Finished Cotton Textile Materials

IS 244:1984	Method For Determination Of Viscosity (Or Fluidity) Of Solutions Of Cotton And Regenerated Cellulosic Man-Made Fibres In Cuprammonium Hydroxide (*Second Revision*)
IS 1070 : 2023	Reagent Grade Water — Specification (*Fourth Revision*)
IS 9068 : 2021 ISO 1833-1 : 2020	Textiles — Quantitative Chemical Analysis — General Principles of Testing (*First Revision*)

3 PRINCIPLE

In both the methods, a known amount of cotton material is heated for 3 hours at 100°C with an alkaline solution of copper prepared from copper sulphate and a mixture of sodium carbonate and sodium bicarbonate. The cuprous oxide formed is dissolved in a solution of ferric alum and sulphuric acid, reducing an equivalent amount of iron to the ferrous state. The reduced iron is then determined by titration with standard solution of potassium permanganate or, preferably, with ceric ammonium sulphate, using phenylanthranilic acid as indicator.

4 TERMINOLOGY

4.1 Copper Number

The mass of copper in grams reduced by 100 grams of bone-dry cellulose from cupric to cuprous state in alkaline solution.

5 SAMPLING

Sample from the lot shall be drawn so as to be representative of the lot. Sample drawn in accordance with the procedure specified in the relevant material specification or as agreed to between the buyer and the seller shall be taken to be the representative of the lot.

6 PREPARATION OF TEST SPECIMENS

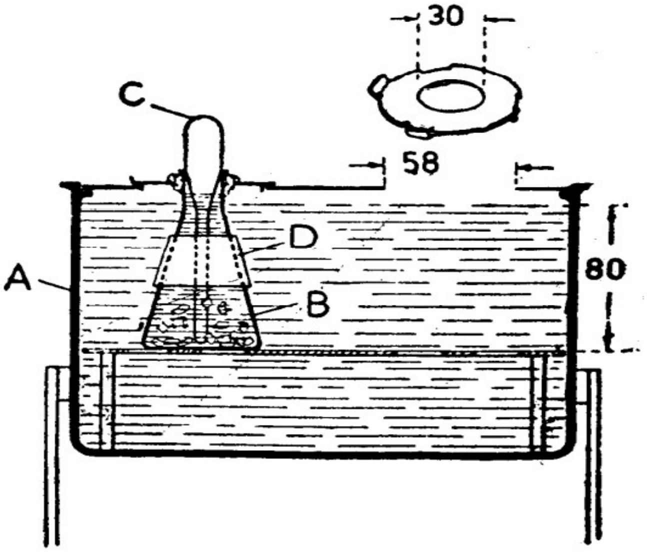
6.1 Remove the extraneous reducing matter, specially starches, and other finishes by the methods prescribed in IS 9068. Dye in the coloured fibre is considered to be an integral part of the fibre and is not to be removed.

6.2 Take some portion of the test sample and determine its moisture content by following the procedure given in IS 199. Cut the other portion into small pieces of approximately 1.5 mm length and mix them thoroughly. Take at least 2 test specimens having oven-dry mass of 2.5 g weighed accurate to the nearest mg.

7 STANDARD METHOD

7.1 Apparatus

7.1.1 *Constant Level Water-Bath*, with perforated false bottom (see A in Fig. 1)



All dimensions in millimetres.

Fig. 1 Arrangement of Apparatus

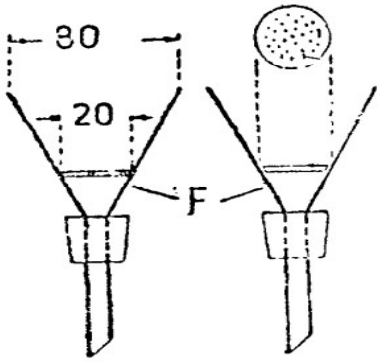
7.1.2 *Conical Flasks*, 100 ml (see D in Fig. 1).

7.1.3 *Combined Glass Stopper and Stirrer*, (see C in Fig. 1)

7.1.4 *Load Sinkers*, to tit B (*see* D in Fig. 1).

7.1.5 Filter Flasks, two of 500 and 250 ml capacity, respectively, rhe necks of which should have the same internal diameter.

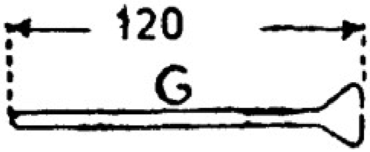
7.1.6 *Glass Funnel*, with sealed-in sintered glass plate or ordinary glass funnel and perforated porcelain plate (*See* F in Fig. 2). The stem of the funnel is provided with a rubber stopper to fit the flasks.



All dimensions in millimetres.

Fig. 2 Funnel and Filter Plate

7.1.7 *Glass Squeezing Rod* (see G in Fig. 3)



All dimensions in millimetres.

Fig. 3 Squeezing Rod

7.1.8 *Buchner Funnel*

7.1.9 *Beakers*, 600 and 250 ml capacity.

7.2 Reagents

7.2.1 *Quality of Reagents*

Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS 1070) shall be used where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

7.2.2 *Solution A*

Add 130 g of anhydrous sodium carbonate slowly to about 750 ml of distilled water at about 70°C and stir until dissolved. Dissolve 50 g of sodium bicarbonate in this solution and then filter through a Buchner funnel and make the solution up to one litre.

7.2.3 *Solution B*

Dissolve 100 g of crystalline copper sulphate (CuSO4.5H20) in distilled water and make the solution up to one litre.

7.2.4 *Solution C*

Dissolve 100 g of freshly ground ferric alum in about 500 ml of distilled water. Add 140 ml of concentrated sulphuric acid slowly with constant stirring and cooling, and dilute the whole to one litre with distilled water.

7.2.5 *Solution D-Dilute Sulphuric Acid*, 2 N (approx.).

7.2.6 *Potassium Permanganate Solution* (0.04 N)

The solution is prepared as follows:

Dissolve about 1.27 g of potassium permanganate in distilled water. Dilute the solution to about 900 ml, boil for 15 min, cool and then filter by suction through a pad of pure asbestos fibre. After dilution to about one litre, standardize the solution against pure sodium oxalate and store in the dark in a well-stoppered bottle. It should be re-standardized at frequent intervals.

7.2.7 *Ceric Ammonium Sulphate Solution* (0.04 N) $[Ce(SO_4)(NH_4)_2SO_4.2Ha_2O]$

It may be used as an alternative to potassium permanganate and is prepared as follows:

Take the required mass of ceric ammonium sulphate (see Note) in a 600 ml tall beaker, mix it with 50 ml of concentrated sulphuric acid and heat it gently, with stirring, until the acid just begins to fume. The product at this stage should be a lemon-yellow paste free from lumps, Cool and dilute it by the cautious addition of about 500 ml of water. The salt dissolves readily, and when the solution is cold, dilute it to one litre with water. This solution is stable but care should be taken not to store it in bottles whose surfaces have been etched in any way. The normality should be checked if the period of storage exceeds 2 months.

NOTE — The mass of the solid reagent required depends on its purity and shall be determined by a preliminary trial.

7.2.8 *Phenylanthranilic Acid Indicator*

Dissolve anhydrous sodium carbonate (0.13 g) in a small quantity of hot water, add phenylanthranilic acid (0.266 g) to the solution, and then dilute to 250 ml.

7.2.9 *Ferrous Ortho-Phenanthroline*

Dissolve 1.49 g of ortho-phenanthroline monohydrate in 100 ml of water containing 0.7 g of hydrated ferrous sulphate.

7.3 Procedure

7.3.1 Place 2.5 g of the material, previously cut into small pieces, into flask B.

7.3.2 Run 5 ml of solution B from a pipette into 95 ml of Solution A contained in a 250 ml lipped beaker and raise the mixture to the boil then pour immediately into flask Band mix thoroughly with the sample by means of a pear-bulb stirrer which afterwards serves as a loose stopper.

7.3.3 Weigh the flask by means of the load sinker and immerse to the neck in the bath; close it as completely as possible by means of a metal ring (see Fig. 1) and finally pack round the neck with a short length of cotton sliver. Allow the flask to remain in boiling water for 3 h and stir the contents occasionally during the first 15 min to release air bubbles. Transfer the liquor and fibre to the funnel *F* and filter by suction through two layers of filter paper (42.5 mm diameter) cut radially round the edges to facilitate fitting into the funnel. Wash the flask well, first with a dilute solution of sodium carbonate and then with a dilute solution of pour the washing over the sample. Press the sample thoroughly with a glass squeezing rod (see Fig 3) and wash with further quantities of hot water. Reject the filtrate and washings which have collected in the larger filter flask.

7.3.4 Fit the funnel to the smaller filter flask and dissolve the cuprous oxide by treatment with successive portions of Solution *C*; use the first portion to remove any adhering cuprous oxide from flask *B* before pouring into the funnel. Two portions of the solution, 15 ml and 10 ml respectively, usually suffice but an additional 10 ml may occasionally be necessary. Wash the, material finally with successive 15 ml portion of Solution *D*. Prior to each addition of Solution *C* or *D* release the suction to ensure that the liquid saturates the fibrous material thoroughly before being drawn into the flask; the connection to the filter pump should be provided with a three-way tap for this purpose.

7.3.5 Titrate the solution either with 0.04 N potassium permanganate or preferably with 0.04 N ceric ammonium sulphate. If the latter oxidant is used, add four drops of phenylanthranilic acid indicator to the solution before titration. The colour of the solution then changes from pale green to brownish purple when oxidation of the ferrous iron is complete.

7.3.6 Ferrous-*o*-phenthroline indicator may be used, in which case the colour changes is from red to pale green. This indicator may also be used if the titration is carried out with potassium permanganate. Similar colour changes occur and the end point is much sharper than if no indicator is used.

One millimetre of 0.04 N solution corresponds to 0.002 543 g of copper.

7.4 Expression of Results

7.4.1 Calculate the copper number $N\mathrm{c_U}$ by the formula:

$$N\mathrm{c_u} = \frac{t \times f \times 0.002\ 543 \times 100}{2.5 \times m}$$

Where

t = the volume of 0.04 N solution (**7.2.6** or **7.2.7**) required,

f = the normality of the solution, and

m = the correction for moisture content.

NOTE — For most purposes, it is sufficient to assume an average moisture content, for example, 6 percent for cotton materials, m = 0.94.

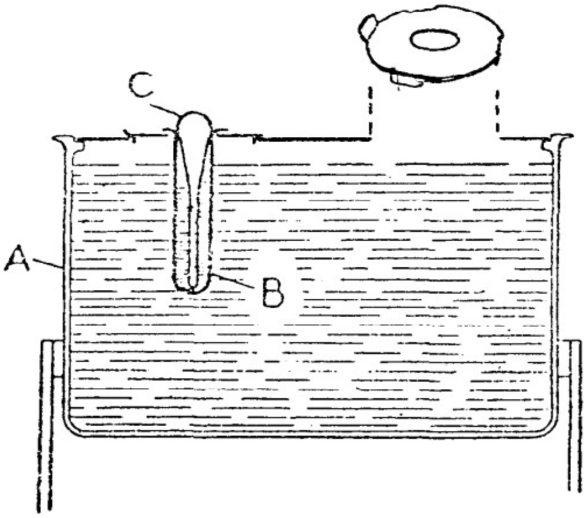
8 MICRO METHOD

8.1 Principle

The sample of known mass is heated for 3 h at 100°C with an alkaline solution of copper prepared from copper sulphate and a mixture of sodium carbonate and bicarbonate. The cuprous oxide formed is dissolved in a solution of iron alum and sulphuric acid reducing an equivalent amount of iron to the ferrous state. The reduced iron is then determined by titration with a standard solution of ceric ammonium sulphate using phenylanthranilic acid as indicator.

8.2 Apparatus

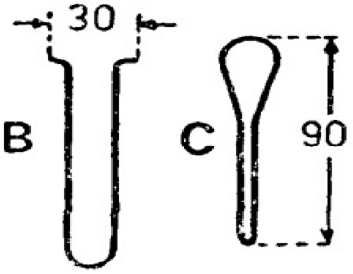
8.2.1 *Constant Level Water-Bath* (see *A* in Fig. 4).



All dimensions in millimetres.

Fig. 4 Level of Suspended Tube in Water-Bath

8.2.2 *Glass Tubes*, 85 mm × 16 mm (internal) (*see B* in Fig 4).



All dimensions in millimetres.

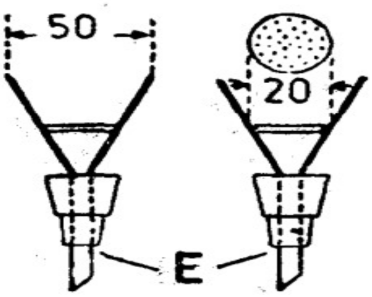
Fig. 5 Stopper and Stirrer Combined

8.2.3 *Combined Glass Stopper and Stirrer* (see *C* in Fig. 5)

8.2.4 *Filter Flasks*, 250 and 100 ml, respectively.

8.2.5 *Glass funnel*

It shall be with sealed in sintered glass plate or ordinary glass funnel and perforated porcelain plate (see *E* in Fig. 6). The stem of the funnel is provided with two rubber stoppers to enable it to be fitted to either filter flask.



All dimensions in millimetres.

Fig. 6 Adaptable Filter Funnel

8.2.6 *Micro-Burette* (10 ml), graduated it, fiftieths of a millilitre.

8.3 Reagents, same as in standard method.

8.4 Procedure

8.4.1 Place 0.25 g of the material, previously cut into small pieces into tubs *B* (*see* Note).

NOTE — When sufficient material is available, a mass of about 2 or 3 g is cut info small pieces and mixed thoroughly before the sample is taken for analysis.

8.4.2 Run solution *B* (0.5 ml) from a pipette into 9.5 ml of Solution A contained in a 60 ml lipped beaker, raise the mixture to the boil, pour immediately into the tube and mix thoroughly with the sample by means of a pear-bulb stirrer *C* which afterwards serves as a loose stopper.

8.4.3 Suspend the tube in the water bath to a depth such that the surface of the liquid in the tube is at, or slightly below the level of the boiling water (*see* Fig. 4). Stir the contents of the tube occasionally during the first 15 min to release air bubbles, and continue heating for a total period of 3 h. Transfer the liquor and fibre to the funnel *E* and filter by suction through two layers of filter paper (42.5 mm diameter) cut radially round the edges to facilitate fitting into the funnel. Wash the tube well, first with a dilute solution of sodium carbonate and then with hot water, and pour the washing over the sample. Then wash the sample with further quantities of hot water. Reject the filtrate and washings.

8.4.4 Fit the funnel to the smaller fitter lark and dissolve the cuprous oxide by treatment with successive portions of Solution *C*, use the first portion to remove any adhering cuprous oxide from the tube *B* before pouring into the funnel. Two portions of solution, 1.5 ml. and 1.0 ml respectively, usually suffice but an additional 1.0 ml may occasionally be necessary. Wash the material finally with two successive 1.5 ml portion of Solution *D*. Prior to each addition of either Solution *C* or *D*, release the suction to ensure that the liquid saturates, the fibrous material thoroughly before being drawn into the flask; the connection to the filter pump should be provided with a three-way tap for this purposes.

8.4.5 Titrate the solution with 0.01 N ceric ammonium sulphate after adding one drop of phenylanthranilic acid indicator; the colour of the solution changes from pale green to bright purple when oxidation of the ferrous iron is complete. Alternatively, ferrous-*o*-phenanthroline indicator may be used, the colour change then being red to pale green. One millilitre of 0.01 N ceric ammonium sulphate corresponds to 0.000 635 7 g of copper.

8.5 Expression of Results

8.5.1 Calculate the copper number ($N\text{c}_\text{u}$) by the formula:

$$N\text{c}_\text{u} = \frac{t \times f \times 0.000\ 635\ 7 \times 100}{0.25 \times m}$$

where

t = volume of 0.01 N ceric ammonium sulphate required,

f = normality of the ceric ammonium sulphate, and

m = correction for moisture content.

NOTE — For most purposes, it is sufficient to assume an average moisture content, for example, 6 percent for cotton materials, m = 0.94.

9 REPORT

9.1 The report shall include the following information:

a) Nature and type of textile material tested;
b) Copper number of the textile material tested;
c) Method (*see* 7 or 8) used; and
d) Number of tests performed.

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024

भारतीय मानक मसौदा

वस्त्रादि – क्यूप्रामोनियम हाइड्रॉक्साइड में कपास और पुनर्जीवित सेल्यूलोसिक मानव निर्मित फाइबर के समाधान की चिपचिपाहट (या तरलता) के निर्धारण के लिए विधि

(आई एस 244 का *तीसरा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Determination of Viscosity (Or Fluidity) Of Solutions of Cotton and Regenerated Cellulosic Man-Made Fibres in Cuprammonium Hydroxide

(*Third Revision* of IS 244)

ICS:

Chemical Methods of Test
Sectional Committee, TXD 05

last date for receipt of comments is
XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1951 and revised in 1969 and 1984. The last revision has been revised again with a view to include regenerated cellulosic man-made fibres that is cellulose acetate and triacetate, and mixtures of cellulosic fibres. Changes have been made for calculation of test results, removal of non-fibrous materials, mass and moisture regains of test specimens.

This Third revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) Reference to Indian Standard has been updated.
iii) ICS number is incorporated in place of udc number.

Viscosity of solutions of cellulose in cuprammonium hydroxide is of proved importance in some major industries. For instance, viscosity of such solutions affords a means of control of bleaching and other chemical operations to which cellulose textiles, such as cotton, linen and rayon, are put through. Manufacturers of cellulose, paper, pulp, explosives, celluloids and lacquers also use this characteristic of cellulose solutions in the control of manufacturing processes.

Viscosity of solutions of cotton and regenerated cellulose in cuprammonium hydroxide has a close correlation with the tensile strength of the fibres. For instance, very large changes at the high end of the viscosity scales are accompanied by changes in the tensile strength of the cotton and rayon fibres which are too small to be capable of direct experimental detection. The absolute viscosity of a solution of a slightly scoured cotton, containing 0.5 g of cellulose per 100 ml, is about 1 poise. But more vigorous scouring treatment may reduce this to 0.2 poise without seriously affecting the quality of the material. A further fall of viscosity from 0.2 to 0.05 poise is accompanied, however, by a loss of 20 to 30 percent in tensile strength. Changes in viscosity of the same order but at different parts of the scale have, therefore, a different technical significance; this is best brought out when the rate of flow is expressed in terms of fluidity. It has been shown that, when fluidity is plotted against the percentage loss of strength produced by chemical action on cotton, a curve is obtained which approximates more closely to a straight line than that given by other methods of expression.

While testing mixtures of cellulosic fibres, it is more appropriate to estimate the fluidity of the cotton component only and therefore, only methods for determination of the fluidity of the cotton component are given. Since the majority of the mixtures are prepared before any treatment is applied which is likely to affect the fluidity, it can be assumed that any increase in fluidity of cotton component reflects an increase in the fluidity of the other component, although these changes may not be proportional.

Three basic methods for calculating test specimen size and test results are given, the first dealing with pure fibre, the second and the third dealing with mixtures of cotton with cellulosic man-made fibres.

Difficulties in working with such cuprammonium solutions are many. Firstly, it is necessary to exclude air from any lengthy contact with the solutions, as oxygen causes a marked decrease in viscosity. Hence, the solutions are made in the viscometer itself. Secondly, sometime even carefully purified cotton (of consequent high viscosity) and some commercially bleached cotton yarns or cloth give turbid solutions. This is avoided if the nitrous acid content of the solutions is kept below 0.5 g/l and also if the cotton is freed from extraneous matter before being dissolved. Thirdly, solutions of cotton in cuprammonium differ from truly viscous liquids. The apparent fluidity of such solutions consequently varies with the nature and dimensions of the viscometer. This abnormality, which applies particularly to cotton of high viscosity or low fluidity (that is, normal cotton) and which rapidly becomes less accentuated as the severity of treatment of cotton is increased, may be neglected.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes a method for determination of viscosity (or fluidity) of solutions of cotton, regenerated cellulosic fibres and blends of cotton with regenerated cellulosic fibres in cuprammonium hydroxide.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 460 (Part 1) : 2020	Test Sieves — Specification Part 1 Wire Cloth Test Sieves (*Fourth Revision*)
IS : 1889 (Part II) - 1976	Method For Quantitative Chemical Analysis Of Binary Mixtures Of Regenerated Cellulose Fibres And Cotton Part Ii Cadoxen Solvent Method
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)
IS 1564 : 2024 ISO 1833-10 : 2019	Textiles — Quantitative Chemical Analysis — Mixtures of Triacetate or Polylactide with Certain other Fibres (Method Using Dichloromethane) (*Second Revision*)
IS 1889 (Part 1) : 2024 ISO 1833-5 : 2006	Textiles — Quantitative Chemical Analysis — Mixtures of Viscose Cupro or Modal and Cotton Fibres Method Using Sodium Zincate (*Second Revision*)
IS 2176 : 2023 ISO 1833-3 : 2020	Textiles — Quantitative Chemical Analysis — Mixtures of Acetate with Certain other Fibres (Method Using Acetone) (*Second Revision*)
IS 9068 : 2021 ISO 1833-1 : 2020	Textiles — Quantitative Chemical Analysis — General Principles of Testing (*First Revision*)

3 TERMINOLOGY

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

3.1 Fluidity — It is reciprocal of viscosity of the solution and is expressed in reciprocal poises.

3.1.1 *Fluidity of Cotton* — Fluidity of cuprammonium hydroxide solution containing 0.5 g of bone-dry cotton per 100 ml of solution at 20°C.

3.1.2 *Fluidity of Regenerated Cellulose — The* fluidity of cuprammonium hydyoxide solution containing 2.0 g of bone-dry regenerated cellulose per 100 ml of solution at 20°C.

3.1.3 *Fluidity of Cellulose Acetate or Triacetate* — The fluidity of cuprammonium hydroxide solution containing cellulose acetate or triacetate equivalent to 2.0 g of regenerated cellulose per 100 ml of the solution at 20°C (see **ANNEX D**).

4 PRINCIPLE

4.1 A weighed sample of the material is dissolved in cuprammonium hydroxide solution in a viscometer. The temperature of viscometer and its contents is brought to 20°C in the thermostat. The solution is allowed to flow from the viscometer through the capillary, the time taken by meniscus to fall from one fixed mark to another is noted and then the fluidity is calculated.

5 APPARATUS

5.1 Viscometer — The viscometer shall be as shown in Fig. 1. Glass tube A has an internal diameter of 10 mm. The capillary *F* with an internal diameter of 0.88 mm and an external diameter of 6 mm is 25 mm long. Three marks B, *D* and C are etched around the outer surface of the tube *A* at vertical heights of 242 mm, 122 mm and 62 mm from the flat end of the capillary *F.* The upper end of the tube is closed with a rubber stopper, carrying a capillary tube *E* (the dimensions of the capillary tube *E* are not important). The lower end of rubber stopper should not protrude below the mark near the top of the viscometer. The overall lengths of the viscometer without fittings shall be 300 mm.

NOTE — Tolerances for various dimensions are indicated in **Fig. 1**.

5.2 Glass Jackets — For supporting the viscometer in the thermostat during the time required to bring the temperature to 20°C and during the time the flow of solution is being measured, a glass jacket shall be provided. One typical glass jacket is shown in **Fig. 2**; jackets of other designs may also be used provided the viscometer remains vertical in it.

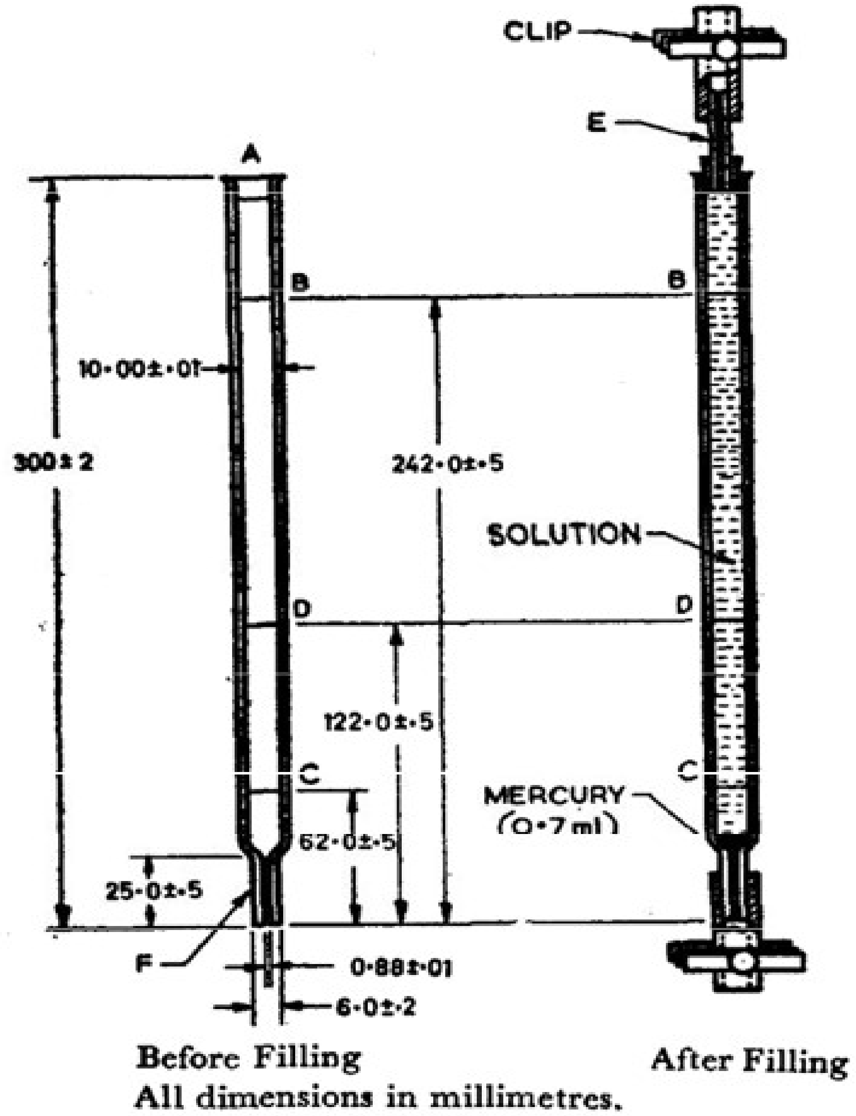


FIG. 1 VISCOMETER BEFORE AND AFTER FILLING THE SOLUTION

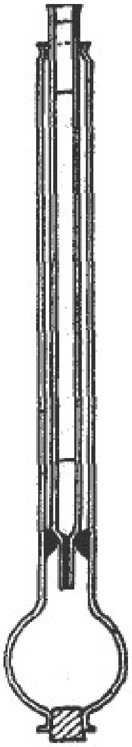


FIG. 2 VISCOMETER IN JACKET READY FOR TIME FLOW MEASUREMENT

5.3 Brass Supports — with plumb line or other means of verifying that the jacket is vertical while the time of flow is being measured. One suitable design is illustrated in Fig. 3.

5.4 Blackened Glass Container — for cuprammonium hydroxide solution.

5.5 A device for rotating the filled viscometer end-over-end at a speed not more than 4 rev/min.

5.6 Glass Thermostat — with stirrer, capable of being maintained at 20 ± 1.0° or 20 ± 0.1°C (*see* **7.5**).

5.7 Stop-Watch — graduated in seconds and fifth of a second.

5.8 Steel Rod — approximately 1.6 mm in diameter and 300 mm long.

5.9 Strips of Black Cloth — to cover viscometer.

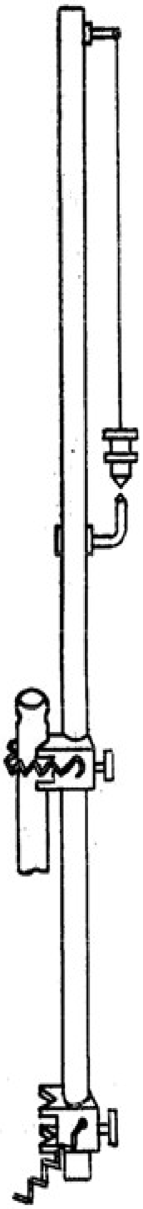


FIG. 3 BRASS SUPPORTS

6 CUPRAMMONIUM HYDROXIDE SOLUTION

6.1 The cuprammonium hydroxide solution used shall have the following composition*.

*Shirley cuprammonium may be used which is available from BDH Ltd, Poole, Dorset.

Copper	15± 0.1 g/l

Ammonia	200± 5 g/l
Nitrous acid	less than 0.5 g/l

6.1.1 The solution shall be prepared and tested before use as given in **ANNEX B**.

7 PROCEDURE

7.1 Remove all the non-cellulosic matter from the material under examination as given in IS: 9068 and dry. If a blend is to be tested, determine the composition using the appropriate method as given in IS: 1564 IS: 1889 (Parts 1 and 2) and IS: 2176 before determining the fluidity using a fresh sample. Condition the sample in standard atmosphere at 27 ± 2°C temperature and 65 ± 2 percent relative humidity (*see* also IS: 6359). Cut yarns or loose fibres into lengths of 2 mm such that specimen includes both warp and weft yarns.

NOTE — Some of the methods specified in IS: 9068 may degrade cellulose and therefore, correct fluidity values cannot be obtained when these methods are used to remove added matter.

7.2 Mass of Specimen — Calculate the mass of the specimen of cotton or regenerated cellulose required, by the formula given in **C-3**.

7.2.1 Cotton — Assuming the moisture regain of 6.5 percent of pure or slightly modified cotton, weigh to the nearest milligram the required quantity of material as obtained in **7.1** depending on the volume of the viscometer used (*see* **ANNEX C**) to give, on bone-dry basis, 0.500 ± 0.001 percent solution. In case of mercerised cotton, weigh the required quantity of material as in **7.1** assuming moisture regain of 8.5 percent to give 0.500 ± 0.001 percent solution on bone-dry basis depending on volume of the viscometer used (*see* **ANNEX C**).

7.2.2 Regenerated Cellulose or Cellulosic Man-made Fibres

7.2.2.1 Weigh the required quantity of regenerated cellulose material as obtained in **7.1**, depending on volume of viscometer used, (*see* **ANNEX C**) to give a 2.000 ± 0.001 percent solution on bone-dry basis assuming its moisture regain to be 11 percent. To calculate the mass of acetate or triacetate required see **ANNEX D**.

7.2.3 Mixture of Cotton with Cellulosic Man-made Fibre

7.2.3.1 Method 1 — Find out the concentration of the mixture required on bone-dry basis from Table 1 given below. This concentration chosen gives simple proportionality between the fluidity of the mixture and that of the cotton component.

TABLE 1 CONCENTRATION OF MIXTURE REQUIRED

COTTON IN MIXTURE* Percent	CONCENTRATION 100 (BONE-DRY MIXTURE REQUIRED) g/ml OF CUPRAMMONIUM SOLUTION

80	0.762
75	0.807
66.7	0.875
60	0.948
50	1.088
40	1.267
33.3	1.424
25	1.649
*Bone-dry basis.	

7.2.3.2 ***Method 2*** — Calculate the concentration of mixture by using the formula:

$$C_m = \frac{1}{1.5R_c+0.5}$$

Where,

C_m = concentration of the bone-dry mixture, g/100 ml of the solution; and

R_c = the mass (g) of cotton per g of bone-dry mixture.

NOTE — The second method gives a concentration which equals that which would have been obtained if the components had been separate, the whole of the cotton dissolved at a concentration of 0.5 percent, the whole of the cellulosic man-made fibre being dissolved at a concentration of 2 percent, and the two solutions then mixed.

7.2.3.3 The mass M of bone-dry mixture to be taken for test is given by:

$$M = \left(\frac{C_m V_o}{100} \right)$$

where

C_m = concentration (g/100 ml) from Table 1 or as calculated by above formula (see **7.2.3.2**); and

V_o = volume (ml) of the viscometer, as determined in **ANNEX C**.

7.3 Close capillary ***F*** of the viscometer (see **Fig. 1**) with a short piece of pressure tubing and fill the apparatus to half of its capacity with cuprammonium solution. Run a few drops of the solution through capillary *F* to ensure that the solvent completely fills the capillary and pour 0.7 ml dry mercury into the viscometer. Add the weighed material (*see* **7.2.1, 7.2.2** and **7.2.3**) in the viscometer and stir the solution rapidly with the steel rod. Fill the viscometer completely with cuprammonium hydroxide solution, insert the stopper so that the excess liquid overflows through the top capillary tube displacing all the air and close it immediately.

7.4 Wrap the viscometer in black cloth and fix it to rotating device. Rotate at such a speed that the mercury moves from end to end during half a revolution, till complete solution of the material is effected (*see also* **ANNEX E**)

NOTE — A maximum rate of 4 rev/min is suitable even for very viscous solutions. The agitation thus produced is sufficient to cause complete solution of the cellulose overnight.

7.5 Remove the lower clip and the rubber tube off the viscometer and suspend it in a wider tube, and place the assembly in a thermostat maintained for technical determinations, at 20 ± 1°C and for accurate determination at 20 ± 0.1°C and till temperature equilibrium is established. Now transfer the viscometer to glass jacket (*see* Fig. 2), rest it on three glass points at the lower end, and fix it vertically in the thermostat. Open the upper clip so that the solution flows out through the lower capillary. Observe the time necessary for the meniscus to fall from mark *B* to *D* and *B* to *C* respectively. The time of flow from *B* to *C* is only required to calculate the fluidity, the reading from *B* to *D* serves to detect any considerable irregularity which might be there due to partial chocking of the capillary.

NOTE — If the flow *time* of the solution of cellulose in cuprammonium solution is measured at room temperature instead at 20°C, the fluidity determined at that temperature may be converted to that at 20°C by the following formula:

$$F_{20} = \frac{F_t}{0.4+0.03}$$

where

F_{20} = fluidity at 2O"C,
Ft = fluidity determined at t° C, and
t = temperature at which the flow time is measured.

8 CALCULATIONS

8.1 Calculate the fluidity of cotton and regenerated cellulose solutions by the following formula:

$$\mathrm{F} = \frac{C_1}{t - \frac{K}{t}}$$

where

F = fluidity in absolute units that is in reciprocal poises,
C_1 = modified constant of the viscometer (*see* **A-1.3**),
t = observed time of flow of solution from mark *B* to C in seconds, and
K = kinetic energy correction constant (*see* **A-1.2**).

NOTE - $\frac{K}{t}$ shall be neglected in cases where t exceeds 200 seconds.

8.2 Calculate the fluidity F_m of the mixture by the formula given in **8.1**. Then calculate the fluidity F_c of cotton component by the formulae:

$Fc = 1.4\ F_m$ (for Method 1 in **7.2.3.1**)
or by the formula:
$Fc = 1.15 \times F_m - 2.2$ (for Method 2 in **7.2.3.2**)

9 REPORT

The report shall state the following:

a) Fluidity of cotton,
b) Fluidity of cellulosic man-made fibre,
c) For mixtures:
    i) Composition of the blend,

ii) The fluidity of the mixture, and
iii) The fluidity of cotton.

ANNEX A
(*Clause* **8.1**)

CONSTANT C AND KINETIC ENERGY CORRECTION FACTOR *K*

A.1 DETERMINATION OF CONSTANT C OF THE VISCOMETER AND KINETIC ENERGY CORRECTION FACTOR *K*

A-l.1 Use any of the following as standard for fluidity:

a) Prepare a mixture of glycerin and water, containing approximately 65 percent of glycerine by weight and adjust the specific gravity of the solution to 1.168 1 in air at 20%. The fluidity of this solution at 20°C is 6.83 reciprocal poises. The kinematic fluidity of this solution is approximately 8 s/cm^2 at 20°C.

b) Use pure phenyl ethyl alcohol (relative density 1.019 and fluidity 7.01) the kinematic fluidity of this chemical is 7.14 s/cm^2 at 20°C.

A-1.1.1 Fill the viscometer tube with either solution (a) or (b) and allow the liquid to acquire a temperature of 20°C. Observe the time in seconds taken for the meniscus to fall from the upper to the lower etched mark that is from the mark B to the mark C (*see* **Fig. 1**).

A-l.2 If the calibrating liquid is glycerine, calculate the kinetic energy constant *K* as follows:

$$K = 0.131 \times V \times t_o$$

where
V = volume (ml) between the top and bottom timing marks *B* and *C* (*see* **Fig. 1**), and
t_o= time of flow in seconds of glycerine solution.

If the calibrating liquid is phenyl ethyl alcohol then:

$$K = 0.117 \times V \times t_v$$

where
V = volume (ml) between the top and bottom timing marks *B* and C (*see* **Fig. l**), and
t_v = time of flow in seconds of phenyl ethyl alcohol.

NOTE — The value of K should be preferably between 400 to 500.

A-1.3 Calculate the constant C of the viscometer by using the following formula:

$$C = 1.075 \times d \times F \times t$$

where
d = density of glycerine solution or pure phenyl ethyl alcohol,
F = fluidity in absolute units of glycerine solution or pure phenyl ethyl alcohol, and
t - time of flow in seconds.

For the determination of cuprammonium fluidity, C needs modification. The modified value (C_1) is given as follows:

$$C_1 = \frac{C}{d_c}$$

where
d_c = density of cuprammonium hydroxide solution.

NOTES

1 The density of the cuprammonium solvent and of dilute solutions of cellulose in cuprammonium is assumed to be 0.94 g/cm^2.

2 The constant C for the viscometer shall preferably be between 1 750 and 2 100 as determined in **A-1.3**.

ANNEX B

(Clause **6.1.1**)

PREPARATION AND TEST OF CUPRAMMONIUM SOLUTION

B-l PREPARATION

B-l.1 Take a suitable bottle of 5 litre capacity, fitted with a cork, carrying a centrifugal stirrer and air-inlet iron tube. The other end of the iron tube is connected to the wash bottle, containing a solution of ammonia (0.88 sp gr). Place 2.6 litres of liquor ammonia (0.88 sp gr), 0.4 litre of water, 3 g of cane sugar and 180 g of precipitated reduced copper (passing through 250-micron IS: 460 (Part l)) in the reaction bottle, well-lagged externally with felt, keeping the space between the bottom and the vessel filled with ice to prevent loss of ammonia and excessive formation of nitrous acid. Rotate the stirrer at a speed of approximately 400 rev/min.

B-l.2 Blow air through the wash-bottle into the reaction bottle at the rate of 10 l/h. Compare calorimetrically the solution with a standard solution containing 15 g/l of copper. When the comparison shows that the concentration of copper in the solution under preparation exceeds that of the standard (which is reached usually in about 5 or 6 hours of aeration), allow the solution to settle for 30 minutes, and syphon off the clear liquid into a stoppered bottle. Again allow the solution to settle and syphon off. Analyse the clear liquid for copper and ammonia, and adjust the concentration of copper to 15 ± 0.1 g/l of copper and to 200 ± 5 g/l of ammonia. Check the nitrous acid by analysis (*see* **B.2**) and reject the solution if the value obtained exceeds 0.5 g/l.

B-l.3 The cuprammonium solution shall be stored in a blackened bottle fitted with a tap at the bottom and connected at the top through a vessel containing alkaline pyrogallol to a glass vessel (such as a Kipp's apparatus) filled with nitrogen. Keep it preferably at temperatures below l0° C, the stability of the solution being greater at such temperatures.

B-2 ANALYSIS OF CUPRAMMONIUM SOLUTION

B-2.1 Copper Content — Boil off the ammonia from 25 ml of cuprammonium solution, acidify with nitric acid (1: 1) and boil again. Remove all nitrous acid by adding a trace of bromine and re-boiling. Cool and then add ammonia solution dropwise until blue colour is formed. Then add 10 ml glacial acetic acid followed by 3 to 5 g of potassium iodide and titrate in the usual way the 'liberated iodine against standard sodium thiosulphate solution. Calculate the copper content from the volume of standard sodium thiosulphate solution consumed.

[Copper content, g/l = ml of 0.1 N Sodium thiosulphate × 0.254 4]

B-2.2 Ammonia — Add 2 ml of cuprammonium solution to 25 ml of 2 N sulphuric acid, and titrate the excess acid with normal sodium hydroxide, using methyl red as indicator. Run a blank, using the same reagents except cuprammonium solution. Calculate the ammonia content from the difference between the readings for the blank and the solution under test. Correct the value so obtained by subtracting from it the ammonia equivalent to copper which is $0.536 \times C$ g/l of ammonia, C being the copper concentration (g/l).

Ammonia content, g/l = [1 N sodium hydroxide (ml) for blank - 1 N sodium hydroxide (ml) for sample] $\times 8.5 - 0.536 \times C$].

B-2.3 Nitrous Acid — Determine the volume of cuprammonium solution necessary to decolorize 10 ml of 0.1 N potassium permanganate in the presence of excess of dilute sulphuric acid at 50°C and calculate the nitrite in the usual way.

Nitrous acid content g/l = 23.51 ÷ cuprammonium solution (ml) required to decolorize 10 ml of 0.1 N potassium permanganate.

ANNEX C

(*Clauses* **7.2, 7.2.1, 7.2.2.1** and **7.2.3.3**)

MEASUREMENT OF THE TOTAL VOLUME ENCLOSED BY THE VISCOMETER

C-l The total volume (ml) enclosed by the viscometer is used in calculating the mass of cellulose necessary to obtain a solution of the desired concentration.

C-2 Weigh the viscometer, first empty, and then filled with water as it would be the cuprammonium solution for use. The volume determined in this way is diminished by 0.7 ml of volume of the mercury stirrer to calculate the total volume of cuprammonium solution to be used in viscometer.

C-3 The mass of the specimen of cotton or regenerated cellulose required can be calculated by the following formula:

$$m = \frac{0.94 \times V \times C}{100 - M}$$

where
m = mass of the specimen required,
V = volume of liquid in the dissolving tube,
M = moisture content of the specimen,
C= percentage of the solution of cotton or regenerated cellulose required, and
0.94= density of cuprammonium hydroxide solution.

ANNEX D

(*Clauses* **3. 1 .3** *and* **7.2.2.1**)

CALCULATION OF THE REQUIRED MASS OF ACETATE OR TRIACETATE FIBRE

D-l. Calculate the required mass of acetate or triacetate by the following formula:

$$M = 2V_o\left(\frac{1}{100-m} \times \frac{142.9}{142.9-A}\right)$$

where
M = required mass of acetate or triacetate (mg),
V_o = total volume of viscometer as determined in **ANNEX C**,
m = percentage of moisture (water, g/100 g of bone-dry cellulose acetate), and
A = percentage acetic acid yield of acetate or triacetate.

ANNEX E

(*Clause* **7.4**)

PRE-TREATMENT OF FIBRES WHICH ARE DIFFICULT TO DISSOLVE

E-l Natural cotton, very mildly scoured cotton, mineral dyed or chrome proofed cotton, cotton dyed with Sulphur black and certain reactive dyes require a pre-treatment for complete dissolution in cuprammonium solution.

E-l.1 Boil for 1 hour under reflux in 1 percent sodium hydroxide solution in case of grey cotton and cotton dyed with Sulphur black before conditioning and testing.

E-2 Boil for 2 hours in 4 percent sodium carbonate solution in case of cotton dyed with some reactive dyes, for example those based on dichlorotriazine.

E-3 In case of mineral dyed or chrome proofed fabrics, or fabrics treated with aminoformaldehyde resins, the results are of limited value because of the hydrolytic action of the acid used on cellulose. Better fluidity value can be obtained by subtracting the fluidity value of a similarly treated control sample from that of the sample under examination. But this is only partially satisfactory because the resin or mineral dyeing may exert some protective action on the cellulose.

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि – बुणडसमान प्रकार के उपकरण का उपयोग करके वस्त्रों में जल अवशोषण और जल भेधता ज्ञात करना

(आई एस 392 का *चौथा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Determination of water Absorption and penetration of fabrics Using bundesmann type apparatus

(*Fourth Revision* of IS 392)

ICS:

Chemical Methods of Test Sectional Committee, TXD 05	last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard, first published in 1952, was revised in 1962, 1975 and 1989. It has been last revised keeping in view the experience gained during its use and to make it up-to-date according to the national and international practices followed in this field. In this revision, modifications have been carriep out in scope, preparation of test specimens, procedure, and description of the test apparatus.

This fourth revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

vii) The Title of the standard has been updated.
viii) ICS number is incorporated in place of udc number.
ix) Apparatus and reagents has been updated.

The work carried out with the Bundesmann apparatus has produced evidence of unidentified variables. The reproducibility of the method is such that although variability within tests or ed given apparatus may be reduced to a satisfactory level, the variability between tests on different apparatus may be large. However, for testing water-repellency and water resistance of textile fabrics, the use of the Bundesmann apparatus is well established since the method fulfils a need where quality control testing within a laboratory is concerned.

Water passes through water-resistant fabrics by:

a) wetting of one side of the fabrics followed by capillary action thus bringing the water to the other side and wetting it (the resistance offered by fabrics to this action is influenced mainly by their water-repellency),

b) penetration of water through their interstices under its own or applied pressure (the resistance offered by fabrics to this action is influenced mainly by their construction or structure), or

c) a combination of (a) and (b).

A number of test methods have been developed for testing waterproofness, water repellency and water resistance of fabrics, namely, spray test, hydrostatic head test, Bundesmann test and cone test. However, the use of a particular test depends upon the type of fabric under test and its end use. So far no correlation has been established between the results of different test methods and hence their results are not comparable. The Bundesmann test adopted in this standard is designed to assess the behaviour of water resistant fabrics when exposed to heavy rain.

To assess the efficiency of proofing of water resistant fabrics permeable to air, the quantity of water absorbed by the specimen and that forced through the specimen as a result of exposure to artificial rainfall for the period of test are measured separately, and the data considered collectively.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes a method for determination of water repellency, resistance to wetting (in term of water absorbed) and resistance to penetration by water (in terms of water penetrated) of fabrics by the Bundesmann type apparatus.

1.1.1 It is primarily applicable to woven or non-woven water repellent fabrics that are permeable to air.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 3919 :1966	Methods For Sampling Cotton Fabrics For Determination Of Physical Characteristics
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)

3 PRINCIPLE

Four specimens of the fabrics under test are simultaneously exposed to a simulated heavy rain shower of controlled intensity, while the specimen as a whole is flexed and the under surface subjected to the rubbing action. The water absorbed by the specimens is determined after the test is over which is the measure for resistance to wetting. The penetrated water collected in cups is the measure for resistance to penetration by water.

4 SAMPLING

Sample shall be drawn so as to be representative of the lot. Sample drawn in compliance with the procedure laid down in the material specification or as agreed to between the buyer and the seller shall be taken as representative of the lot. In case of cotton fabrics, reference to IS 3919 shall be made.

5 PREPARATION OF TEST SPECIMENS

Condition the test sample as specified in **6.1**. From each individual piece in the test sample, cut out four circular test specimens without any crease, each of 140 mm diameter with a circular dye such that each is taken from different location spaced at least 100 mm away from the edge of the fabric sample being tested. The specimens shall not be folded, ironed or treated otherwise during the interval between the drawing of the sample and testing, except for conditioning. If possible the specimens should not be taken directly from the ends of the material, since experience has shown that the area density (for example, structure) and the finishing may be different to that of the majority of the fabric.

NOTE — The cutting of specimens by means of a circular cutting die and press is facilitated if squares 150 mm × 150 mm are first cut from the fabric sample.

6 CONDITIONING AND TESTING ATMOSPHERE

6.1 The test specimens shall be conditioned in the standard atmosphere at 65 ± 2 percent relative humidity and 27 ± 2°C temperature at least for 24 hours (*see* IS 6359). In case of fabric specimens heavier than 270 g/m^2, the minimum conditioning period shall be 48 hours.

6.2 The tests shall be preferably carried out in standard atmosphere (see **6.1**). In case it is not possible to carry out the test in standard atmosphere, the specimens shall be conditioned as provided for in 6.1 and tested in prevailing atmosphere within 15 minutes of their removal from the standard atmosphere (see **6.1**).

7 APPARATUS

7.1 The apparatus shall be of the continuous shower type (*see* **Annex A** for details).

7.2 Suitable Means for Cutting Specimens of 140 mm Diameter

A circular die shall be used with a press or a template and scissors.

7.3 A Mechanical Shaker, conforming to requirements given in **A-5**.

7.4 A Stop-Watch or Stop Clock

7.5 Airtight Containers

These containers shall be of known mass and of such a shape and size that the specimen may be inserted without being creased before exposure to the shower.

7.6 A Balance, sensitive to 0.01 g.

8 PROCEDURE

8.1 Determine the mass of each conditioned specimen in a tared airtight container to the nearest 0.01 g. Set the shower working. The water supply used for the test shall conform to the following requirements and any blocking to the drop-forming system (by foreign matter, etc.) must be avoided. Use of a filter (containing porcelain, Kieselghur candles) on water feeding is recommended.

a) *Temperature*

The temperature of water in the shower tank shall be 27 ±2°C. A thermostatically controlled domestic electric water heater may be used to maintain the required temperature.

b) *p*H

The $_p$H of the water shall be 7.0 f 1.0.

NOTE — If required, pH may be adjusted by passage of water through suitable ion-exchange resins, or distilled water may be used.

c) *Rate of Flow*

The rate of flow of water into a cup shall be 65 ± 3 ml/min per cup.

8.1.1 Check the rate of flow at least once every 60 min of continuous operation as follows:

Place the cup assembly in position inside the apparatus, with the cups drained and the draincocks closed. Switch on the motor. Swing away the tray to allow the drops to fall on the cups, simultaneously starting the stop watch or stop clock. Expose the cups for 1 min, swing the tray into position to intercept the shower, stop the motor and remove the cup assembly to its stand. Dry the outside of the draincocks. Drain each cup through the draincock into a 100 ml graduated cylinder and check that the required rate of flow has been obtained.

8.2 Before mounting the test specimens, dry all parts of the cups, wipers and clamps that may come in contact with the specimens. Remove any water in the exit tubes. Do not dry the insides of the cups which should be in drained condition at the start of each test. Close the draincocks.

8.3 Mount the specimens with the wiper mechanism in the depressed position. Lay the specimens over the cups and apply the size of clamping ring that will expose an area of specimen with diameter as close as possible to 100 mm. The specimens must be in continuous contact with the rims of cups without folds or other irregularity. Lock the clamping rings in position with the spring-operated clamps.

NOTE — It is important to note that the clamps should be so designed that according to its thickness, the test specimen is not exposed where it is mounted over a hard backing (for example. the outside of the cup rim) since the impact of the shower on fabric so mounted may lead to an increase in penetration through the test specimen.

8.4 Release the wiper arms, if necessary and place the cup assembly in position inside the apparatus. Switch on the motor. Swing away the tray to allow drops to fall on the specimens, simultaneously starting the stop-watch or stop-clock. Expose the specimens to the shower for 10 min unless otherwise agreed between the buyer and the seller.

8.5 At the end of the test period, swing the tray into position to intercept the shower, stop the motor and remove the cup assembly to its stand. Immediately unclamp each specimen from the cups and remove the loosely attached water by gripping each specimen without folding or creasing it in the clip of the mechanical shaker and rotating the handle so that the specimen receives 10 shakes. Transfer each specimen to an airtight container immediately after the shaking is completed.

8.6 Determine the mass of each loaded container to the nearest 0.01 g.

8.7 Dry the outside of the closed draincocks. Individually drain each cup into a measuring cylinder and measure to the nearest millilitre the volume of water collected from each cup separately.

8.8 Expression of Results

Calculate the absorption and penetration of water as follows.

8.8.1 *Absorption*

Calculate the percentage of absorption of water by the following formula:

$$A = \frac{(M_2 - M_2) \times 100 \times 2}{M_1}$$

where

A = percentage of absorption of water,

M_1 = mass of the test specimen before test in g, and

M_2 = mass of the test specimen after testing in g.

NOTE — Since the total area of the test specimen is double the exposed area, it is necessary to multiply the absorption figure by two to get the correct results.

8.8.2 *Penetration*

The volume of water in millilitres, collected in each cup, shall be expressed as the penetration of water.

8.8.3 The average of the four test results for absorption and penetration shall be deemed to be: (a) absorption in percentage, and (b) penetration in millilitre of water by and through the specimen, respectively.

8.9 Repeat the test prescribed in **8.1** to **8.8.3** with the remaining pieces in the test sample.

9 REPORT

9.1 The report shall include the following information:

a) The nature of the textile fabric tested;

b) The temperature, hardness and pH value of water used;
c) The period of rain shower exposure to;
d) The number of tests performed;
e) The absorption of water in percent by mass of each test specimen in the sample, the arithmetic mean and range; and
f) The penetration of water (in ml) through each test specimen.

ANNEX A

(*Clause* **7.1**)

BUNDESMANN TYPE APPARATUS

A-l GENERAL DESCRIPTION

A-l.1 The Bundesmann apparatus (see Fig. 1) shall be provided with a water tank fitted with a number of fine jets to generate a shower of water simulating rainfall. The tank shall be mounted on a fixed height above the four metal test cups provided for mounting the specimens. The cups shall be mounted on the apparatus in such a manner that they can be rotated by means of an electric motor ensuring equal exposure for each specimen to falling water. The interior of each cup (or specimen holder) shall be fitted with an automatically worked wiper device. The wiper arms shall press lightly against the specimen by means of springs so that the specimen is flexed slightly in addition to the rubbing action as the wiper arms pass over its surface. The cups and base plate shall be separated from the electric motor by means of a sheet metal trough.

A-2 SHOWER

A-2.1 The shower tanks shall be provided with 304 brass jets made as shown in Fig. 2. They shall be placed 20 mm apart centre-to-centre.

A-2.2 The means shall, be provided for the formation of uniformly spaced drops of average mass 0.075 ± 0.010 g when the rate of flow of water at 27 ± 2°C and *p*H 6 to 8 is established at 65 ± 3 ml/min per cup.

A-2.3 The drops shall fall vertically and cover an area greater than that swept by the cups as the cups assembly rotates. The vertical distance between the centre of the specimens when fixed in a position at which the drops are released, shall be 1 500 ± 10 mm.

A-3 CUP ASSEMBLY

A-3.1 The cup assembly shall rotate at 5 ± 1 rev/min under the shower.

A-3.2 Four cups shall be so mounted on the assembly that the specimens are tilted 10 to 15° to the horizontal so as to shed water outwards. The centre of the mounted specimens shall be 105 ± 10 mm from the vertical axis of rotation of the cup assembly.

A-3.3 The cups having a circular orifice shall be provided with clamps of such a kind that an area of the specimen with 100 mm diameter is exposed. There shall be no leakage round the mounted specimen into the cup and through the specimen at the clamps.

A-3.4 An exit hole or aperture of 7 ± 1 mm diameter shall be provided for allowing air displacement but not permitting the ingress of water into the cup. The cups shall have a minimum capacity of 350 ml when water fills the cup up to the exit hole. The cup shall be provided with draincocks; having a bore of 3 mm, *Min* so that the water collected may be completely drained.

NOTE — The air exit holes in the cups may be advantageously provided with external metal tubes that ace bent in such a way that the impact of the shower on the cup assembly does not cause the water to splash up into the tubes during the test period. This will prevent water that overflows down the cup during the exposure from becoming lodged in the exit hole.

A-3.5 Each cup shall be provided with four wiper arms fixed at right angles to each other and rotating about the axis of the cup. When released, the highest point of the wiper arm shall stand 3.0 mm proud of the rim of the cup and the wipers shall press initially against the specimen with a load of 400 ± 50 g. The wiper arms shall sweep an arc of 100 ± 5°, making 20 complete oscillations per minute. The length of the base of the wiper arms shall be 96 mm. the maximum width of the wiper and its support shall not exceed 9.5 mm. The horizontal locating surfaces of the wiper supports shall lie in the same plane and this plane shall be at right angles to the axis of rotation of the wiper-head spindle.

A-3.6 The wiping surfaces shall be made from stainless steel of good quality. The operative surface of the wipers shall be formed by machining the material to form a part of the cylinder having a diameter 12.7 ± 0.1 mm with its axis disposed radially about the wiper head spindle when viewed from above and tilted downwards 2° ± 3 when viewed horizontally. The thickness of the wiping surface shall be from 5.08 to 5.13 mm. The extremities of the wipers shall have a radius of 3 mm. The centre of the wipers shall be indented in the form of a cone with a diameter of 13 mm diminishing to 11 mm over a depth of 0.8 mm so that the centre of indentation is coaxial with the wiper cylinders. Care shall be taken to ensure that the ends of the single wiper make a closely fitting but joint with the opposite sides of the doubled wiper. The machining marks shall then be carefully removed by filling parallel to the cylinder axis and final polish given to the surface by Grade 00 emery paper to which is added a little paraffin. Paraffin residues which would contaminate the next specimen to be tested, should be removed by subsequent cleaning, such as with trichloroethylene.

A-4 FILTER

A-4.1 It is desirable for almost all water supplies, to provide a filter to obviate the need for frequent cleaning of jets. A piece of closely woven cotton fabric, wrapped around a perforated metal support, may be efficient filter for use on Bundesmann type apparatus.

A-5 MECHANICAL SHAKER

A-5.1 A clip for holding the specimen shall be attached at the end of 213 mm long arm to which a torque of 9.7 kgf cm should be applied when this arm is released. The arm shall move through an arc of 170° to the horizontal position and come to rest with a residual torque of 1.15 kgf cm.

A-5.2 The mass of the arm shall be such that the velocity measured tangentially at a radius of 195 mm and at a deflection of 140 ± 5° from the initial position shall be 5.4 ± 0.54 m/s.

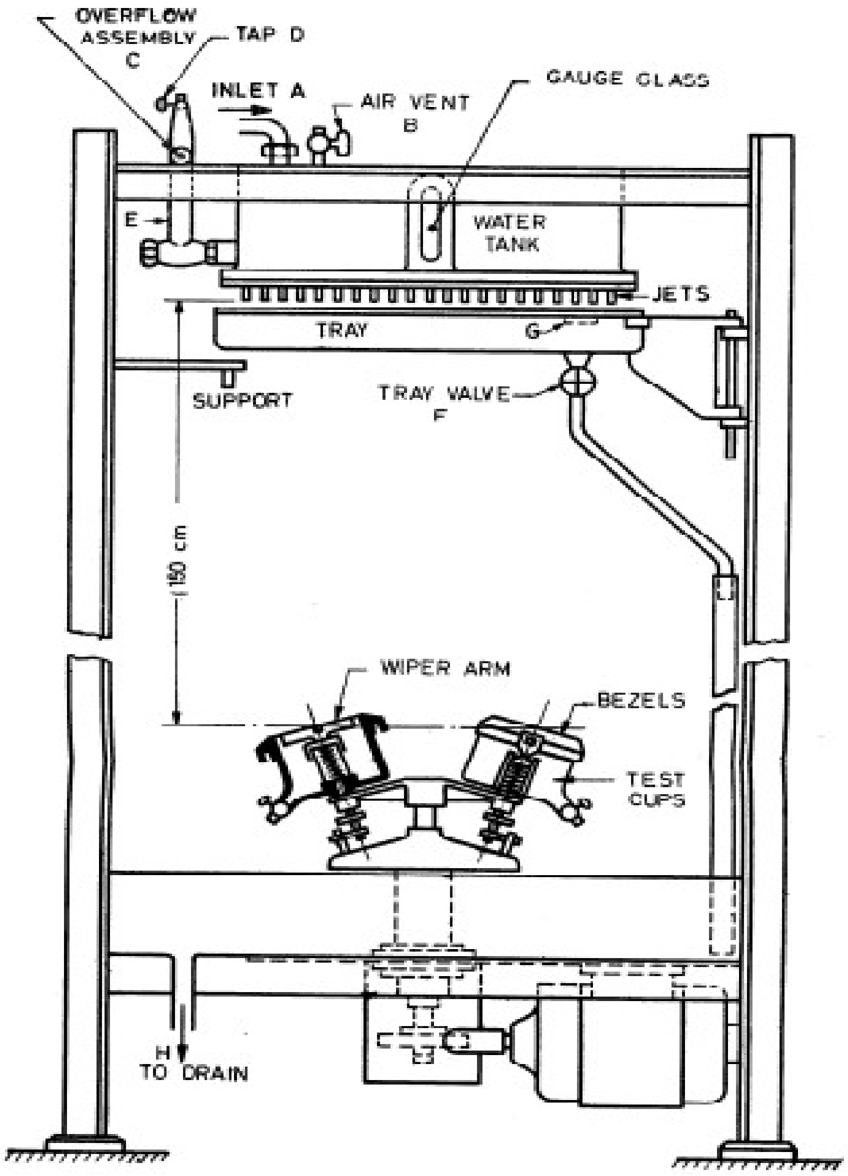
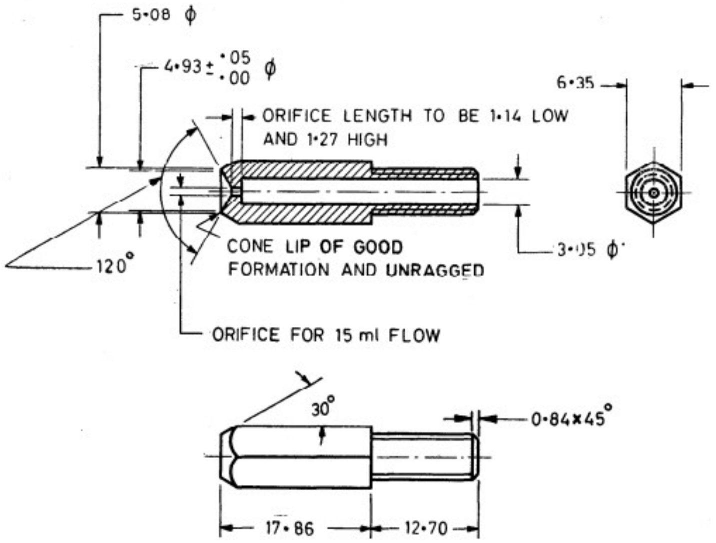


Fig. 1 The Bundesmann Tester



All dimensions in millimetres.

Fig. 2 Jet for The Bundesmann Tester - Water Repellency Testing Apparatus

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भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

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XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि – पानी में भिगोने पर ऊनयुक्त वस्त्रों का परिमाणात्मक परिवर्तन ज्ञात करना

(आईएस 665 का *दूसरा पुनरीक्षण*)

Draft *Indian Standard*

Textiles —Determination of Dimensional Changes of Fabrics Containing Wool on Soaking In Water

(*Second Revision* of IS 665)

ICS:

Chemical Methods of Test last date for receipt of comments is

FOREWORD

(Formal clause will be added later)

This standard was first published in 1962 and has been revised in 1989 to make it up to date on the basis of experience gained during its use. In last revision, the following changes have been carried out:

a) The title and scope have been modified to cover woven and knitted textile fabrics of all kinds except those containing less than 50 percent wool;
b) Sampling, preparation of test specimens, apparatus and test procedure has been modified; and
c) Use of an efficient wetting agent has been specified for thorough soaking of the specimens.

This second revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

x) The Title of the standard has been updated.
xi) References to the Indian standard have been updated.
xii) ICS number is incorporated in place of udc number.
xiii) Apparatus and reagents has been updated.

On soaking with water, fabrics containing wool shrink due to the relaxation of strains to which they are subjected during their manufacture. Appreciable shrinkage also takes place during drying of the wet fabrics. As fabrics containing wool are quite often exposed to rain or humid atmosphere, their shrinkage behaviour is of obvious interest to the consumer.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).

1 SCOPE

This standard prescribes a method for determination of dimensional changes of all woven and knitted fabrics containing more than 50 percent wool when wetted out without agitation and dried. The test is applicable to fully finished fabrics.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 1070 : 2023	Reagent grade water — Specification (*Fourth Revision*)
IS 6359 : 2023	Method for conditioning of textiles (*First Revision*)
IS 10099 : 2020 ISO 3759:2011	Textiles – Preparation marking and measuring of fabric specimens and garments in tests for determination of dimensional change (*First Revision*)

3 PRINCIPLE

The specimen, after conditioning, is measured, soaked, dried under prescribed conditions, reconditioned and remeasured. The dimensional changes obtained are calculated from the means of the original and final dimensions in the lengthwise and/or width wise directions.

4 TERMINOLOGY

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

4.1 Dimensional Change, Percent

The decrease or increase in dimensions (that is, in length or width or both) after subjecting the fabric to the prescribed test, expressed as a percentage of the corresponding dimensions before such test.

5 SAMPLING

Sample from the lot shall be drawn so as to be representative of the lot. Sample drawn in accordance with the relevant material specification or as agreed to between the buyer and the Seller shall be held to be representative of the lot.

6 APPARATUS

6.1 Watertight Tray or Container It shall be approximately 100 mm deep and of sufficient area to contain the specimen horizontally without folding. It shall be provided with a glass plate for covering and with suitable draining arrangement.

6.2 Steel Rule, graduated in millimetres.

6.3 Means of Marking Reference Point, as specified in **5.3** of IS 10099.

6.4 Flat Horizontal Surface, at least 100 mm longer than the specimen in each direction.

6.5 Trays, with mesh of approximately 10 mm, on which specimens are dried and conditioned.

6.6 Stopwatch

6.7 Towels

7 REAGENTS

7.1 Quality of Reagents unless otherwise specified, pure chemicals and distilled water (see IS 1070) shall be used wherever the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

7.2 Sodium Hexametaphosphate, commercially available as 'Calgon'.

7.3 An Efficient Wetting Agent, for example, sodium die—octyl sulpho—succinate or dodecyl benzene sodium sulphonate.

8 ATMOSPHERE FOR CONDITIONING AND TESTING

8.1 Prior to test, the test specimens shall be conditioned to moisture equilibrium from the dry side in a standard atmosphere at 65 ± 2 percent relative humidity and 27°C ± 2°C temperature (*see* IS 6359).

8.2 When the test specimens have been left in such an atmosphere for 24 hours in such a way as to expose, as far as possible, all portions of the specimen to the atmosphere, they shall be deemed to have reached moisture equilibrium. However, case of fabrics which weigh more than 270 g/m^2, this period shall be 48 hours.

NOTE — It is preferable to store the newly finished fabrics for about a week before conditioning.

8.3 The testing shall be carried out in the standard atmosphere (see **8.2)**.

9 TEST SPECIMENS

Draw at least one test specimen from each piece of wide fabrics measuring not less than 500 × 500 mm with edges parallel to the length and width of the fabric and at least three specimens from each piece of narrow fabrics measuring 500 mm in length and of full width. Do not take any specimen within 1 m of either end of the piece. In case of wide fabrics, do not take specimens with selvedges. For knitted fabrics, make up the specimens in double thickness, sewing the free edges together with dimensionally stable thread. When fabrics with fancy weave structures are being tested, ensure as far as possible that exact number of repeats are taken in each test specimen.

NOTE — The specimen should be cut and not torn from the fabric.

10 PROCEDURE

10.1 Mark on each specimen pairs of reference points as prescribed in IS 10099. Lay the marked specimens without tension on the mesh tray and expose it to the standard atmosphere for conditioning (see **8.2**) at least for 24 hours to reach moisture equilibrium. Determine the mass of the specimen. Lay the conditioned specimen without stretching on the flat surface and measure and record the distance between the corresponding reference points to the nearest millimetre.

10.2 Soak the measured specimen laid flat for 1 hour at 35°C to 37°C in water, to which has been added 0.5 g/l of an efficient wetting agent (calculated on active matter content).

NOTE — The water should be of zero hardness or of not more than 50 ppm of calcium carbonate hardness to which sodium hexametaphosphate has been added at The rate of 0.08 g/l per 10 ppm of calcium carbonate. Ensure that the depth of liquid above the specimen is at least 25 mm. If necessary, keep the specimen submerged, for example, by use of small weight-pieces, ensuring that these are as small as possible.

10.3 After one hour, pour off the liquid and remove the specimen, without distortion, from the tray or container and place it flat on a towel. In this process, handle the specimen with care. The most convenient method is to fold over the edge to the centre so that the whole specimen is supported when lifted on to the towel. Remove excess moisture by lightly pressing another towel on top of the specimen.

10.4 Lay the specimen flat on the mesh tray, dry it at room temperature and condition it to within 5 percent of its original mass in the standard atmosphere (*see* **8.2**), taking care to condition from the wet side. Lay the dried, conditioned specimen on the flat surface and re measure and record the distances between corresponding reference points, to the nearest millimetre.

10.5 Repeat the procedure from **10.1** to **10.4** with the remaining test specimens.

11 CALCULATION AND EXPRESSION OF RESULTS

11.1 Calculate the mean of the original dimensions and the mean of the final dimensions for each test specimen in each direction separately to the nearest millimetre. Calculate separately the percentage dimensional change for each specimen in each direction (lengthways and widthways) by the formula:

$$\text{Dimensional charge, percent} = \frac{100\,(b-a)}{a}$$

Where

a = mean original dimension before treatment for each test specimen; and

b = mean final dimension after treatment for each test specimen.

11.2 Calculate the mean of dimensional changes of all the specimens separately in each direction.

11.3 Express the mean dimensional change, percent in each direction to the nearest 0.25 percent.

12 REPORT

12.1 The report shall include the following information:

a) Whether the specimens were from wide or narrow fabrics and the number of specimens tested from each piece in the test sample;
b) Mean dimensional change, percent in the lengthways and widthways directions for wide fabrics, and in the lengthways direction for narrow fabrics; and
c) Indicate a decrease in dimension by a minus sign and an increase by a plus sign.

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

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XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि – रेयान और सिंथेटिक फाइबर से बुने हुए कपड़ों की धुलाई पर आयामी परिवर्तन के निर्धारण की विधि

(आईएस 1299 का *तीसरा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Determination of Dimensional Changes on Washing of Fabrics Woven From Rayon and Synthetic Fibres

(*Third Revision* of IS 1299)

ICS:

Chemical Methods of Test Sectional Committee, TXD 05	last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1958. It was revised in 1963 and 1984 to express all the values in metric system. The last revision is again in the light of the experience gained during its use. In past revision, the Cubex International Shrinkage Testing Apparatus has been included.

This third revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) References to the Indian standard have been updated.
iii) ICS number is incorporated in place of udc number.
iv) Apparatus and reagents has been updated.

Merely on soaking in water, fabrics woven from rayon and synthetic fibres are liable to change in dimensions; when washed with soap, their dimensional instability ty is liable to be higher. As the goods made out of these materials are usually washed with soap, their dimensional change behavior is of obvious interest to the consumer.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes a method for determination of dimensional changes on washing of fabrics woven from rayon and synthetic fibres or their mixtures.

1.2 The method is intended only for the assessment of dimensional changes undergone by woven fabrics subjected to single mechanical washing. When it is desired to determine the amount of progressive dimensional changes, the test specimens should be washed repeatedly and the amount of dimensional changes in the washed specimens and the number of testing cycles to which the specimens have been subjected indicated clearly.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)
IS 10099 : 2020 ISO 3759 : 2011	Textiles—Preparation, Marking and Measuring of Fabric Specimens and Garments in Tests for Determination of Dimensional Change (*First Revision*)

3 TERMINOLOGY

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

3.1 Dimensional Change, Percent — The increase or decrease in dimensions (length or width or area) after subjecting the fabric to the prescribed test, expressed as a percentage of the corresponding dimension before such test.

4 SAMPLING

4.1 Lot — The quantity of the fabric purporting to be of one definite type and quality, delivered to a buyer against one dispatch note shall constitute a lot.

4.2 Samples for test shall be selected so as to be representative of the lot. Samples drawn in compliance with the material specification or as agreed to between the buyer and the seller shall be held to be representative of the lot.

5 TEST SPECIMENS

5.1 From the samples under test draw 3 test specimens, each, of length 650 mm and of full width, taking care that:

a) The specimens are not drawn from within 1 m of either end of the piece,
b) No two specimens are drawn from the same piece, and
c) The specimens are cut and not torn from the piece.

5.2 The free edges of the specimens shall be sewn with a dimensionally stable thread, for example, polyester thread, using a chain stitch and stitch length of 2 to 3 mm.

6 CONDITIONING OF TEST SPECIMENS

6.1 Prior to test, the test specimens shall be conditioned to moisture equilibrium from dry side in the standard atmosphere at 65 ± 2 percent relative humidity and 27 ± 2°C temperature (*see* IS: 6359).

6.2 When the test specimens have been left in such an atmosphere for 24 hours in such a way as to expose, ***as*** far as possible**,** all positions of the specimens to the atmosphere, they shall be deemed to have reached moisture equilibrium. However, in the case of fabrics which weigh more than 270 g/m^2, this period shall be 48 hours.

NOTE ── It is preferable to store the newly finished fabrics for about a week before conditioning.

6.3 Atmospheric Conditions for Testing — The test shall be carried out in the standard atmosphere (*see* **6.1**).

7 APPARATUS

7.1 Cubex International Shrinkage Testing Apparatus or Wash Wheel or an Equivalent Machine - *see* **ANNEX A**.

7.2 Extractor — A laundry—type centrifugal extractor with perforated basket, capable of adjusting the moisture retention of the fabric to a range between 50 and 100 percent (*m/m*) based on the air-dry mass of the fabric.

NOTES

1 Any other apparatus that will give equivalent results without fabric distortion for example, rubber roll wringer which could pass the specimen through the rolls along a diagonal line without altering its dimensions may also be used.
2 Heavier fabrics of tight construction require a high moisture retention to ensure removal of wrinkles during pressing.

7.3 Pressing Equipment — A flat bed press capable of pressing a specimen of size 600 × 600 mm and of providing a minimum pressure of 3 kPa. The temperature of the press shall be 150± l 5°C.
7.4 Marking Equipment — As specified in **4.3** of IS: 10099.

7.5 Make-Weights — The make-weights shall consist of fabric similar to that of the test specimens. Each make-weight shall be adjusted to a *p*H of 7 prior to use.

7.6 Stopwatch

7.7 Steel Rule, graduated in millimeters.

7.8 Weighing Machine

8 REAGENT

8.1 Soap Solution — Prepare a stock solution by dissolving 0’5 kg of soap in 4 litres of hot water. When cooled, this solution forms a thick jelly which may be used as required. From this stock solution, prepare a soap solution for the test containing 5 g/l of soap on dry mass basis.

Soap meeting the following composition (based upon dry mass) is satisfactory:

Free alkali calculated as Na_2CO_3, Max	0.3 percent
Free alkali calculated as NaOH, Max	0.1 percent
Combined fatty acids calculated as Na salt, Min	85 percent
Titre of mixed fatty acids prepared from the soap, *Max*	39°C
Iodine value of fatty acids, *Max*	50

NOTE — Information regarding availability of the soap of above composition may be had from ISI.

9 PREPARATION, MARKING AND MEASURING OF TEST SPECIMENS

9.1 The test specimens shall be prepared, marked and measured as specified in IS: 10099.

10 PROCEDURE

10.1 Initial Measurement — Expose the specimens to the standard atmosphere as specified in **6.1** until they reach moisture equilibrium (*see* **6.2**). Measure the distance between the centers of each of the pairs of marks to the nearest millimeter using the procedure described in IS: 10099.

10.2 Washing and Rinsing

10.2.1 Run water into the machine (*see* **7.1**) at the temperature such that the machine will heat the liquor to 50°C within 10 minutes, maximum, and fill to the proper level for washing (*see* **A-l.5** or **A-2.6**) within 4 minutes.

10.2.2 Add a load of mass 1 kg, made up of the test specimens plus make-weights not more than half the load of the specimens.

10.2.3 Add sufficient soap (**8.1**) to give good running suds. If more than 5 g/l of soap is used, the amount and reasons for this shall be reported [*see* **12.1 (c)]**. The temperature shall be maintained at not less than 45°C.

10.2.4 When the machine has run for 45 minutes, timed from the start of the test, drain off the soap solution quickly and fill the machine with water to the proper level for rinsing. Raise the temperature to 50°C within 10 minutes maximum.

10.2.5 When the machine has run for another 5 minutes, drain off the water, fill again and heat to 50°C as before.

10.2.6 At the end of the next 5 minute: drain off the water quickly. Allow the machine to run without further additions for 5 minutes more. Stop the machine.

10.3 Extraction — Remove the specimens from the machine by folding the corners of each to the centre in such a way that the whole specimen can be supported in hand. Lay each specimen flat against the side of the perforated basket of the extractor to avoid streching during rotation and extract the excess water (**7.2**).

10.4 Pressing — Press each specimen taking care to ensure that it is smoothened. Without stretching, remove wrinkles before pressing. Continue this operation until sufficient moisture has been extracted from the fabric to ensure conditioning from the dry side.

10.5 Final Measurement—Allow the pressed specimen to cool, condition in the standard atmosphere and measure the distance between the centres of the markings to the nearest millimetre (*see* IS 10099).

11 CALCULATlON AND EXPRESSION OF RESULTS

11.1 Calculate the dimensional changes in the length and width directions separately by the following formula:

$$\text{Dimensional change, percent} = \frac{F-I}{I} \times 100$$

where

F = final measurement (*see* 9.5); and
I = initial measurement (*see* 9.1).

Express as percentages of the original, value to the nearest 0.5 percent, using a minus sign (-) to indicate shrinkage and a plus sign (+) to indicate elongation. Calculate the mean value and the range of the dimensional change for each set of replicates.

11.2 Determine the area dimensional change as follows:

Area dimensional change, percent

$$= D_W + D_L - \frac{D_W \times D_L}{100}$$

Where

D_W=mean dimensional change, percent in width; and
D_L=mean dimensional change, percent in length.

12 REPORT

12.1 The test report shall include the following particulars:

a) A statement that the test was conducted in accordance with this Indian Standard;

b) Type of apparatus used (*see* **7.1);**

c) Concentration of the soap solution used (state the reasons for using more than 5 g/l of soap when this amount is exceeded);

d) Number of testing cycles to which the specimens were subjected;

e) Dimensional changes in each specimen in the length and width directions and in area;

f) Mean dimensional changes in the replicates, in the length and width directions and in area; and

g) Range of individual dimensional change values.

ANNEX A

(*Clause* **7.1**)

DETAILS OF WASHING APPARATUS

A-l CUBEX INTERNATIONAL SHRINKAGE TESTING

A-l.1 The apparatus consists of a stainless steel hollow cube (368 × 368 × 368 mm inside measurement) having a capacity of 50 litres. The cube is insulated on five sides and the insulation is covered by a metal outer casing in one face there is an opening fitted with a watertight hinged lid, through which the cube is loaded and discharged. The cube rotates on spindles fixed at diagonally opposite corners, the apparatus being fitted with a reversible drive.

A-l.2 Mounted on the frame is a motor incorporating reduction gearing and an electrically controlled timing device which periodically reverses the motion of the cube. The apparatus is revolved at 60 rev/min for given time, the direction of rotation being automatically reversed every 5 minutes with a 5-second pause between the reversing cycles. The timing device covers the range of 0 to 60 minutes and automatically cuts off at the end of the pre-set period.

A-l.3 At one corner of the cube is mounted a manually operable drain valve, through which liquid may escape when it is opened by the operator.

A-l.4 An expanded steel guard is provided and is so arranged that when it is lifted to allow the cube to be loaded or discharged, the driving power to the cube is cut off. The whole assembly may be mounted on a rigid steel framework.

A-l.5 The load shall be made up of the test specimens plus makeweights not more than half the load of the specimens. The quantity of liquor used shall be sufficient to cover the load. Normally a load of 1 kg shall be used in 25 litres of the liquor.

A-2 WASH WHEEL

A-2.1 The wash wheel comprises horizontal cylindrical machine with rotating cage and reversing mechanism. The cage should have a diameter between 400 and 600 mm and peripheral speed of 50 to 55 m/min. Other diameters may also be used provided that the rotational frequency is adjusted **to** give an equivalent peripheral speed.

A-2.2 Preferably 3 or 4 fins or lifters, about 8 cm wide, equally spaced around the interior of the cage and extending its full length, should be used. A single fin or 2 fins may also be used provided that equivalent results are obtained.

A-2.3 The cage shall turn at such a speed that the load is lifted by the fins and falls back into it. (A peripheral speed of 54 m/min has been found satisfactory.) The cage shall make 5 to 10 revolutions before its direction of rotation is reversed.

A-2.4 The machine shall be equipped with a heating facility, using live steam, gas or electricity, and an outlet large enough to permit discharge of all liquid from the machine in less than 2 minutes.

A-2.5 A thermometer in a suitable well, or an equivalent equipment, shall be provided to indicate the temperature of water within 1 °C during washing and rinsing, and there shall be an outside water gauge to indicate the level of water in the wash wheel.

A-2.6 The mass of the load to be run in the machine shall be between 8 and 50 kg of air-dry fabric per cubic metre of cage space, including the volume of the fins. The load shall be made up of the test specimens plus make-weights not more than half the load of the specimens. The quantity of liquor used shall be sufficient to cover the load, the level being situated at a height from one-seventh to one third of the inside diameter of the cage.

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भारतीय मानक **मसौदा**

वस्त्रादि – कपड़े (ऊन के अलावा) - पानी में भिगोने पर आयामी परिवर्तन निर्धारित करने की विधि

(आई एस 2977 का *दूसरा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Fabrics (Other Than Wool) — Method for Determination of Dimensional Changes on Soaking In Water

(*Second Revision* of IS 2977)

ICS:

Chemical Methods of Test Sectional Committee, TXD 05

last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1966 and has been revised in 1989 to make it up to date on the basis of experience gained during its use. In last revision the following changes have been carried out:

a) The title and scope have been modified to cover woven and knitted textile fabrics of all kinds except those containing more than 50 percent wool;
b) Sampling, preparation of test specimens, apparatus and test procedure have been modified; and
c) Use of an efficient wetting agent has been specified for thorough soaking of the specimens.

This second revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) References to the Indian standard have been updated.
iii) ICS number is incorporated in place of udc number.
iv) Apparatus and reagents has been updated.
v) Amendment has been incorporated.

On merely soaking in water, woven fabrics undergo change in dimensions due to relaxation of the strains which are introduced during manufacture and processing operations. The dimensional changes thus introduced are of obvious interest to the consumer. It is hoped that the method prescribed here will be found useful by the consumer.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes a method for determination of dimensional changes of all woven and knitted fabrics, other than those containing more than 50 percent wool, on soaking in water, without agitation.

1.2 The method is intended only for the assessment of dimensional changes undergone by fabrics subjected to a single soaking procedure. When it is desired to determine the amount of progressive dimensional changes, the test specimens should be soaked repeatedly and the amount of dimensional changes of the soaked specimens and the number of soaking cycles to which the specimens has been subjected, be indicated clearly in the report.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 1070 : 2023	Reagent Grade Water — Specification (*Fourth Revision*)
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)
IS 10099 : 2020 ISO 3759 : 2011	Textiles—Preparation, Marking and Measuring of Fabric Specimens and Garments in Tests for Determination of Dimensional Change (*First Revision*)

3 PRINCIPLE

3.1 The specimen, after conditioning, is measured, soaked, dried under prescribed conditions, reconditioned and re-measured. The dimensional changes obtained are calculated from the means of the original and final dimensions in the lengthways and/or width ways directions.

4 TERMINOLOGY

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

4.1 Dimensional Change Percent

The decrease or increase in dimensions (that is, in length or width or both) after subjecting the fabric to the prescribed test, expressed as a percentage of the corresponding dimensions before such test.

5 SAMPLING

5.1 Sample from the lot shall be drawn so as to be representative of the lot. Sample drawn in accordance with the relevant material specification or as agreed to between the buyer and the seller shall be held to be representative of the lot.

6 APPARATUS

6.1 Watertight Tray or Container

Approximately 100 mm deep and of sufficient area to contain the specimen horizontally without folding. It shall be provided with a glass plate for covering and with suitable draining arrangement.

6.2 Steel Rule, graduated in millimeters.

6.3 Means of Marking Reference Points, as specified in **4.3** of IS 10099.

6.4 Two Pieces of Plate Glass, each measuring at least 600 × 600 mm.

6.5 Stopwatch

7 REAGENTS

7.1 Quality of Reagents

Unless otherwise specified, pure chemicals and distilled water (see IS 1070) shall be used wherever the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

7.2 Sodium Hexametaphosphate, commercially available as 'Calgon'.

7.3 An Efficient Wetting Agent, for example, sodium di-octyl sulphosuccinate or dodecyl benzene sodium sulphonate.

8 ATMOSPHERE FOR CONDITIONING AND TESTING

8.1 Prior to test, the test specimens shall be conditioned to moisture equilibrium from the dry side in a standard atmosphere at 65 ± 2 percent relative humidity and 27 ± 2°C temperature (*see* IS 6359).

8.2 When the test specimens have been left in such an atmosphere for 24 hours in such a way as to expose, as far as possible, all portions of the specimen to the atmosphere, they shall be deemed to have reached moisture equilibrium. However, in case of fabrics which weigh more than 270 g/m^2, this period shall be 48 hours.

NOTE — It is preferable to store the newly finished fabrics for about a week before conditioning.

8.3 The testing shall be carried out in the standard atmosphere (see **8.2**).

9 TEST SPECIMENS

9.1 Draw at least one test specimen from each piece of wide fabrics measuring not less than 500 mm × 500 mm with edges parallel to the length and width of fabric and at least three specimens from each piece of narrow fabrics measuring 500 mm in length and of full width. Do not take any specimen within 1 m of either end of the piece. In case of wide fabrics, do not take specimens with selvedges. For knitted fabrics, make up the specimens in double thickness, sewing the free edges together with dimensionally stable thread. When fabrics with fancy weave structures are being tested, ensure as far as possible that exact number of repeats are taken in each test specimen.

NOTE — The specimen should be cut and not torn from the fabric.

10 PROCEDURE

10.1 Preparation, Marking and Measuring of Test Specimens before Soaking

Mark and measure the distances between reference points in the test specimens previously conditioned in the standard atmosphere (see **8.2**) as prescribed in **6.2** to **6.5** of IS 10099.

10.2 Treatment of Test Specimen

10.2.1 Soak the measured specimen laid flat after removal of all creases and wrinkles by hand for 2 hours in water in the watertight tray containing water and 0.5 g/l of an efficient wetting agent (calculated active content) at 25 to 35°C temperature.

NOTE — The water should be of zero hardness or of not more than 50 ppm of calcium carbonate hardness to which sodium hexametaphosphate has been added at the rate of 0.08 g/l per 10 ppm of calcium carbonate. Ensure that the depth of liquid above the specimen is at least 25 mm. If necessary, keep the specimen submerged, for example, by use of small weight-pieces, ensuring that these areas small as possible.

10.2.2 After 2 hours, pour off the liquid and remove the specimen without distortion from the tray and place it flat on a towel. In this process, handle the specimen with care. The most convenient method is to fold the corners to the center so that the whole specimen is supported when lifted on to the towel. Remove excess moisture by lightly pressing another towel on top of the specimen.

10.2.3 Lay the specimen on a smooth flat surface and allow it to dry at room temperature. Condition the specimen in the standard atmosphere (see **8.2**) to moisture equilibrium from the dry side and re-measure the distances between corresponding reference points to the nearest mm as prescribed in **9.1**.

10.3 Repeat the procedure from **10.1** to **10.2.3** with the remaining test specimens.

11 CALCULATION AND EXPRESSION OF RESULTS

11.1 Calculate the mean of the original dimensions and the mean of the final dimensions for each test specimen in each direction separately to the nearest mm. Calculate separately the percentage dimensional change for each specimen in each direction (lengthways and width ways) by the formula:

$$\text{Dimensional change, percent} = 100\frac{(b-a)}{a}$$

where

a = as mean original dimension before treatment for each test specimen, and
b = mean final dimension after treatment for each test specimen.

11.2 Calculate the mean of the dimensional changes of all the specimens separately in each direction.

11.3 Express the mean dimensional change, percent in each direction to the nearest 0.1 percent.

12 REPORT

12.1 The report shall include the following information:

a) Whether the specimens were from wide or narrow fabrics and the number of specimens tested from each piece in the test sample;
b) The mean dimensional change, percent in the lengthways and width ways direction for wide fabrics, and in the lengthways direction for narrow fabrics; and
c) Indicate a decrease in dimension by a minus sign and an increase by a plus sign.

वस्त्रादि – पुनर्जीवित सेल्युलोज फाइबर और कपास के बाइनरी मिश्रण के मात्रात्मक रासायनिक विश्लेषण के लिए विधि भाग 2 कैडोक्सन सॉल्वेंट विधि

(आईएस 1889-2 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Quantitative Chemical Analysis of Binary Mixtures of Regenerated Cellulose Fibers and Cotton Part 2 Cadoxen Solvent Method

(*First Revision* of IS 1889-2)

ICS:

Chemical Methods of Test Sectional Committee, TXD 05	last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard, first published in 1976. This first revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) ICS number is incorporated in place of udc number.
iii) References to the Indian standard has been updated

The Indian Standard on method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton, when first published in 1962 covered only sodium zincate method. While taking up the revision of this standard, the Committee decided to cover Cadoxen solvent method and formic acid-zinc chloride method also as Part II and Part III of this standard respectively.

The use of different fibre blends in textiles has necessitated the formulation of standard methods for identification and quantitative estimation of respective fibres. The quantitative analysis of textile fibres in mixtures is of considerable importance to textile technologists, traders and consumers.

In the preparation of this standard (Parts I to III) due weightage has been given to the test methods prevalent in the industry and trade and also the methods developed by International Organization for Standardization, ISO. Parts I and III are based mainly on ISO 1833 ‘Textiles - Binary fibre mixtures - Quantitative chemical analysis ‘. This part (Part II) is based on the method developed by Prof W. B. Achwal of the University of Bombay (Department of Chemical Technology), Bombay, and the extensive experiments carried out at the Ahmedabad Textile Industry’s Research

Association, Ahmadabad, the Bombay Textile Research Association, Bombay, and the Silk & Art Silk Mills' Research Association, Bombay.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard (Part II) prescribes Cadoxen solvent method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton in any textile form, such as fibre, yarn or fabric.

NOTE—Before conducting an analysis according to this method, the fibres present in the mixture should be identified (*see* IS: 667) and the sample to be analysed shall be freed from all non-fibrous matter by the method given in **ANNEX A**. Dye in the dyed fibrea is considered to be an integral part of the fibre and is not to be removed.

1.1.1 This method is not applicable to mixtures in which the cotton has suffered extensive chemical degradation, nor when the viscose, cupro or modal fibre is rendered incompletely soluble by the presence of certain permanent finishes or reactive dyes that cannot be removed completely.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 667 : 1981	Methods For Identification Of Textile Fibres (*First Revision*)
IS 5463 : 2022	Methods for Sampling of Cotton Fabrics for Chemical Tests (*First Revision*)

3 PRINCIPLE

3.1 A sample of the mixture is dried and weighed. The regenerated cellulose fibres in the sample are dissolved in Cadoxen solvent. The residue, that is, cotton, is collected, washed, dried and weighed and the proportion of regenerated cellulose and cotton is calculated,

4 SAMPLING

4.1 Lot — The quantity of textile material of definite type and quality delivered to one buyer against one despatch note shall constitute a lot.

4.1.1 If the textile material is fibre or yarn and the lot consists of more than 200 kg of the material, it shall be divided into sub-lots weighing 200 kg or less and each sub-lot shall be tested separately.

4.2 Sampling for Fibre and Yarn — From a sub-lot 15 increments weighing approximately 10 g each shall be taken from different parts and mixed thoroughly to constitute a test sample.

4.3 Sampling for Fabrics — From each piece in the gross sample selected as in IS: 5463 cut out small portions from at least two different parts weighing about 25.g. Dissect the small portions of the fabric thus collected into yarn and mix thoroughly. This shall constitute a test sample.

5 APPARATUS

5.1 Sintered Glass Filter Crucibles — of appropriate capacity with pore size of 90 to 150 microns (porosity 1) and fitted with ground glass stoppers. If the stoppers are not available, the crucibles should be enclosed in weighing bottles for weighing.

5.2 Desiccator — with phosphorus pentoxide as desiccant.

5.3 Analytical Balance — of an accuracy of 0.000 2 g.

5.4 Conical Flask — of 150 ml capacity, provided with a glass stopper.

5.5 Ventilated Oven — for drying specimens/residue at 105 ±3°C.

6 REAGENTS

6.1 Cadoxen Solvent — containing 4.6 ± 0.1 percent cadmium and 28 percent ethylenediamine.

6.1.1 ***Method of Preparation*** — Dilute freshly distilled ethylenediamine with distilled water to 28 percent (*m/m*). Coo1 the solution below 0°C. To this slowly add 8 percent cadmium oxide under vigorous stirring over a period of 4 hours, after which continue stirring for 2 hours. Keep the solution in cold storage (0 to 5°C) for a period of 60 hours and then slowly bring it to room temperature (30°C). Filter the solvent through sintered glass crucible and analyse for ethylenediamine and cadmium contents as given in **ANNEX B**.

6.2 Light Petroleum — boiling range 40 to 60°C.

7 PREPARATION OF TEST SPECIMENS

7.1 From each sample (3.2 or 3.3), after removing size and finishes as prescribed in **ANNEX A**, draw a representative specimen weighing about 2 to 3 g. Cut, the test specimen into pieces of approximately 25 mm length.

8 PROCEDURE

8.1 Take about 0.25 g of the specimen in weighing bottle and dry at 105 ± 3°C for 3 hours, cool over phosphorus pentoxide in desiccator and weigh. Transfer the contents to 150-ml stoppered flask and determine the exact mass of the specimen by weighing the bottle again.

8.2 Add 50 ml of Cadoxen solvent to the flask and shake the flask at room temperature for 1 hour. Filter the contents through a weighed sintered glass crucible.

8.3 Wash the residue (undissolved cotton) with 10 ml of Cadoxen solvent, and then give several washes with distilled water till the washings are free of cadmium. Dry the crucible with residue at 105 ± 3°C for 3 hours, cool over phosphorus pentoxide in desiccator and weigh. Determine the mass of the residue.

8.4 Similarly carry out the test for other test specimens.

9 CALCULATION

9.1 Calculate the percentage of cotton fibre in the specimen by the following formula for each test specimen and find out the average of all the values:

$$\text{Percentage of cotton} = \frac{100 \times m_r}{m_s}$$

Where

m_r = *mass in* grams of the residue (**7.3**), and
m_s = mass in grams of the specimen (**7.1**).

NOTE – Since cotton fibre does not undergo any loss in mass under above conditions no correction factor is necessary.

10 REPORT

10.1 The report shall include the following information:

a) Type of the material,

b) Percentages of regenerated cellulose and cotton in the mixture, and

c) Number of specimens tested.

ANNEX A

(Note under Clause **1 .1** and Clause **7.1**)

METHOD FOR REMOVAL OF SIZE AND FINISHES FROM TEST SAMPLES

A-l From each test sample, draw a representative sample weighing about 10 g and dry it at 105 ± 3°C for 3 hours. Treat the sample as given in **A-2** to **A-6.** However, if the nature of the finish present in the sample is known only relevant steps may be carried out.

A-2 Exlract the sample with carbon tctrachloride in a soxhlet apparatus for 2 hours at a minimum rate of 6 cycles per hour. (This removes oils, fats, waxes, certain thermoplastic resins, etc.)

A-3 Extract the sample with ethyl alcohol in a soxhlet apparatus for 2 hours at a minimum rate of G cycles per hour. (This removes soaps, cationic finishes, etc.)

A-4 Treat the sample with 200 ml of water at 50°C for 30 minutes, stirring occasionally with glass rod or mechanically. Rinse thrice with fresh portion of warm water (50°C) and dry. (This removes water—soluble materials.)

A-5 Give an enzyme treatment to the sample under conditions depending upon the nature of enzyme used and rinse thoroughly. (This removes starch, gelatine, etc.)

A-6 Immerse the sample in 200 ml of 0.1 N hydrochloric acid at 18°C for 25 minutes, stirring gently every 3 minutes. Rinse thoroughly with water at 80°C containing a few drops of ammonia and then finally with plain water. Remove excess water from the sample by squeezing, suction or centrifuging and allow to dry. (This removes resins.)

ANNEX B

(*Clause* **6.1.1**)

METHODS FOR DETERMINATION OF ETHYLENEDIAMINE AND CADMIUM CONTENTS IN CADOXEN SOLVENT

B-l DETERMINATION OF ETHYLENEDIAMINE CONTENT

B-l.1 Weigh accurately about 5 g of the Cadoxen solvent, dilute in water and make up to 100 ml in a volumetric flask (*solution A*).

B-l.2 Titrate a 20-ml aliquot of *solution A* prepared as in **B-l.**1with 0.5 N sulphuric acid in the presence of methyl orange indicator.

B-l.3 Calculation

$$\text{Ethylenediamine, percent by mass} = v \times N \times \frac{100}{20} \times \frac{100}{m} \times \frac{30}{1000} = \frac{v \times N \times 15}{m}$$

where

v = volume in millilitres of sulphuric acid consumed,

N= normality of sulphuric acid, and

m = mass in grams of the sample taken for the test.

B-2 DETERMINATION OF CADMIUM CONTENT

B-2.1 Pipette out 20 ml of *solution A* (**B-l.1**) and add two-thirds the quantity of 0.5 N sulphuric acid required in titration as in **B-l.2** in order to keep *p*H at a proper level for getting a sharp end-point. Add a pinch of indicator mixture (2.5 g eriochrome black T + 1.0 g methyl red + 200.0 g sodium chloride) and 2 ml of buffer solution (350 ml ammonia, 25 percent + 54 g ammonium chloride). Add 20 ml of distilled water and titrate the mixture with 0.05 M EDTA solution to be standardized against 0.05 M cadmium acetate (analytical reagent grade) till the colour changes from wine-red to bright green,

B2.2 Calculation

$$\text{Cadmium content, percent by mass} = v \times M \times \frac{100}{20} \times \frac{100}{m} \times 0.112\,4$$

$$= v \times M \times \frac{56.2}{m}$$

Where

v = volume in millilitres of 0.05 M EDTA solution consumed,
M = molarity of EDTA solution, and
m = mass in grams of the sample taken for the test.

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि – पुनर्जीवित सेल्युलोज फाइबर और कपास के बाइनरी मिश्रण के मात्रात्मक रासायनिक विश्लेषण के लिए विधि भाग 3 फॉर्मिक एसिड-जिंक क्लोराइड

(आईएस **1889-3** का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Quantitative Chemical Analysis of Binary Mixtures of Regenerated Cellulose Fibres and Cotton Part 3 Formic Acid-Zinc Chloride

(*First Revision* of IS 1889-3)

ICS:

Chemical Methods of Test last date for receipt of comments is

FOREWORD

(Formal clause will be added later)

This standard was first published in 1979. This First revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) ICS number is incorporated in place of udc number.
iii) Reference to Indian Standard has been updated.

The Indian Standard on method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton, when first published in 1962 covered only sodium zincate method. While taking up the revision of this standard, the Committee decided to cover Cadoxen solvent, formic acid-zinc chloride and sulphuric acid methods also as Parts II, III and IV of this standard respectively.

The use of different fibre blends in textiles has necessitated the formulation of standard methods for identification and quantitative estimation of respective fibres. The quantitative analysis of textile fibres in mixtures is of considerable importance to textile technologists, traders and consumers.

In the preparation of this standard (Parts I to IV) due weightage has been given to the test methods prevalent in the industry and trade and also the methods developed by International Organization for Standardization (ISO). Parts I and III are based mainly on ISO 1833-1973 'Textiles - Binary fibre mixtures- Quantitative chemical analysis'. Part II is based on the method developed by Prof W. B. Achwal of the University of Bombay (Department of Chemical Technology), Bcmbay and the extensive experiments carried out at The Ahmadabad Textile Industry's Research Association, Ahmadabad; The Bombay Textile Research Association, Bombay; and The Silk & Art Silk Mills' Research Association, Bombay. Part IV is based on the work done by Textiles Committee, Bombay and other Textile laboratories.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard (Part III) prescribes formic acid-zinc chloride method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton in textile form, such as fibre, yarn or fabric.

NOTE—Before conducting an analysis according to this method, the fibres present in the mixture should be identified (see IS: 667) and the sample to be analysed shall be freed from all non-fibrous matter by the method given in **ANNEX A**. Dye in the dyed fibres is considered to be an integral part of the fibre and is not to be removed.

1.1.1 This method is not applicable to mixtures in which the cotton has suffered extensive chemical degradation, nor when the viscose, cupro or modal fibre is rendered_incompletely soluble by the presence of certain permanent finishes or reactive dyes that cannot be removed completely.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 667 : 1981	Methods For Identification Of Textile Fibres (*First Revision*)
IS 1070 : 2023	Reagent Grade Water — Specification (*Fourth Revision*)
IS 5463 : 2022	Methods for Sampling of Cotton Fabrics for Chemical Tests (*First Revision*)

3 PRINCIPLE

3.1 A sample of the mixture is dried and weighed. The regenerated cellulose fibres in the sample are dissolved in formic acid-zinc chloride reagent. The residue (cotton) is collected, washed, dried and weighed; and the proportion of regenerated cellulose and cotton is calculated.

4 SAMPLING

4.1 Lot — The quantity of textile material of definite type and quality delivered to one buyer against one despatch note shall constitute a lot.

4.1.1 If the textile material is fibre or yarn and the lot consists of more than 200 kg of the material, it shall be divided into sub-lots weighing 200 kg or less and each sub-lot shall be tested separately.

4.2 Sampling for Fibre and Yarn — From a sub-lot, 15 increments weighing approximately 10 g each shall be taken from different parts and mixed thoroughly to constitute a test sample.

4.3 Sampling for Fabrics — From each piece in the gross sample selected as in IS: 5463 cut out small portions from at least two different parts weighing about 25 g. Dissect the small portions of the fabric thus collected into yarn and mix thoroughly. This shall constitute a test sample.

5 APPARATUS

5.1 Sintered Glass Filter Crucibles — of appropriate capacity with pore size of 90 to 150 microns (porosity 1) and fitted with ground glass stopper. If the stoppers are not available, the crucibles should be enclosed in weighing bottles for weighing.

5.2 Conical Flask — of 100 ml capacity provided with a glass stopper.

5.3 Analytical Balance — of an accuracy of 0.000 2 g.

6 REAGENTS

6.1 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS: 1070) shall be used where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

6.2 Formic Acid-Zinc Chloride Reagent — Dissolve 20 g of anhydrous zinc chloride (analytical reagent quality) and 68 g of anhydrous formic acid in water and make up to 100 g, specific gravity 1.367. If anhydrous formic acid is not available, equivalent quantity of 80 to 85 percent formic acid may be used.

6.3 Dilute Ammonia Solution — 20 ml of concentrated ammonium hydroxide (specific gravity 0.88) made up to one litre with water.

7 PREPARATION OF TEST SPECIMENS

7.1 From each sample (3.2 or 3.3), after removing size and finishes as prescribed in **ANNEX A**, draw a representative specimen weighing about 2 to 3 g. Cut the test specimen into pieces of approximately 25 mm length.

8 PROCEDURE

8.1 Take a test specimen weighing about 0.5 g and put it in a weighting bottle. Dry the specimen in the weighing bottle at 105 ± 3°C to constant mass and obtain oven-dry mass of the specimen.

8.2 Put the oven-dry specimen without any delay in a loo-ml glass stoppered conical flask pre-heated to 70° C, and add to it 50 ml of formic acid-zinc chloride reagent also pre-heated to 70°C. Stopper the flask, shake it and keep it in a thermostatically controlled bath at 70 ± 2°C for 20 minutes. During this period, shake the flask a couple of times. Filter the contents through a tared sintered glass crucible avoiding the transfer of residue.

8.3 Wash the residue (undissolved cotton) thoroughly with water at 40°C by decantation. Add 100 ml dilute ammonia solution and keep for 10 minutes. Filter through the crucible under suction, wash with water and dry the residue at 105 ± 3°C to constant mass.

9 CALCULATION

9.1 Calculate the percentage of cotton fibre in each test specimen by the following formula and determine the average of all the values:

Percentage of cotton = $\frac{100 \times M_r \times d}{M_s}$

Where

M_r = mass of residue obtained in 7.3,
M_s = mass of specimen obtained in 7.1, and
d = correction factor for the loss in mass sustained by cotton during the analysis.

NOTE — The value of *d* is found to be 1.06 for raw cotton and 1.02 for bleached cotton.

10 REPORT

10.1 The report shall include the following information:

a) Type of the material,

b) Percentages of:
  1) regenerated cellulose,
  2) cotton, and

c) Number of specimens tested.

ANNEX A

(*Note under clause* **1.1**, and *clause* **7.1**)

METHOD FOR REMOVAL OF SIZE AND FINISHES FROM TEST SAMPLES

A-l From each test sample, draw a representative sample weighing about 10 g and dry it at 105 ±3°C for 3 hours. Treat the sample as given in **A-2** to **A-6**. However, if the nature of the finish present in the sample is known only relevant steps may be carried out.

A-2 Extract the sample with benzene-methyl alcohol mixture in a Soxhlet apparatus for 2 hours at a minimum rate of 6 cycles 4 per hour. (This removes oils, fats, waxes, certain thermoplastic resins, etc.)

A-3 Extract the sample with ethyl alcohol in a Soxhlet apparatus for 2 hours at a minimum rate of 6 cycles per hour. (This removes soaps, cationic finishes, etc.)

A-4 Treat the sample with 200 ml of water at 50°C for 30 minutes, stirring occasionally with glass rod or mechanically. Rinse thrice with fresh portion of warm water (50°C) and dry. (This removes water soluble materials)

A-5 Give an enzyme treatment to the sample under conditions depending upon the nature of enzyme used and rinse thoroughly. (This removes starch, gelatin, etc.)

A-6 Immerse the sample in 200 ml of 0.1 N hydrochloric acid at 80°C for 25 minutes, stirring gently every 3 minutes. Rinse thoroughly with water at 80°C containing a few drops of ammonia and then finally with plain water. Remove excess water from the sample by squeezing, suction or centrifuging and allow to dry. (This removes resins.)

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि – पुनर्जीवित सेलूलोज़ फाइबर और कपास के बाइनरी मिश्रण के मात्रात्मक रासायनिक विश्लेषण के लिए विधि भाग 4 सल्फ्यूरिक एसिड विधि

(आईएस 1889-4 का *दूसरा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Quantitative Chemical Analysis of Binary Mixtures of Regenerated Cellulose Fibres and Cotton Part 4 Sulphuric Acid Method

(*Second Revision* of IS 1889-4)

ICS:

Chemical Methods of Test
Sectional Committee, TXD 05

last date for receipt of comments is
XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard, first published in 1962 covered only sodium zincate method. While taking up the revision of the standard, the Committee decided to issue its revised version as Part I and to cover three more methods, namely; cadoxen solvent method, formic acid zinc chloride method and sulphuric acid method also as Parts II, III and IV of the standard respectively.

Two or more different types of fibres are mixed with one another for producing variety of textiles for different purposes. The use of different types of fibres in mixture has necessitated the formulation of standard methods, for identification and quantitative estimation of the fibres. Such an evaluation is of interest to the textile technologists, traders and consumers.

In the preparation of this standard (Parts I to IV) due weightage has been given to the test methods prevalent in the industry and trade and also the methods developed by International Organization for Standardization (ISO). Parts I and III are based mainly on ISO 1833-1977 'Textiles — Binary fibre mixtures — Quantitative chemical analysis'. Part II is based on the method developed by Prof W.B. Achwal of the University of Bombay (Department of Chemical Technology), Bombay and the extensive experiments carried out at the Ahmedabad Textile Industry's Research Association, Ahmadabad, the Bombay Textile Research Association, Bombay, and the Silk & Art Silk Mills' Research Association, Bombay. Part IV is based on the work done by the Textiles Committee, Bombay.

Last edition 2.1 incorporates Amendment No. 1 (April 1983). Amendment No. 1 is being carried out mainly to align the procedure given in this standard with the procedure given in IS: 6504 Method for quantitative chemical analysis of ternary mixtures of viscose rayon, cotton and protein fibres (*first revision*). Side bar indicates modification of the text as the result of incorporation of the amendment.

This second revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) ICS number is incorporated in place of udc number.
iii) References to the Indian standard have been updated.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard (Part IV) prescribes sulphuric acid method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton in any textile form, such as fibre, yarn or fabric.

NOTE — Before conducting an analysis according to this method, the fibres present in the mixtures should be identified (*see* IS: 667) and the sample to be analysed shall be freed from all non-fibrous matter. Dye in the dyed fibres is considered to be an integral part of the fibre and is not to be removed.

1.1.1 This method is not applicable to mixtures in which the cotton has suffered extensive chemical degradation, nor when the viscose, cupro or modal fibre is rendered incompletely soluble by the presence of certain permanent finishes or reactive dyes that cannot be removed completely.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 667 : 1981	Methods For Identification Of Textile Fibres (*First Revision*)
IS 1070 : 2023	Reagent Grade Water — Specification (*Fourth Revision*)
IS 6503 : 2023 ISO 1833-2 : 2020	Textiles — Quantitative Chemical Analysis — Ternary Fibre Mixtures (*Second Revision*)
IS 9068 : 2021 ISO 1833-1 : 2020	Textiles — Quantitative Chemical Analysis — General Principles of Testing (*First Revision*)

3 PRINCIPLE

3.1 A sample of the mixture is dried and weighed. The regenerated cellulose fibre is dissolved in sulphuric acid solution. The residue, that is cotton is collected, washed, dried and weighed. Then the proportion of regenerated cellulose and cotton is calculated.

4 SAMPLING

4.1 The quantity of textile material of definite type and quality delivered to one buyer against one despatch note shall constitute a lot.

4.1.1 If the textile material is fibre or yarn and the lot consists of more than 200 kg of fibre or yarn, it shall be divided into sub-lots each weighing 200 kg or less.

4.1.2 Each sub-lot shall be tested separately.

4.2 Sampling for Fibre and Yarn

4.2.1 From a sub-lot 15 increments, each weighing approximately 10 g, shall be taken from different parts and mixed thoroughly. This shall constitute a test sample.

4.3 Sampling for Fabrics

4.3.1 The number of pieces to be selected shall be in accordance with Table 1. The pieces thus selected shall constitute a gross sample.

TABLE 1 SAMPLE SIZE

LOT SIZE	SAMPLE SIZE
Up to 100	3
101 to 300	4
301 to 500	5
501 and above	7

4.3.2 From each piece in the gross sample selected as in **4.3.1**, cut out small portions from at least two different parts weighing about 25 g. The parts selected shall be as representative as possible of the gross sample. In the case of fabrics with a definite repetition in weave pattern, the parts selected shall include all yarns in the complete pattern. Dissect the small portions of fabric thus collected into yarns and mix them thoroughly. This shall constitute a test sample.

5 APPARATUS

5.1 Sintered Glass Filter Crucibles — of appropriate capacity with pore size of 90 to 150 microns (porosity 1) and fitted with ground glass stoppers. If the stoppers are not available, the crucibles should be enclosed in weighing bottles for weighing.

5.2 Ventilated Oven — capable of maintaining a temperature of 105 ± 3°C.

5.3 Analytical Balance — of an accuracy of 0.000 2 g.

6 REAGENTS

6.1 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS: 1070) shall be used where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

6.2 Sulphuric Acid Solution — Reagent grade, 60 percent (*m/m*) (specific gravity 1.493 at 27°C).

6.3 Sulphuric Acid (Dilute Solution) — Reagent grade, 10 percent (*m/m*).

6.4 Ammonia (Dilute Solution) — 2 percent (*m/m*). 20 ml concentrated ammonium hydroxide (specific gravity 0.88) made up to one litre with water.

7 PREPARATION OF TEST SPECIMENS

7.1 From the sample **4.2** or **4.3**, after removing size and finishes as recommended in IS: 9068 draw a representative specimen weighing about 2 to 3 g. Cut the test specimen into pieces of approximately 25 mm length and divide it into two.

8 PROCEDURE

8.1 Take a test specimen weighing about one gram from the pre-treated sample (*see* **7**). Cut the specimen to small pieces of about 2 mm length. Dry the specimen in a weighing bottle at 105 ± 3°C to constant mass and obtain the oven-dry mass of the specimen.

8.2 Dissolution of Viscose Rayon — Transfer the specimen to a flask containing 100 ml of sulphuric acid (60 percent) at room temperature, and stir vigorously to break up the sample completely at the first instant and then shake thoroughly, preferably with a mechanical shaker for 30 minutes. Transfer the contents of the flask to a weighed sintered glass crucible, wash the residue remaining in the flask, using a little more sulphuric acid solution, and transfer the contents to the crucible. Then wash the residue twice with a small quantity of dilute sulphuric acid solution followed by distilled water. Then wash the residue with dilute ammonia solution and finally wash the residue thoroughly with water. After each washing, drain the crucible with the aid of suction. Dry the residue to a constant mass in an oven at 105 ± 3°C, cool and weigh.

8.3 Similarly carry out the test on the other test specimen.

9 CALCULATION

9.1 Calculate the percentage of cotton fibre in each test specimen by the following formula and determine the average:

$$\text{Percentage of cotton} = \frac{100 \times M_r \times d}{M_s}$$

where
M_r = mass of residue obtained in **8.2**,
d = correction factor for the loss in mass sustained by cotton during the analysis, and
M_s = mass of specimen obtained in **8.1**.

NOTE — The value of d is found to be 1 05.

9.2 Calculate the percentage of cotton fibres with percentage correction for moisture in each test specimen as given below:

$$P_M = \frac{100\,P\,(1+0.01\,a_2)}{P\,(1+0.01\,a_2)+(100-P)(1+0.01\,a_1)}$$

where
P_M = percentage, by mass, of insoluble cotton with percentage additions for moisture;
P = percentage, by mass, of insoluble cotton on dry mass basis (*see* **9.1**);
a_1 = percentage addition to the soluble component for moisture;
and
a_2 = percentage addition to the insoluble component for moisture.

NOTE — The moisture regain values for different textile fibres shall be as given below:
Raw cotton — 7 percent
Bleached/Mercerized cotton — 8 5 percent
Viscose/Polynosic — 11 percent
Cuprammomum — 11 percent

9.3 Determine the percentage of regenerated cellulose fibre by difference.

10 REPORT

10.1 The report shall include the following information:

a) Type of material,
b) Percentages of:

    1) regenerated cellulose,
    2) cotton, and

c) Number of specimens tested.

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि – सिंथेटिक फाइबर से बने बुने हुए कपड़ों की आयामी स्थिरता के निर्धारण की विधि

(आई एस 4419 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Determination of Dimensional Stability of Knitted Fabrics Made of Synthetic Fibres

(*First Revision* of IS 4419)

ICS:

Textiles Chemical Methods of Test Sectional Committee, TXD 05

last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1967. This revision has been made in the light of experience gained since its last publication and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) References to Indian standard have been updated.
iii) ICS number is incorporated in place of udc number.
iv) Apparatus and reagents has been updated.

The knitted fabrics, especially made from synthetic fibres and their blends, are stabilized with the combined effects of heat and moisture. It is desirable to determine the extent to which a fabric has been set in order to assess its suitability for particular purposes.

Considerable assistance has been derived from B.S. 2959 : 1958 Method of test for dimensional stability of warp-knitted nylon fabrics (boiling water test) ' issued by the British Standards Institution.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes a method for determination of dimensional stability of knitted fabrics made of synthetic fibres and their blends.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 196:1966	Atmospheric Conditions For Testing (*Revised*)
IS 394 : 1985	Specification For Ink, Cloth Marking (*Second Revision*)
IS/ISO 105:C10: 2006	Textiles — Tests For Colour Fastness Part C10 Colour Fastness To Washing With Soap Or Soap And Soda

3 PRINCIPLE

3.1 A specimen is immersed in boiling water for 30 minutes and any change in dimensions is determined.

4 TERMINOLOGY

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

4.1 Dimensional Change Percent — The decrease or increase in dimensions (that is, in length or width or both) after subjecting the fabric to the prescribed test, expressed as a percentage of the corresponding dimensions before such test.

5 SAMPLING

5.1 Lot — The quantity of textile material purporting to be of one definite type and quality, delivered to one buyer against one dispatch note.

5.2 Unless otherwise agreed to between the buyer and the seller, the number of pieces of cloth to be selected at random from a lot shall be as given below. The pieces thus selected shall constitute the test *sample.*

Lot Size (*Number of Pieces in the Lot*)	*5 Sample Size* (*Number of 6 Pieces to be Selected*)
N	*n*
up to 100	5
101 „ 300	6
301 „ 500	7
501 „ 800	8
801 and above	9

5.2.1 To ensure randomness of selection, a random number table shall be used. In case such a table is not available, the following procedure shall be adopted:

Starting from any piece count the pieces in the lot as 1, 2, 3, etc., up to *r* in a systematic manner. Every *r*th piece thus counted shall be included in the test sample, where *r* is the integral part of *N/n* (*see* **5.2**).

6 TEST SPECIMENS

6.1 Draw one test specimen of full width or circumference and measuring not less than 1 m in length from each piece constituting the test sample, taking care (a) that the specimens are not drawn from within 1 m of either end of the piece, and (b) that they are cut and not torn from the piece.

7 CONDITIONING OF TEST SPECIMENS

7.1 Prior to test, the test specimen shall be conditioned to moisture equilibrium in a standard atmosphere at 65 ± 2 percent RH and 27°C ± 2°C temp (*see also* IS: 196)

7.2 When the test specimens have been left in such an atmosphere for 24 hours, in such a way as to expose, as far as possible, all portions of the specimens to the atmosphere, they shall be deemed to have reached moisture equilibrium.

8 APPARATUS

For the purpose of this test, the following apparatus shall be used.

8.1 A stainless steel or similar smooth-surfaced vessel of suitable size to hold the specimen(s) and water during boiling.

8.2 Glass Scale —A plate glass of 6 mm thickness with dimensions not less than 75 × 15 cm, on the under-surface of which is marked a scale graduated in centimeters and millimeters, the scale running parallel to and approximately equidistant from the long sides of the glass plate.

NOTE — The scale may be engraved on the glass or it may be printed on a thin transparent film which is fastened to the glass plate in such a way as to cover its entire undersurface uniformly. For convenience in use, handles may be fitted at the ends of the plate but they should be attached in such a way that they do not project below the lower surface of the plate.

8.3 Measuring Table — having a horizontal smooth flat surface, both length and width of the table being at least 10 cm greater than the length of the glass plate referred to in **8.2**.

8.4 Marking Ink — conforming to IS: 394

NOTE — If this is not readily available, cotton sewing thread of contrasting colour and having a colour fastness rating of 5 to washing: Test 1 (*see* IS: 687) may be used.

9 QUALITY OF REAGENTS

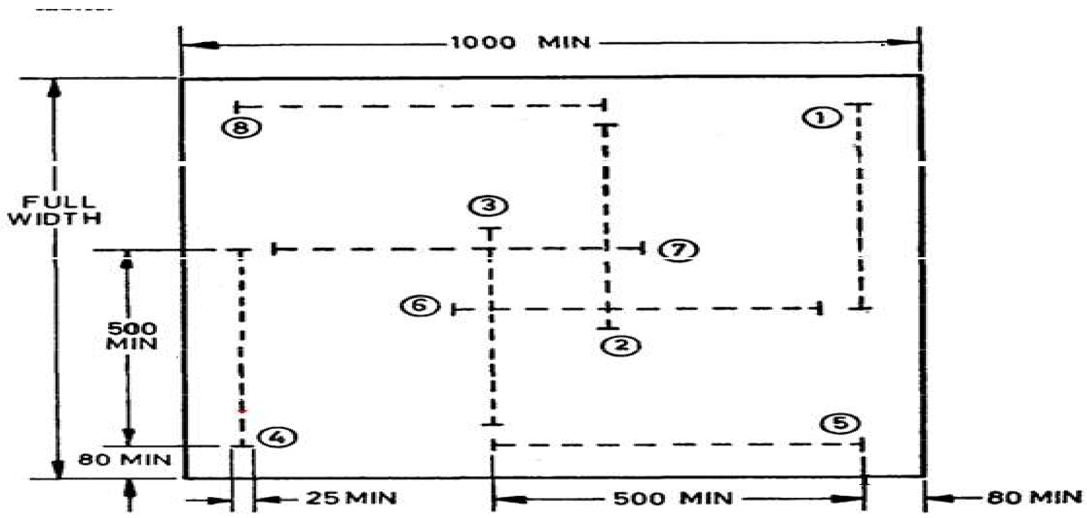
9.1 Pure chemicals and soft water having a hardness of not more than 50 ppm expressed as calcium carbonate shall be used for the purpose of this test.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

10 PROCEDURE

10.1 Preparation and Marking of Specimens — Condition the test specimen to moisture equilibrium in the standard atmosphere (*see* **7**). Weigh and spread it (*see* Note) on the measuring table, removing by hand all creases and wrinkles taking care not to extend or distort the specimen, and with a fine pointed nib and marking ink (or with cotton sewing thread) mark on it by dotted lines the first, second, third and fourth pairs of marks in the wale direction, and the fifth, sixth, seventh and eighth pairs of marks in the course direction, each mark being at least 25 mm long and at least 80 mm away from the edges of the test specimen. Keep the distance between the two marks in every pair the same but not less than 500 mm (or as much greater as the size of the specimen permits) and distribute the pairs of marks across the test specimen, staggering them as illustrated in **Fig. 1**. Mark one datum point on each of the two marks in the pairs so that the lines joining the datum points on the first, second, third and fourth pairs of marks run parallel to the courses, and the lines joining the datum points on the fifth, sixth, seventh and eighth pairs of marks run parallel to the wales. Join as illustrated in Fig. 1, the datum points on the first, second, third and fourth pairs of marks and the datum points on the fifth, sixth, seventh and eighth pairs of marks by dotted lines, taking care not to distort or extend the specimen. Measure to nearest millimetre the distance between the datum points on all pairs of marks by means of the scale.

NOTE — If the fabric is tubular-knitted, cut the fabric lengthwise and open it before spreading on table. Thereby the circumference of the fabric would be the width of the fabric.



All dimensions in millimeters.

FIG. 1 METHOD OF MARKING OF TEST SPECIMENS

10.1.1 Similarly mark the remaining test specimens and measure the distance between the pairs of marks in each of the remaining specimens. Mark the specimens so that each can be identified from the other.

10.2 Immerse the specimen in sufficient boiling water to prevent undue creasing of the fabric (normally a water to cloth ratio of not less than 50:1 will be convenient) and continue boiling for 30 minutes. Remove the fabric gently from the water and then place it flat between two layers of absorbent material, pressing gently with the hand, so as to absorb excess moisture. Allow the fabric to dry by exposing it freely to air while flat and without tension. Condition it to moisture equilibrium in a standard atmosphere (*see* **7**). Place it on the measuring table; carefully remove by hand all wrinkles and creases and measure correct to the nearest millimeter the distance between datum points on every pair of marks by means of the glass scale, taking care not to stretch or distort the specimen while measuring.

10.3 Repeat the procedure given as in **10.2** with the remaining test specimens.

11 EVALUATION

11.1 Calculate separately on one test specimen the percentage of dimensional change between datum points on every pair of marks by the following formula:

$$S = \frac{100\,(a-b)}{a}$$

where
S = percentage dimensional change,
a = distance between datum points on a pair of marks before treatment (*see* **10.1**), and
b = distance between the same datum points after treatment (*see* **10.2**).

11.2 Take the mean of the values so determined for the first, second, third and fourth pairs of marks as the course way dimensional change of the test specimen and the mean of the values determined for the fifth, sixth, seventh and eighth pairs of marks as the wale way dimensional change of the test specimen.

11.3 Determine similarly (*see* **11.1** and **11.2**) the course way and wale way dimensional changes of all the treated test specimens.

12 REPORT

12.1 Report individually the course way and wale way dimensional changes of each test specimen in the sample.

12.2 Report also whether the change in dimension is shrinkage or extension.

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BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024

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***भारतीय मानक* मसौदा**

वस्त्रादि – स्टेटिक प्रेशर हेड टेस्ट द्वारा कपड़ों में पानी के प्रवेश का प्रतिरोध निर्धारित करने की विधि

(आई एस 7940 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Determining Resistance to Penetration by Water of Fabrics by Static Pressure Head Test

(*First Revision* of IS 7940)

ICS:

Chemical Methods of Test last date for receipt of comments is

FOREWORD

(Formal clause will be added later)

This standard was first published in 1976. This First revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

- i) The Title of the standard has been updated.
- ii) ICS number is incorporated in place of udc number.
- iii) Reference to Indian Standard has been updated.

Water passes through water-resistant fabrics by:

a) penetration through their interstices under its own or applied pressure (The resistance offered by fabrics to this action is influenced mainly by their construction or structure.);

b) wetting of one side of the fabrics followed by capillary action, which brings the water to the other side and Wets it (The resistance offered by fabrics-to this action is influenced mainly by their water-repellency.); or

c) combination of (a) and (b).

A number of test methods have been developed for testing waterproofness, water-repellency and water-resistance of fabrics, like spray test, hydrostatic head test, static pressure head test, Bundesmann test .and cone test. All these test methods are prevalent in industry and trade. However, the use of a particular test depends upon the type of fabric under test and its end uses. So far no correlation has been established between the results of different test methods and hence their results are not comparable.

The static pressure head test prescribed in this standard is a relatively simple test and gives a good indication of the effect of fabric structure on resistance to penetration by water of fabrics. The resistance by a fabric to penetration of water is measured in terms of the amount of water penetrating through the fabric per unit area per unit time under a static head of water.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes a method for determining resistance to penetration by water of fabrics by static pressure head test. It is applicable to fabrics non-permeable to air.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 196:1966	Atmospheric Condition For Testing (*Revised*)
IS 5463 : 2022	Methods for Sampling of Cotton Fabrics for Chemical Tests (*First Revision*)
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)

3 PRINCIPLE

3.1 A circular specimen of the fabric is mounted horizontally and water is forced through the specimen from upper side under static pressure. The volume of water collected in a given time is expressed in terms of the volume of water penetrated per unit area of the fabric per unit time ($l/m^2/h$).

4 SAMPLING

4.1 Samples shall be so drawn as to be representative of the lot. Samples drawn in compliance with the procedure laid down in the material specification or as agreed to between the buyer and the seller shall be taken as representative of the lot. In case of cotton fabrics reference to IS 5463 shall be made.

5 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

5.1 The test samples shall be conditioned in accordance with IS 6359 except in case of fabrics heavier than 270 g/m2 for which the minimum conditioning period shall be 48 hours.

5.2 The tests shall be carried out in standard atmosphere (see IS: 196).

6 PREPARATION OF TEST SPECIMENS

6.1 From each test sample prepare circular test specimens of 13 cm diameter from different portions at random. Prepare at least 3 test specimens.

7 EQUIPMENT

7.1 Means for:

a) clamping the specimens with a circular test portion of 10 cm diameter,

b) applying the required static water head pressure and maintaining the pressure throughout the test, and

c) collecting penetrated water without any loss.

7.1.1 A typical equipment is detailed in **ANNEX A**.

7.2 Water - having *p*H between 6 and 8.5 and total hardness not exceeding 50 ppm, maintained at the temperature of testing atmosphere (*see* **5.2**).

8 PROCEDURE

8.1 Adjust the water pressure head level to the required height. Place the container for collecting penetrated water in position. Open the water supply to the apparatus and note .the time. Maintain the water level height for 1 hour.

8.2 After 1 hour, immediately remove the water container used for collecting penetrated water and determine the volume of water collected in litres.

8.3 Similarly carry out the test for other test specimens.

9 CALCULATION

9.1 From the volume of water collected as in **8.1** and **8.2** calculate the rate of water penetration (water resistance) in terms of litres per square metre per hour as follows:

$$\text{Rate of water penetration, l/m}^2\text{/h} = \frac{\text{Volume of water collected in litres} \times 100 \times 100}{3.14 \times 5 \times 5}$$

$$= \frac{\text{Volume of water collected in litres} \times 400}{3.14}$$

9.2 Determine the average of all the observations.

10 REPORT

10.1 The report shall include the following information:

a) Type of the fabric,
b) Number of specimens tested,
c) Static water pressure head, in millimetres, and
d) Rate of water penetration in liters per square meter per hour.

ANNEX A
(*Clause* **7.1.1**)

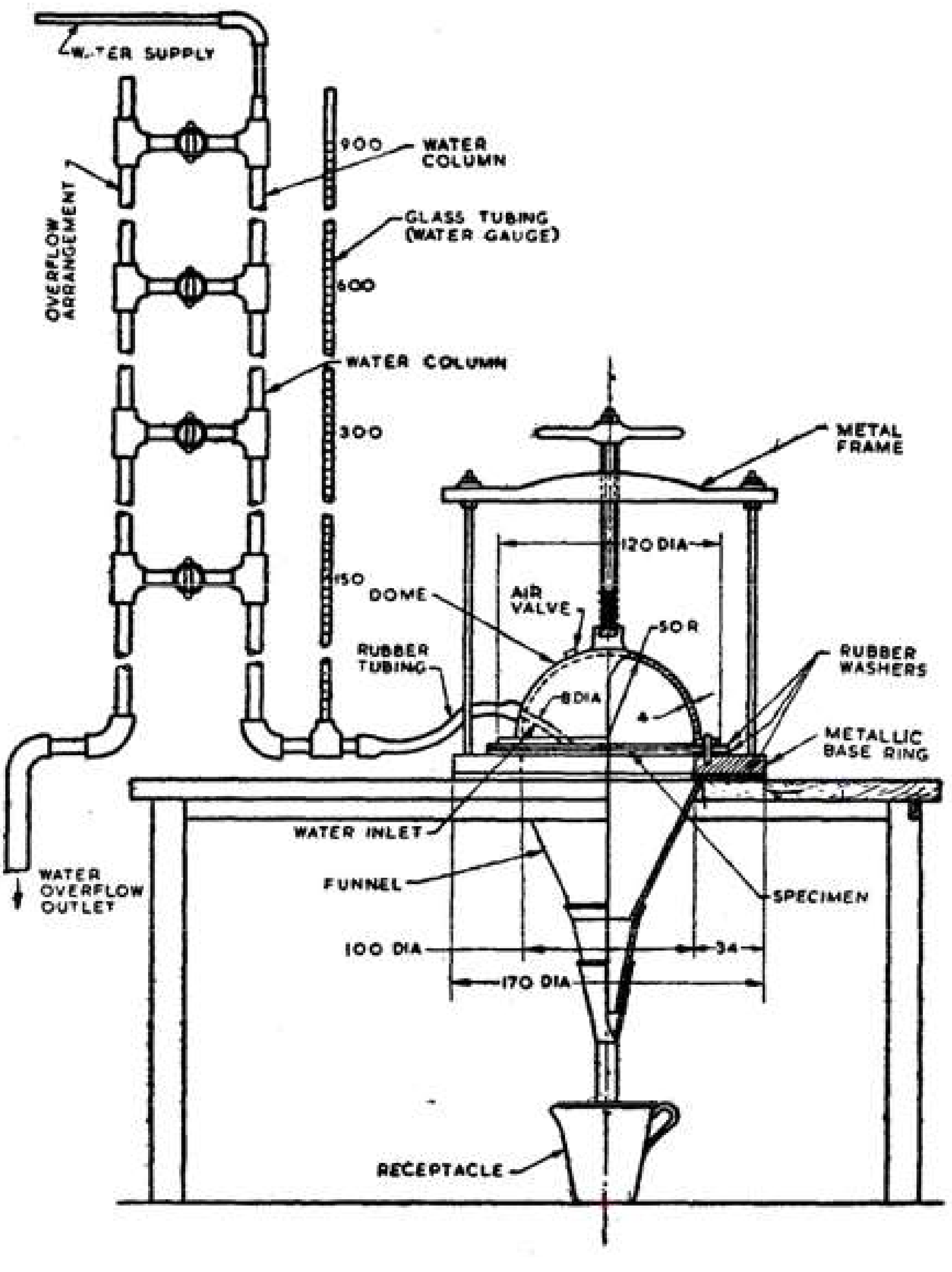
STATIC PRESSURE HEAD TEST APPARATUS

A-l DESCRIPTION OF THE EQUIPMENT

A-1.1 The apparatus (*see* Fig. 1) consists of a metallic base ring with an internal diameter of 10 cm (for holding the specimen), and a metallic dome of diameter 10 cm at the base provided with a water inlet and an air valve. The dome is fitted in a metal frame, so that the dome can be moved up and down or firmly fixed over the base ring. A funnel is fitted under the base ring. To collect water leaking through the specimen, a receptacle is provided. A gauge is attached to the water column for measuring the height of the column. The water column is connected to the water inlet on the metallic dome by means of a rubber tubing. The apparatus is also provided with an overflow arrangement (to regulate overflow) and an overflow outlet.

A-2 OPERATION

A-2.1 Clamp the specimen under test tightly between the base ring and the dome with the help of rubber washers. Open the water supply and fill the dome with water, taking care that all entrapped air is removed by permitting a little quantity of water to come out of the air valve. When the dome is full of water, close the valve and let the water rise in the water column to the required height (depending upon the type of fabric). Immediately, place the receptacle under funnel. Maintain, for 1 hour, the water column at the required height by adjusting the overflow arrangement. Immediately after 1 hour, remove the receptacle from under the funnel, and drain off the water in the dome by disconnecting the rubber tubing. Determine the volume of water which has collected in the receptacle in litres.



All dimensions in millimetres.

FIG. 1 A TYPICAL STATIC PRESSURE HEAD TEST APPARATUS

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भारतीय मानक मसौदा

वस्त्रादि – शंकु परीक्षण द्वारा कपड़ों की जलरोधी क्षमता निर्धारित करने की विधि

(आई एस 7941 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Determining the Water Repellency of Fabrics by Cone Test

(*First Revision* of IS 7941)

ICS:

Chemical Methods of Test Sectional Committee, TXD 05	last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1976. This First revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) ICS number is incorporated in place of udc number.
iii) Reference to Indian Standard has been updated.

Water passes through water-resistant fabrics by:

a) penetration of water through their interstices under its own or applied pressure (the resistance offered by fabrics to this action is influenced mainly by their construction or structure),

b) wetting of one side of the fabrics followed by capillary action; this brings the water to the other side and wets it (the resistance offered by fabrics to this action is influenced mainly by their water repellency), and

c) combination of (a) and (b).

A number of test methods has been developed for testing waterproofness, water repellency and water resistance of fabrics like spray test, hydro-static head test, Bundesmann test, cone test, etc. All these test methods are prevalent in industry and trade. However, the use of a particular test depends upon the type of fabric under test and its end uses. So far no correlation has been established between the results of different test methods and hence their results are not comparable.

The cone test prescribed in this standard is a fairly simple test for assessing the resistance of fabrics to wetting by water. According to this standard the water resistance of fabrics is assessed on the basis of, (a) the degree of wetting of outer surface, and (b) the amount of water leakage through the fabric cone when water is kept standing for a fixed time.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes a method for determining the water repellency of fabrics (permeable as well as non-permeable to air) by cone test.

1.1.1 This test shall be generally applicable for testing heavier types of proofed fabrics used as covers for wagons, shelters, etc., where pools of water may collect during use due to depressions formed by the uneven level of the cover.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 196:1966	Atmospheric Condition For Testing (*Revised*)
IS 5463 : 2022	Methods for Sampling of Cotton Fabrics for Chemical Tests (*First Revision*)
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)

3 PRINCIPLE

3.1 Specimen of the fabric is folded to form a cone and kept in a wire cone kept in glass funnel. A specified amount of water is poured into the cone and left to stand for a fixed time. The assessment is made on the basis of:

a) wetting of the outer exposed surface, and

b) amount of water leaked out of the cone.

4 SAMPLING

4.1 Samples shall be so drawn as to be representative of the lot. Samples drawn in compliance with the procedure laid down in the material specification or as agreed to between the buyer and the seller shall be taken as representative of the lot. In case of cotton fabrics, reference to IS: 5463 shall be made.

5 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

5.1 The test specimens shall be conditioned in accordance with IS: 6359 except in case of fabrics heavier than 270 g/m^2 for which the minimum conditioning period shall be 48 hours.

5.2 The tests shall be carried out in standard atmosphere (see IS: 196).

6 PREPARATION OF TEST SPECIMEN

6.1 Take a specimen of 30 × 30 cm from the conditioned test sample and Fold it in the form of cone without creasing the folds. Prepare at least 3 test Specimens.

7 APPARATUS

7.1 Glass or Metal Funnel — of 60° angle and of sufficient size.

7.2 Wire Cone — A typical sketch of the wire cone is given in Fig. 1.

7.3 Glass Rod

7.4 Conical Flask — for collecting water under the glass funnel.

7.5 A Stand — for holding the cone assembly.

7.6 Measuring Flask

7.7 Water—Distilled water maintained at a temperature of the testing atmosphere (*see* **5.2**).

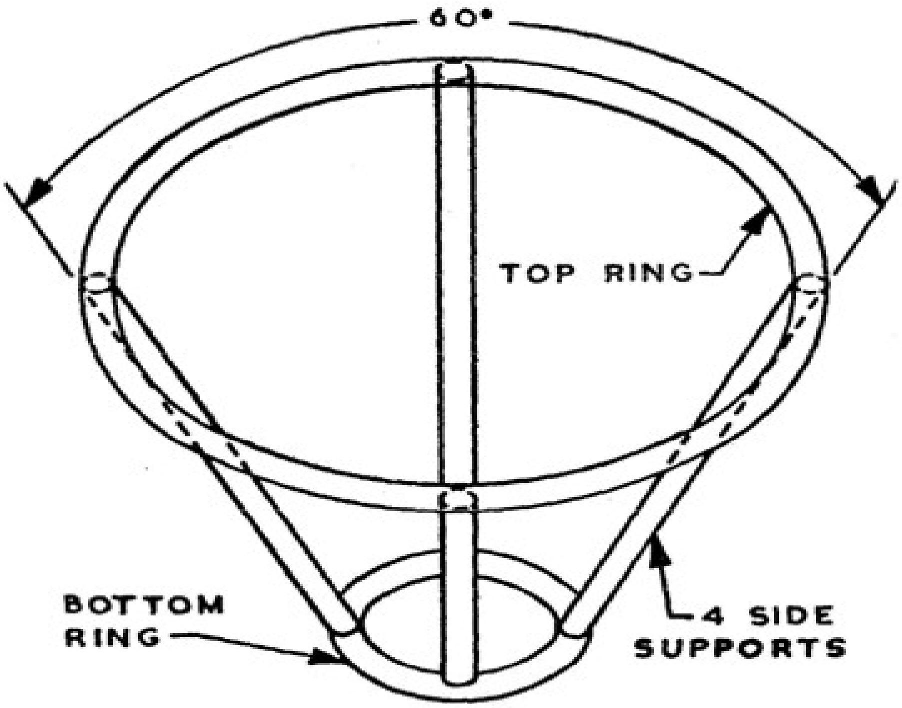


FIG. 1 A TYPICAL WIRE CONE

8 PROCEDURE

8.1 Take a test specimen and prepare a fabric cone (*see* **6.1**), place it in the wire cone and in turn place them (fabric cone in wire cone) in the glass (or metal) funnel. Mount the assembly on the stand (see Fig. 2). Place a conical flask below the glass funnel. Pour slowly 400 ml of water from the sides with the help of a glass rod and let it stand for 18 hours. At the end of the test period remove the water container from below and also pour out the water from the cone assembly immediately.

8.2 Determine the amount of water (in millilitres) collected in the container and also visually assess the area of wetting of the outer surface of the fabric cone coming into contact with the surface of the wire cone (that is, ignoring the presence of water within the folds of the fabric cone).

8.3 Repeat the test with the remaining test specimens.

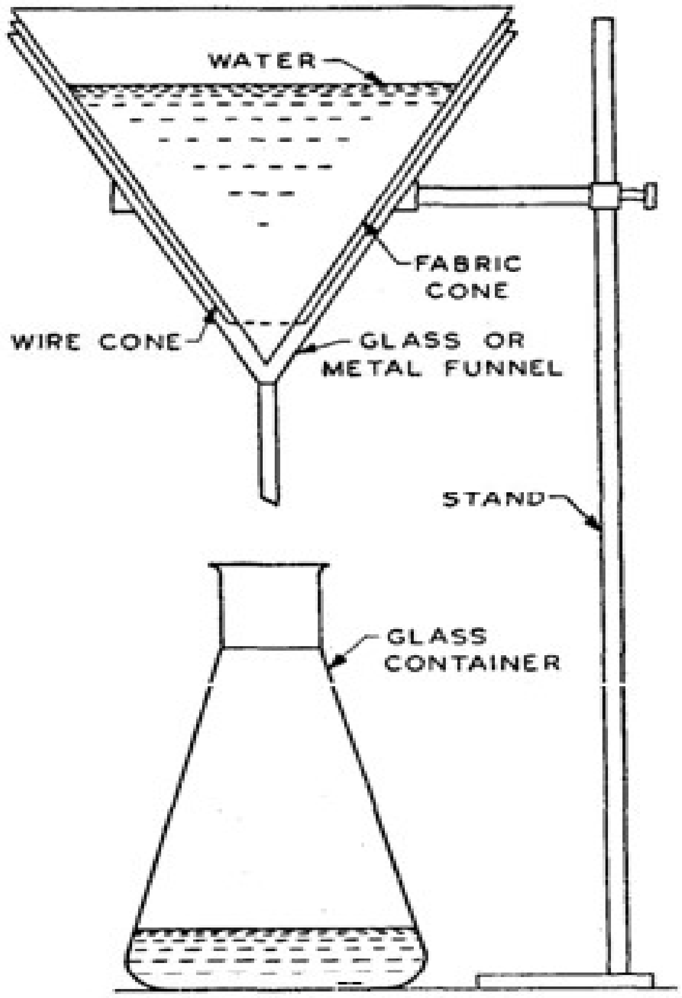


FIG. 2 ASSEMBLY OF APPARATUS

9 CRITERIA OF ASSESSMENT

9.1 Assessment of the effectiveness of proofness of the sample shall be made on the basis of limits laid down in the material specification for:

a) amount of penetrated water collected in millilitres (*see* **8.2),** and

b) amount of wetting of outer surface (*see* **8.2).**

10 REPORT

10.1 The report shall indicate the following information:

a) Type of fabric,

b) Number of test specimens tested,

c) Assessment rating:

1) amount of penetrated water collected in millilitres; and

2) amount of wetting of outer surface.

ANNEX 7

(Item 6.1)

NEW SUBJECTS FOR FORMULATION OF INDIAN STANDARD

Test method for Disperse dye, Heavy Metal Test and Pesticide test

a) Smt. R. Mahalakshmi, SGS, Chennai

Determination of Carcinogenic and Allergenic Dyes

Scope

This method is applicable to determine carcinogenic and allergenic dyes in methanol extracts. The testing method applies to all types of textile products of synthetic, coated textiles, leather components, natural textiles and other fibres that use carcinogenic and allergenic dyes. The dyes are determined by Liquid Chromatography- Tandem Mass Spectrometer (LC-MS/MS).

Principle

The sample of the dye material of the textile product is extracted using methanol in an ultrasonic bath. The final extract is analysed in Liquid Chromatography- Tandem Mass Spectrometer (LC-MS/MS) a triple quad technique.

Procedure

Equipment

Liquid chromatography with mass spectra (LC-MS/MS).

LC column: Symmetry C18 or any equivalent column

Analytical balance accurate to 0.1mg

Reaction vials, 40ml

Micropipettes calibrated.

Volumetric Flasks, calibrated.

Ultrasonic bath with temperature controller, suitable for operation at 70 deg C

Membrane filter, 0.22µ, 0.45µ, PTFE/PET or any suitable filter

Chemicals & Reagents

The Certified Reference material by ISO 17034 to be used for carcinogenic and allergenic dyes with their CAS numbers mentioned in the standard.

Grade 3 Water according to ISO 3696:1987

Methanol, AR grade, CAS # 67-56-1

Acetonitrile, AR grade, CAS # 75-05-8

Formic Acid, CAS # 64-18-6

Ammonium Acetate, CAS # 631-61-8

Preparation of Reagents

10mM Ammonium Acetate pH 3.60 ± 0.1: - Dissolve 0.771g ammonium acetate in 900ml of milli-Q water, add 10ml of Acetonitrile and mix well. Adjust pH to 3.6±0.1 with 30% (v/v) formic acid and dilute to 1.0 l with milli-Q water, filter through 0.45µ PTFE filter.

Standard preparation

Primary Stock standard solution, 1000mg/l: accurately weigh 10mg, equivalent adjusted to purity corrections, of each CRM listed in this method into 10 ml volumetric flasks, dissolve in methanol and make up the volume with methanol, store at -18°C, validity: 1 year

Note: When a different weight is taken then the actual concentration is exactly calculated. Ensure the complete dissolution by sonication at room temperature (23°C ± 5°C) before making up, as required.

Mixture of working standard solutions, 10mg/l: Pipette out 0.10ml each of the primary stock standard solution from 3.4.1 to a 10ml volumetric flask. Dilute the solution and makeup with methanol, and store at -18°C, validity: 3 months.

> *Note:Validity is provided based on the general stability of the standards. However, stability can be established by checking on day-to-use*

Calibration Standards: Fresh preparation using methanol or acetonitrile.

Prepare the calibration standard solutions according to the table below

Mixture of working standard (mg/l)	Volume of standard taken (ml)	Final volume in methanol (ml)	Final Concentration (mg/l)
10	0.50	10	0.50
10	1.0	10	1.0
10	5.0	10	5.0
10	10.0	10	10.0

Follow the Expiration date of solutions, Labeling guidelines (or equivalent local procedure) and Safe Handling, Transport and Use of Reference Materials & Measuring equipment with equivalent procedure employed.

Sample Preparation

The preparation of the sample shall involve the removal of the individual materials from the sample and preparing a test item. The test item consists of a single material of textiles taken from the footwear, such as synthetic or coated textiles.

Cut the homogeneous sample (test item) into pieces of size not larger than 0.3 to 0.5 cm^2.

Sample Extraction

Weigh 0.5g ± 5mg (w) homogeneous sample and transfer each test item into a 40 ml reaction vial.

Add 7.5ml of Methanol

Extract the sample at 70°C ± 2°C for 30min ± 2min in an ultrasonic bath.

Filter the solution with 0.22µ PTFE membrane filter and proceed with LC-MS analysis.

Upto 3 samples can be combined (of the same sample mass) for the determination of dyes considering the detection limits into account

Quality Control Sample Preparation

Prepare the laboratory QC Sample in the same way as the samples according to 3.4 by spiking 0.25ml of a mixture of working standard solution 10mg/l into a blank matrix.

Instrumental analysis

Instrument conditions

Set up an LC-MS/MS with the below conditions after the suitable calibration of the equipment employed.

<table>
<tr><th>Parameter</th><th colspan="3">LC-MS</th></tr>
<tr><td>LC-MS</td><td colspan="3">HPLC/UPLC- Mass Spectrometer or equivalent</td></tr>
<tr><td>Column</td><td colspan="3">C18 100mm x 2.1mmx1.7µ (UPLC) (or) equivalent</td></tr>
<tr><td>Mobile Phase</td><td colspan="3">A: Acetonitrile
B: 10mM Ammonium Acetate (pH:3.6) in 0.1% Formic acid</td></tr>
<tr><td>Flow Rate</td><td colspan="3">0.30 ml/min</td></tr>
<tr><td>Injection volume</td><td colspan="3">2µl</td></tr>
<tr><td>MS parameters</td><td colspan="3">Ionization: Electro spray Positive/Negative
Mode :SIR</td></tr>
<tr><td rowspan="9">Gradient Program</td><td>Time in min</td><td>% A</td><td>% B</td></tr>
<tr><td>0.00</td><td>90</td><td>10</td></tr>
<tr><td>0.50</td><td>90</td><td>10</td></tr>
<tr><td>1.00</td><td>70</td><td>30</td></tr>
<tr><td>1.50</td><td>50</td><td>50</td></tr>
<tr><td>2.50</td><td>10</td><td>90</td></tr>
<tr><td>5.50</td><td>10</td><td>90</td></tr>
<tr><td>6.00</td><td>90</td><td>10</td></tr>
<tr><td>7.50</td><td>90</td><td>10</td></tr>
</table>

Note: 1. The conditions are for reference purposes. For each piece of equipment, the Lab can follow suitable equipment conditions with proper resolution and response of analytes in the matrix with appropriate run time about the conditions mentioned above. This shall be established through linearity on standard and repeatability on the matrix at the estimated limit of quantification.

This method can be employed for any restriction of similar dyes following the conditions specified in the procedure wherever applicable.

Mass fragment table

3.8.2.1. Carcinogenic Dyestuffs

S. No	Analytes	CAS #	Target Ions
1	Disperse Blue 1	2475-45-8	268.10
2	Solvent Yellow-1	60-09-3	198.14

S. No	Analytes	CAS #	Target Ions
3	Solvent Yellow-2	60-11-7	226.20
4	Solvent Yellow-3	97-56-3	226.30
5	Basic Red-9	569-61-9	288.00
6	Basic Violet 14	632-99-5	302.00
7	Disperse Yellow-3	2832-40-8	270.14
8	Acid Red 26	3761-53-3	436.00
9	Direct Black 38	1937–37–1	736.29
10	Direct Blue/Basic Blue 6	2602-46-2	421.00
11	Direct Red 28	573–58–0	651
12	Disperse Orange-11	82-28-0	238.00
13	Acid Red 114	6459-94-5	472.23

3.8.2.2. Allergenic Dyestuffs

S. No	Analytes	CAS #	Target Ions
1	Disperse Blue 1	2475-45-8	268.10
2	Disperse Blue-3	2475-46-9	297.00
3	Disperse Blue-7	3179-90-6	359.00
4	Disperse Blue-26	3860-63-7	299.00
5	Disperse Blue-35 A/B*	56524–77–7/56524–76–6	285/299
6	Disperse Blue-102	69766-79-6 (12222–97–8)	366.40
7	Disperse Blue-106	12223-01-7	336.10
8	Disperse Blue-124	615141-18-1	378.00
9	Disperse Brown-1	23355-64-8	433.18
10	Disperse Orange-1	2581-69-3	319.00
11	Disperse Orange 3	730-40-5	243.00
12	Disperse Orange-37/76/59	13301-61-6	392.00
13	Disperse Red-1	2872-52-8	315.00
14	Disperse Red-11	2872-48-2	269.00
15	Disperse Red-17	3179-89-3	345.00
16	Disperse Yellow 1	119-15-3	274.00
17	Disperse Yellow-3	2832-40-8	270.14
18	Disperse Yellow 9	6373–73–5	273
19	Disperse Yellow 39	12236–29–2	265.3
20	Disperse Yellow 49	54824-37-2	375.00

2. Other dyestuffs

S. No	Analytes	CAS #	Target Ions
1	Disperse Yellow 23	6250-23-3	303.00
2	Disperse Orange 149	85136-74-9	459.32
3	Navy Blue	118685-33-9	450.10
4	Disperse Orange 61	12270-45-0	482.06
5	Acid Violet 49	1694-09-3	712.00
6	Basic Violet-3	548-62-9	372.42
7	Basic Violet-1	8004-87-3	358.39
8	Solvent Blue 4	6786-83-0	470.37
9	Basic Red 46	12221-69-1	321.25
10	Naphthol As	92-77-3	264.16
11	Basic Orange 2	532-82-1	212.94
12	Direct Brown 95	16071-86-6	356.51
13	Direct Blue 218	28407-37-6	498.00

- Note: * Disperse blue 35 A and B references are not available directly. It is identified through Disperse Blue 35 (CAS no 12222-75-2) and same can be reported.

Batch Sequence & Quality Control Acceptance Criteria

Inject in the sequence of Solvent Blank, Calibration Curve, Laboratory QC, Samples from 1 to 10, Calibration QC, Samples 11 to 20 followed by Solvent Blank.

S. No	QC Point	Criteria	Batch
1	Solvent Blank	Clear baseline	1/20
2	Calibration Standards	$R^2 \geq 0.995$	1/20
3	Laboratory QC	Minimum 70%	1/20
4	Samples 1 to 10	-	-
5	Calibration QC	90% - 110%	1/10
6	Samples 11 to 20	-	-
7	Solvent Blank	Clear baseline	1/20

Note: Batch 1/20 is given, assuming the batch size is 20, but this could be changed as required. One calibration QC in every 10 samples is injected as a quality control checkpoint. If the response ratio is within the acceptance limit then it could be increased to 1/20.

Identify the presence of the target dyes against the standard concerning retention time, relative retention for the internal standard, and ion ratio for the mass spectrometry technique.

Acceptance Criteria for Ion Ratio	
Relative intensity (% of base peak)	Relative (LC-MS)
> 50%	± 20%
> 20 % to < 50 %	± 25%
> 10 % to < 20%	± 30%
< 10%	± 50%

Determine the amount of identified dye from the calibration curve.

Use standard addition technique for any issues in the identification of mass no due to improper resolution and merging of peaks

If the analyte concentration exceeds the calibration curve

- Dilute the extract - single dilution and perform reinjection.
- Confirm by Repeat analysis with appropriate weight.

Note: The lab can decide on the appropriate measure

Calculation

The individual analyte of the sample will be calculated according to the following equation:

$$M_{Dye\text{-}Individual} = \frac{C_{Dye}\text{ From calibration curve} \times V}{M_1} \times DF$$

Where,

$M_{Dye\text{-}individual}$ is the amount of Dye (individual), in mg/kg;

C_{Dye} is the concentration of individual Dye in the sample, in mg/l;

V	is the volume of the sample extract.
m_1	is the weight in grams of the sample
DF	is the dilution factor.

Note: if the requirement is in mg/l then directly report the C_{Dye} *as above.*

Test report

The test report shall refer to the official method and contain at least the following information.

Test Method details

Origin and Destination of the sample (partial sample, if applicable)

Type and identification of the product and/or material tested

Date of receipt and date of analysis

Sampling procedure, if applicable

Detection and Quantification Technique

Results reported as the analyte and reporting limit with unit.

Any deviation in agreement or otherwise from the test

Any unusual features observed during the determination.

Reference Documents

- DIN 54321 2022_Textiles – Determination of dyes after methanol extraction
- ISO 3696:1987 _Water for Analytical Laboratory Specification and test methods.

Scope

This method is applicable to determine carcinogenic and allergenic dyes in methanol extracts. The testing method applies to all types of textile products of synthetic, coated textiles, leather components, natural textiles and other fibres that use carcinogenic and allergenic dyes. The dyes are determined by Liquid Chromatography- Tandem Mass Spectrometer (LC-MS/MS).

Principle

The sample of the dye material of the textile product is extracted using methanol in an ultrasonic bath. The final extract is analysed in Liquid Chromatography-Tandem Mass Spectrometer (LC-MS/MS) a triple quad technique.

Procedure

Equipment

Liquid chromatography with mass spectra (LC-MS/MS).

LC column: Symmetry C18 or any equivalent column

Analytical balance accurate to 0.1mg

Reaction vials, 40ml

Micropipettes calibrated.

Volumetric Flasks, calibrated.

Ultrasonic bath with temperature controller, suitable for operation at 70 deg C

Membrane filter, 0.22µ, 0.45µ, PTFE/PET or any suitable filter

Chemicals & Reagents

The Certified Reference material by ISO 17034 to be used for carcinogenic and allergenic dyes with their CAS numbers mentioned in the standard.

Grade 3 Water according to ISO 3696:1987

Methanol, AR grade, CAS # 67-56-1

Acetonitrile, AR grade, CAS # 75-05-8

Formic Acid, CAS # 64-18-6

Ammonium Acetate, CAS # 631-61-8

Preparation of Reagents

10mM Ammonium Acetate pH 3.60 ± 0.1: - Dissolve 0.771g ammonium acetate in 900ml of milli-Q water, add 10ml of Acetonitrile and mix well. Adjust pH to 3.6±0.1 with 30% (v/v) formic acid and dilute to 1.0 l with milli-Q water, filter through 0.45µ PTFE filter.

Standard preparation

Primary Stock standard solution, 1000mg/l: accurately weigh 10mg, equivalent adjusted to purity corrections, of each CRM listed in this method into 10 ml volumetric flasks, dissolve in methanol and make up the volume with methanol, store at -18°C, validity: 1 year

Note: When a different weight is taken then the actual concentration is exactly calculated. Ensure the complete dissolution by sonication at room temperature (23°C ± 5°C) before making up, as required.

Mixture of working standard solutions, 10mg/l: Pipette out 0.10ml each of the primary stock standard solution from 3.4.1 to a 10ml volumetric flask. Dilute the solution and makeup with methanol, and store at -18°C, validity: 3 months.

> *Note:Validity is provided based on the general stability of the standards. However, stability can be established by checking on day-to-use*

Calibration Standards: Fresh preparation using methanol or acetonitrile.

Prepare the calibration standard solutions according to the table below

Mixture of working standard (mg/l)	Volume of standard taken (ml)	Final volume in methanol (ml)	Final Concentration (mg/l)
10	0.50	10	0.50
10	1.0	10	1.0
10	5.0	10	5.0
10	10.0	10	10.0

Follow the Expiration date of solutions, Labeling guidelines (or equivalent local procedure) and Safe Handling, Transport and Use of Reference Materials & Measuring equipment with equivalent procedure employed.

Sample Preparation

The preparation of the sample shall involve the removal of the individual materials from the sample and preparing a test item. The test item consists of a single material of textiles taken from the footwear, such as synthetic or coated textiles.

Cut the homogeneous sample (test item) into pieces of size not larger than 0.3 to 0.5 cm^2.

Sample Extraction

Weigh 0.5g ± 5mg (w) homogeneous sample and transfer each test item into a 40 ml reaction vial.

Add 7.5ml of Methanol

Extract the sample at 70°C ± 2°C for 30min ± 2min in an ultrasonic bath.

Filter the solution with 0.22µ PTFE membrane filter and proceed with LC-MS analysis.

Upto 3 samples can be combined (of the same sample mass) for the determination of dyes considering the detection limits into account

Quality Control Sample Preparation

Prepare the laboratory QC Sample in the same way as the samples according to 3.4 by spiking 0.25ml of a mixture of working standard solution 10mg/l into a blank matrix.

Instrumental analysis

Instrument conditions

Set up an LC-MS/MS with the below conditions after the suitable calibration of the equipment employed.

Parameter	LC-MS		
LC-MS	HPLC/UPLC- Mass Spectrometer or equivalent		
Column	C18 100mm x 2.1mmx1.7µ (UPLC) (or) equivalent		
Mobile Phase	A: Acetonitrile B: 10mM Ammonium Acetate (pH:3.6) in 0.1% Formic acid		
Flow Rate	0.30 ml/min		
Injection volume	2µl		
MS parameters	Ionization: Electro spray Positive/Negative Mode :SIR		
Gradient Program	Time in min	% A	% B
	0.00	90	10
	0.50	90	10
	1.00	70	30
	1.50	50	50
	2.50	10	90
	5.50	10	90
	6.00	90	10
	7.50	90	10

Note: 1. The conditions are for reference purposes. For each piece of equipment, the Lab can follow suitable equipment conditions with proper resolution and response of analytes in the matrix with appropriate run time about the conditions mentioned above. This shall be established through linearity on standard and repeatability on the matrix at the estimated limit of quantification.

This method can be employed for any restriction of similar dyes following the conditions specified in the procedure wherever applicable.

Mass fragment table

3.8.2.1. Carcinogenic Dyestuffs

S. No	Analytes	CAS #	Target Ions
1	Disperse Blue 1	2475-45-8	268.10
2	Solvent Yellow-1	60-09-3	198.14

S. No	Analytes	CAS #	Target Ions
3	Solvent Yellow-2	60-11-7	226.20
4	Solvent Yellow-3	97-56-3	226.30
5	Basic Red-9	569-61-9	288.00
6	Basic Violet 14	632-99-5	302.00
7	Disperse Yellow-3	2832-40-8	270.14
8	Acid Red 26	3761-53-3	436.00
9	Direct Black 38	1937–37–1	736.29
10	Direct Blue/Basic Blue 6	2602-46-2	421.00
11	Direct Red 28	573–58–0	651
12	Disperse Orange-11	82-28-0	238.00
13	Acid Red 114	6459-94-5	472.23

3.8.2.2. Allergenic Dyestuffs

S. No	Analytes	CAS #	Target Ions
1	Disperse Blue 1	2475-45-8	268.10
2	Disperse Blue-3	2475-46-9	297.00
3	Disperse Blue-7	3179-90-6	359.00
4	Disperse Blue-26	3860-63-7	299.00
5	Disperse Blue-35 A/B*	56524–77–7/56524–76–6	285/299
6	Disperse Blue-102	69766-79-6 (12222–97–8)	366.40
7	Disperse Blue-106	12223-01-7	336.10
8	Disperse Blue-124	615141-18-1	378.00
9	Disperse Brown-1	23355-64-8	433.18
10	Disperse Orange-1	2581-69-3	319.00
11	Disperse Orange 3	730-40-5	243.00
12	Disperse Orange-37/76/59	13301-61-6	392.00
13	Disperse Red-1	2872-52-8	315.00
14	Disperse Red-11	2872-48-2	269.00
15	Disperse Red-17	3179-89-3	345.00
16	Disperse Yellow 1	119-15-3	274.00
17	Disperse Yellow-3	2832-40-8	270.14
18	Disperse Yellow 9	6373–73–5	273
19	Disperse Yellow 39	12236–29–2	265.3
20	Disperse Yellow 49	54824-37-2	375.00

2. Other dyestuffs

S. No	Analytes	CAS #	Target Ions
1	Disperse Yellow 23	6250-23-3	303.00
2	Disperse Orange 149	85136-74-9	459.32
3	Navy Blue	118685-33-9	450.10
4	Disperse Orange 61	12270-45-0	482.06
5	Acid Violet 49	1694-09-3	712.00
6	Basic Violet-3	548-62-9	372.42
7	Basic Violet-1	8004-87-3	358.39
8	Solvent Blue 4	6786-83-0	470.37
9	Basic Red 46	12221-69-1	321.25
10	Naphthol As	92-77-3	264.16
11	Basic Orange 2	532-82-1	212.94
12	Direct Brown 95	16071-86-6	356.51
13	Direct Blue 218	28407-37-6	498.00

- Note: * Disperse blue 35 A and B references are not available directly. It is identified through Disperse Blue 35 (CAS no 12222-75-2) and same can be reported.

Batch Sequence & Quality Control Acceptance Criteria

Inject in the sequence of Solvent Blank, Calibration Curve, Laboratory QC, Samples from 1 to 10, Calibration QC, Samples 11 to 20 followed by Solvent Blank.

S. No	QC Point	Criteria	Batch
1	Solvent Blank	Clear baseline	1/20
2	Calibration Standards	$R^2 \geq 0.995$	1/20
3	Laboratory QC	Minimum 70%	1/20
4	Samples 1 to 10	-	-
5	Calibration QC	90% - 110%	1/10
6	Samples 11 to 20	-	-
7	Solvent Blank	Clear baseline	1/20

Note: Batch 1/20 is given, assuming the batch size is 20, but this could be changed as required. One calibration QC in every 10 samples is injected as a quality control checkpoint. If the response ratio is within the acceptance limit then it could be increased to 1/20.

Identify the presence of the target dyes against the standard concerning retention time, relative retention for the internal standard, and ion ratio for the mass spectrometry technique.

Acceptance Criteria for Ion Ratio	
Relative intensity (% of base peak)	Relative (LC-MS)
> 50%	± 20%
> 20 % to < 50 %	± 25%
> 10 % to < 20%	± 30%
< 10%	± 50%

Determine the amount of identified dye from the calibration curve.

Use standard addition technique for any issues in the identification of mass no due to improper resolution and merging of peaks

If the analyte concentration exceeds the calibration curve

- Dilute the extract - single dilution and perform reinjection.
- Confirm by Repeat analysis with appropriate weight.

Note: The lab can decide on the appropriate measure

Calculation

The individual analyte of the sample will be calculated according to the following equation:

$$M_{Dye\text{-}Individual} = \frac{C_{Dye}\text{ From calibration curve} \times V}{M_1} \times DF$$

Where,

$M_{Dye\text{-}individual}$ is the amount of Dye (individual), in mg/kg;

C_{Dye} is the concentration of individual Dye in the sample, in mg/l;

V	is the volume of the sample extract.
m_1	is the weight in grams of the sample
DF	is the dilution factor.

Note: if the requirement is in mg/l then directly report the C_{Dye} *as above.*

Test report

The test report shall refer to the official method and contain at least the following information.

Test Method details

Origin and Destination of the sample (partial sample, if applicable)

Type and identification of the product and/or material tested

Date of receipt and date of analysis

Sampling procedure, if applicable

Detection and Quantification Technique

Results reported as the analyte and reporting limit with unit.

Any deviation in agreement or otherwise from the test

Any unusual features observed during the determination.

Reference Documents

- DIN 54321 2022_Textiles – Determination of dyes after methanol extraction
- ISO 3696:1987 _Water for Analytical Laboratory Specification and test methods.

Determination of Pesticide Residues in Textiles

Scope

This procedure applies to all textile materials treated with pesticides by using a Gas chromatography-mass spectrometer and Liquid chromatography-mass spectrometer.

Procedure

Equipment

Gas chromatography-mass spectrometer - GC-MS

Liquid chromatography-tandem mass spectrometer- LC-MS/MS

Analytical balance accurate to 0.1mg

Turbovap Nitrogen Evaporator

Refrigerated Centrifuge with temperature control, maintained at 4°C, about 10000 rpm

Vortex mixer

Ultrasonic bath with temperature controller.

Shaker Horizontal, IKA or equivalent

Micro pipettes, calibrated,

Organic Dispensers, Calibrated

Column DB5MS, or equivalent

Chromatography Column Zorbax RRHD C18, or equivalent

Polypropylene tube, 50ml

Membrane filter, 0.22µ, PVDF.

Chemicals & Reagents

The Certified Reference material as per ISO 17034 will be used as given in this procedure with applicable CAS numbers.

n-Hexane, chromatography grade, CAS# 110-54-3

Ethyl Acetate, chromatography grade, CAS # 141-78-6

Methanol, Chromatography grade, CAS # 67-56-1

Acetonitrile, Chromatography grade, CAS # 75-05-8

Formic Acid 99%, Chromatography grade, CAS # 64-18-6

Ammonium Formate, Chromatography grade, CAS # 540-69-2

HLB Catridge6 CC or equivalent

Sodium Sulphate AR, CAS # 7757-82-6

Standard preparation

Primary Stock standard solution, 1000mg/l: accurately weigh 10mg of each CRM listed in this procedure into a 10ml volumetric flask and make up the volume with methanol/ethyl acetate for LC-MS/MS or GC-MS respectively. Apply purity and salt corrections if applicable, and store at -20°C, validity 12 months.

Note: The method is allowed to use different weights/volumes as available. The actual concentration shall be exactly calculated.

Mixture of working standard solution, 10mg/l: Pipette out 0.10ml of each primary stock solution 1000mg/l and make up the volume with 10ml methanol/ethyl acetate for LC-MS/MS or GC-MS respectively, store at -20°C, validity 6 months.

Preparation of working standard solutions of CRM. stored at 2°C - 8°C, validity 3 months.

A mixture of Working standard solution (mg/l)	Volume of standard taken (ml)	Final volume in Acetonitrile (ml)	Final Concentration (mg/l)

10	3.0	10	3.0
10	2.0	10	2.0
10	1.0	10	1.0

Preparation of Calibration standard solutions, freshly prepared

Prepare the matrix based calibration standard solutions according to the below table.

Working standard solution (mg/l)	Volume of standard taken (ml) (0.9ml blank matrix added)	Final volume in methanol (ml)	Final Concentration (µg/kg)
1	0.100	1.0	100
2	0.100	1.0	200
3	0.100	1.0	300
10	0.050	1.0	500
10	0.100	1.0	1000

If Standards mix is available readily can also be used for this procedure.

Follow the Expiry date of solutions, Labeling guidelines, Safe Handling, Transport and Use of Reference Materials & Measuring equipment as per the best practice available in the lab to safeguard the integrity and stability of the standards and measuring equipment.

Sample Preparation & Extraction

Cut the sample into 1 to 2 cm^2 size from the different areas of the sample available.

Weigh 2.0g ± 0.05g of homogenized sample into a 50ml polypropylene centrifuge tube

Add 40ml of Ethyl Acetate: Hexane (1:1) and Sonicate for 30min at 30°C.

Centrifuge at 10000rpm for 5min at 4°C.

Filter the clear solution through sodium sulfate into a Turbovap Tube.

Repeat the extraction by adding 20ml of Ethyl Acetate: Hexane (1:1) to the residue and Sonicate for 5min at 30°C.

Centrifuge at 10000rpm for 5 min at 4°C.

Filter the solution through sodium sulfate into the same Turbovap tube.

Evaporate under a gentle stream of nitrogen at 35°C ± 5°C without complete drying of the tube.

Reconstitute with 2ml of Acetonitrile, filter through 0.22µ PVDF membrane filter.

SPE Cleanup Procedure (for matrix interferences & high colour extract)

Add 8 ml of water to 2 ml Acetonitrile extract from 2.4.10 and proceed with SPE clean-up to remove the interfering constituents.

Condition the SPE HLB cartridge (6cc) with 10 ml Methanol followed by 10 ml of water.

Load the reconstituted sample onto the SPE cartridge and wash it with 5 ml of water.

Elute the SPE cartridge with 10 ml of Methanol into a test tube.

Evaporate under a gentle stream of nitrogen at 35°C ± 5°C without complete drying of the tube.

Reconstitute with 2 ml of Acetonitrile.

Quality Control sample preparation

Prepared 0.10ml of a mixture of working standard solution, 10mg/l, to 2.0g ± 0.05g of the sample and follow the instructions as specified in section 2.4.

Instrumental Analysis

Instrument conditions

1. Setting up of LC-MS/MS system with the below conditions.

Parameters	LC-MS/MS
LC-MS/MS	Equivalent equipment
Column	Zorbax RRHD,100mm x 2.1 x 1.8µ or equivalent
flow rate	0.5ml/min
Injection mode	ESI positive
Stop time	11 min

<table>
<tr><td>Parameters</td><td colspan="3">LC-MS/MS</td></tr>
<tr><td>Solvent program</td><td colspan="3">Gradient</td></tr>
<tr><td>Mobile Phase A:B</td><td colspan="3">5mM ammonium formate with 0.01% Formic acid in water: 5mM ammonium formate with 0.01% Formic Acid in Methanol</td></tr>
<tr><td>Injection Volume</td><td colspan="3">2.0µl/min</td></tr>
<tr><td>Temperature</td><td colspan="3">35°C</td></tr>
<tr><td>MS Parameters</td><td colspan="3">Ionization: Turbo Spray ESI Positive
Mode : MRM</td></tr>
<tr><td rowspan="8">Gradient Program</td><td>Time (min)</td><td>Mobile Phase A</td><td>Mobile Phase B</td></tr>
<tr><td>0</td><td>95</td><td>5</td></tr>
<tr><td>1</td><td>95</td><td>5</td></tr>
<tr><td>2</td><td>30</td><td>70</td></tr>
<tr><td>4</td><td>5</td><td>95</td></tr>
<tr><td>8</td><td>5</td><td>95</td></tr>
<tr><td>9.5</td><td>95</td><td>5</td></tr>
<tr><td>11</td><td>95</td><td>5</td></tr>
<tr><td>Gas temperature</td><td colspan="3">250°C</td></tr>
<tr><td>Gas flow</td><td colspan="3">7 l/min</td></tr>
<tr><td>Nebulizer</td><td colspan="3">20 psi</td></tr>
<tr><td>Capillary Voltage</td><td colspan="3">2500V</td></tr>
</table>

2. Setting up of GC-MS system with the below conditions

Parameter	**GC-MS**
GC-MS	GC MS or GC MS/MS
Acquisition Mode	SIM
Column	DB-5MS, 30m x 0.25 mm x 0.25µ or equivalent
Flow Rate	3ml/min
Injection Mode	Split less
Injection Volume	2 µl/min
Injector Temperature	280°C
Interface temp	280°C
Ion Source	230°C
Carrier Gas	Helium
Temperature Program	Initial Temperature.: 70°C hold for 2min, Gradient: 25°C/min to 150°C, 3.0°C/min to 200°C; 8.0°C to 280°C, hold for 10min. Total run time: 41.867 min
Mass Range	50a.m.u to 550a.m.u

Note: The conditions provided here are for guidance purposes only. These conditions may vary for different equipment, the Lab can follow suitable equipment conditions with proper resolution and response of the analytes in the matrix with appropriate run time about the conditions mentioned above. This shall be established through linearity on standard and repeatability on the matrix at estimated as per validation procedure followed in the standards prescribed.

LC-MS/MS and GC-MS mass fragment tables

2.7.2.1 List of Pesticides with CAS numbers and target and reference ions.

The list provided here is exhaustive to cover all the pesticides listed in the various regulations, standards and requirements. This procedure can be used for the other pesticides not listed here with the proper resolution and validation of the method.

Mass fragment table for LC-MS/MS

Analytes	CAS Number	Target Ion	Qualifier 1	Qualifier 2	Qualifier 3
2,4,5-T	93-76-5	255	197	195	159
2,4-D	94-75-7	221	219	163	161
Azinophosethyl	2642–71–9	346	160	132	77
Azinophosmethyl	86–50–0	318	261	132	77
Bromophos-ethyl	4824–78–6	97	359	242	303
Butiphos (DEF)	78–48–8	57	169	202	170
Carbaryl	63-25-2	202	145	127	-
Chlorfenvinphos	470–90–6	359	205	170	155, 99
Coumaphos	56–72–4	363	335	307	227
Dichlofluanide	1085-98-9	333	224	123	
Dicrotophos (Bidrin)	141–66–2	238	127	112	72
Dimethoate	60–51–5	230	199	171	79
Dinoseb and salts	88–85–7	239	209	193	163, 134
Malathion	121-75-5	331	127	99	-
MCPA	94–74–6	201	199	143	141
MCPB	94–81–5	201	199	143	141
Mecoprop	93–65–2	201	199	143	141
Metamidophos	10265–92–6	142	125	94	
Monocrotophos	6923–22–4	224	193	127	
Parathion	6923–22–4	292	236	97	
Parathion-methyl	298–00–0	281	265	249	73
Phosdrin/Mevinphos	7786–34–7	127	192	109	-
Profenophos	41198–08–7	337	339	97	139
Propetamphos	31218–83–4	282	156	138	110
Quinalphos	13593–03–8	299	163	147	
Tolylfluanide	731-27-1	347	238	137	

Mass fragment table for GC-MS

Analytes	CAS Number	Target Ion	Qualifier 1	Qualifier 2	Qualifier 3
Aldrin	309-00-2	263	66	261	265
Azinophosethyl	2642–71–9	132	160	77	105
Azinophosmethyl	86–50–0	160	77	132	104
Captafol	2425–06–1	80	79	77	78
Carbaryl	63-25-2	144	115	145	116
Chlordane	57–74–9	373	375	377	371
Chlordimeform	1970–95–9	196	181	152	117
Chlorfenvinphos	470–90–6	267	323	269	325
Coumaphos	56–72–4	362	109	97	226
Cyfluthrin	68359–37–5	206	163	165	199
Cyhalothrin (Lambda)	91465–08–6	181	197	208	141
Cypermethrin	52315–07–8	181	163	165	91
DDD-o,p'	72-54-8	235	237	165	236
DDD-p,p'	72-55-9	235	237	236	165
DDE-o,p'	3424–82–6	246	318	248	316
DDE-p,p'	72–55–9	246	318	248	316
DDT-o,p'	789-02-6	235	237	165	199
DDT-p,p'	50-29-3	235	237	165	236
Deltamethrin	52918–63–5	253	181	251	255
Diazinon	333–41–5	179	137	152	-
Dichlofluanide	1085-98-9	123	167	224	77
Dichlorprop	120–36–2	162	164	234	236
Dicrotophos (Bidrin)	141–66–2	127	67	193	109
Dieldrin	60-57-1	79	81	82	-
Dimethoate	60–51–5	125	87	93	63
Endosulfan sulfate	1031-07-8	387	272	274	389
Endosulfan α-	115–29–7	237	195	239	241
Endosulfan β-	33213–65–9	195	237	197	207
Endrine	72-20-8	263	81	261	265
Esfenvalerate	66230–04–4	125	167	181	152
Fenvalerate	51630–58–1	125	167	225	152
Heptachlor	76-44-8	272	274	270	100
Heptachloroepoxide	93-76-5	353	355	81	351
Hexachlorcyclohexane, α−	319–84–6	181	183	219	-

Analytes	CAS Number	Target Ion	Qualifier 1	Qualifier 2	Qualifier 3
Hexachlorcyclohexane, β−	319–85–7	181	183	219	-
Hexachlorcyclohexane, δ−	319–86–8	181	183	219	-
Hexachlorobenzene	118-74-1	284	286	282	288
Lindane	58-89-9	181	183	219	-
Malathion	121-75-5	173	125	93	127
Methoxychlor	72-43-5	227	228	212	152
Mirex	2385-85-5	272	274	270	237
Monocrotophos	6923–22–4	127	67	192	97
Parathion	6923–22–4	291	109	97	139
Parathion-methyl	298–00–0	263	125	109	79
Propetamphos	31218–83–4	138	194	110	122
Quinalphos	13593–03–8	157	146	156	118
Tolylfluanide	731-27-1	238	137	240	181
Toxaphene	8001-35-2	159	161	305	269
Trifluraline	1582-09-8	306	264	290	248
Ethylparathion	56-38-2	291	109	97	139
Pentachloroanisole	1825-21-4	280	265	237	267
Permethrine	52645-53-1	183	163	184	165
Chlorthalonil	1897-45-6	266	264	268	270

Analysis Sequence & Quality Control Acceptance Criteria

Inject in the sequence of Solvent Blank, sample blank, Calibration Curve, Laboratory QC Check, Samples from 1 to 10, Calibration QC check, Samples 11 to 20 followed by Solvent Blank.

S. No	QC Point	Criteria	Batch
1	Solvent blank	Clear baseline	1/20
2	Sample blank	<0.3 times of LOQ	-
3	Matrix Calibration standards	$R^2 \geq 0.95$, Residuals <20%	1/20
4	Laboratory QC	70% to 120%	1/20
5	Samples 1 to 10	-	-
6	Calibration QC	80% to 100%	1/10
7	Samples 11 to 20	-	-
8	Solvent blank	Clear baseline	1/20

Note: Under Batch 1/20 is given, assuming that the batch size is 20, but could be changed as required. One calibration QC in every 10 injections is used as a quality control checkpoint. If the response ratio is within the acceptance limit then it could be increased to 1/20.

Identify the presence of the target analyte against the standard concerning retention time and mass fragment ion ratio for the mass spectrometry technique. While quantifying, check the peak integration

Acceptance Criteria for Ion Ratio	
Relative intensity (% of base peak)	Relative (LC-MS/MS)
> 50%	± 30%
> 20 % to < 50 %	± 30%
> 10 % to < 20%	± 30%
< 10%	± 30%

Acceptance Criteria for Retention time ratio	
LC	± 0.20
GC	

Determine the amount of identified analyte from the calibration curve.

Use standard addition technique for any issues in the identification of mass no due to improper resolution and merging of peaks.

If the analyte concentration exceeds the calibration curve

- Dilute the extract –single dilution and perform reinjection
- Confirm by Repeat analysis with appropriate weight

Calculation

$$\text{Concentration mg/kg} = \frac{C \times V \times DF}{W} \times RF$$

Where,

C is the concentration of analyte from the calibration curve (mg/l)

V is the volume made up (ml)

DF is the dilution factor

W is the weight of the sample (g)

RF is the recovery factor

Test report

The test report shall contain at least the following information and or required.

Test Method details

Sample details (partial sample, if applicable)

Type and identification of the product and/or material tested

Date of receipt and date of analysis.

Sampling procedure, if applicable

Detection and Quantification Technique.

Results reported as the analyte and reporting limit with unit.

Any deviation in agreement or otherwise from the test method.

Any unusual details observed during the determination.

Reference Documents

- US EPA 8081B - Organochlorine pesticides by gas chromatography.
- USEPA 8151A Chlorinated herbicides by GC using methylation or penta fluoro benzylation derivatization.
- Journal of Chromatographic Science, Vol. 45: August, 2007_Multiresidue determination of 77 Pesticides in Textiles by GCMS

b) Smt. Meeta Singhla, Testtex Mumbai

Comments on Formulation of Indian Standards – TXD 05

Test parameter	Method No.	Extraction Method	Componant	Instuement	Comments	Remarks
Disperse dye	DIN-54231:2005	Sonication in Methanol	DISPERSE BLUE 1 DISPERSE BLUE 3	HPLC DAD/HPLC-DAD-MS	This Standard with only 9 disperse	Standard Obsolate

		at 70° for 30 min	DISPERSE BLUE 35		dyes and standard is obsolete now, revised version of standard released in 2022	
			DISPERSE BLUE 106			
			DISPERSE BLUE 124			
			DISPERSE YELLOW 3			
			DISPERSE ORANGE 3			
			DISPERSE ORANGE 3			
			DISPERSE ORANGE 37			
			DISPERSE RED 1			
Disperse dye	DIN-54231:2022, Textiles-Determination of dyes after methanol extraction	Sonication in Methanol at 70° for 30 min	Total 43 Dyes including Allergenic & Carcinogenic disperse dyes	HPLC-DAD/HPLC-DAD-MS, LCMS/MS	In revised version of DIN 54231:2022, Total 43 dyes are listed including allergenic disperse dyes & carcinogenic dyes as Acid dyes, Basic dyes, Direct dyes, Solvent yello and Navy Blue dyes. As per Oekotex MRL for carcinogenic dyes: 50 mg/kg (ppm) and Allergenic	BIS needs to finalise list of dyes for standard prepration.

					disperse dyes: 50 mg/kg (ppm) where as GOTs MRL for <20 mg/kg (ppm) for all.	

Comments on Formulation of Indian Standards - TXD 05						
Test parameter	**Method No.**	**Extraction Method**	**Component**	**Instuement**	**Comments**	**Remarks**
Heavy Metals	**EN-16711-1:2015**	Determination of metals, antimony, Arsenic, cadmium, chromium, cobalt, Lead, mercury, nickel in natural & man-made textile, including coated fabrics & garment components eg. Buttons, zips etc, paint & surface, metalic & non metalic products after microwave digestion	Antimony (Sb), Arsenic(As), Cadmium (Cd), Chromium(cr), Lead(Pd), Cobalt(Co), Copper(Cu), Mercury(Hg), Nickel(Ni)	ICP-MS,ICP-OES,AAS,Cold Vapour AAS		EPA methods can be used for guidance. Digestion method shall be included using Hot block digestor as well as microwave digestor

Total Lead/Total Cadmium	**EPA-3050B**	Heating source-Hot plate,blok digestor, microwave etc	Lead, cadmium	Flame atomic absorption spectrometry (FLAA), Inductive coupled plasma spetometry (ICP-MS), Inductive coupled plasma atomic emission spectrometry (ICP-AES)		

Comments on Formulation of Indian Standards - TXD 05						
Test parameter	**Method No.**	**Extraction Method**	**Componant**	**Instuement**	**Comments**	**Remarks**
The simulation of wear & corrosion for the detection of Nickel release from coated items	**EN 12472**	Swirl the sample for 2 min. in Degresing soln. at room temp. rinse with water & dry using absorbent paper. If applicable the item to be tested shall first be opened to reveal critical surface. The item are suspended a few centimeter above the corrosive medium in closed container & placed in oven for 2hr. at 50° C. Remove container from oven, Rinse item with dw. Dry at room temp. for about 1h. then perform the wear procedure.	For Coated Item		This method is for coated material. The method describes preparation of test sample only.	
		Wear Procedure				

		Rotate the tumbling barrel at speed of (30±2) rotation per min for total of 5h ±5min. The direction of the rotation shall be reversed after 2.5h±5min				
		Remove the assembly from barrel & detach the item, wipe off wear medium				
		Test the items for nickel release with **EN 1811**				
Nickel release(articles intended to come into direct & prolonged contact with the skin)	**BS EN 1811:2023**	Swirl the sample for 2 min. in Degrasing soln. at room temp. rinse with water & dry using absorbing paper. The article to tested for nickel release is placed in solution of artificial sweat for one week. The concentration of dissolved nickel in soln. is determine by inductive coupled plasma spectrometry.	Ni	Inductive coupled plasma spectrometry.(ICP-OES, ICP-MS	Method is applicable for Non-coated materials	

Comments on Formulation of Indian Standards - TXD 05		
Test parameter	**Method No.**	**Comments**
Pesticide test	ISO 15913	All these methods are for water quality, aqueous soil, waste matrices and food products. These are not direct method for Textiles. All these methods describes sample extraction in solvents using ultra sonication or soxhlet or liquid extraction or solid phase extraction (SPE) some methods by derivatisation as well. Analysis to be performed on GC-ECD/MS or GCMS/MS or LC-DAD-MS or LCMS/MS. Organochlorine pesticides can be determined by GC-ECD. These methods are for basic starting point for generating its own detailed SOP and which required complete validation.

	DIN 38407 or EPA 8081	List of pesticides need to be finalized, as per Oekotex requirements - 78 pesticides, GOTs - 111 pesticides, Common to Okeotex & GOTs is 58 Pesticides.	
		Glyphosate in mandatory requirement of list of pesticides for GOTs however for Oketotex its under observation	
	EPA 8151A	MRL also needs to be fixed as GOTs requirment is 0.1 mg/kg (ppm) where as for Oekotex requirement for Baby 0.5 mg/kg(ppm) & for others 1.0 mg/kg (ppm)	
	BV L 00.00 34:2010-09	Depending on the nature of molecules of pesticide there would be more than one method for extraction	
		General method describes homogenigation, test sample extraction, clean up & analysis by GCMS or (GCMSMS) & LCMS or (LCMSMS)	
		Glyphosate require derivatization followed by LCMC or LCMSMS depending on limit of quantification	
		Plant Growth Regulators (PGR) requires two different method so total no. of methods can be 2 to 7 depending on molecule of pesticide & limit of detection	

ANNEX 8

(Item 6.2)

NEW SUBJECTS FOR FORMULATION OF INDIAN STANDARD

TEST METHOD FOR IDENTIFICATION OF BAMBOO, BANANA AND OTHER NATURAL FIBERS

Dr. Manisha Mathur, SASMIRA Mumbai

Test Method for Identification of Bamboo & Banana Fibres

1 Scope

This standard prescribes method for qualitative analysis of Bamboo & Banana fibres in any form such as fibre, yarn & fabric.

2 Principle

The sample of the fibre is identified in 4 steps, Burning, Microscopic, Chemical & FTIR analysis.

3 Preparation of Test Specimen

3.1 If the sample consists of more than one kind of fibre, separate by dissection the different kinds, teasing them apart.

3.2 Remove the non fibrous matter by methods recommended in IS 9068.

4 Apparatus & Chemicals

4.1Compound Microscope

4.2 Glass slides & Cover slips

4.3 Cross section plate & cutters

4.4 FTIR Instrument

4.5 75 % Sulphuric Acid

4.6 60% Sulphuric Acid.

4.7 Ammonia solution.

5 Procedure

5.1 Burning test: A small tuff of fibres is held by forceps in the flame of a burner for about 10 seconds & is removed. The burning behaviour of the fibres is noted.

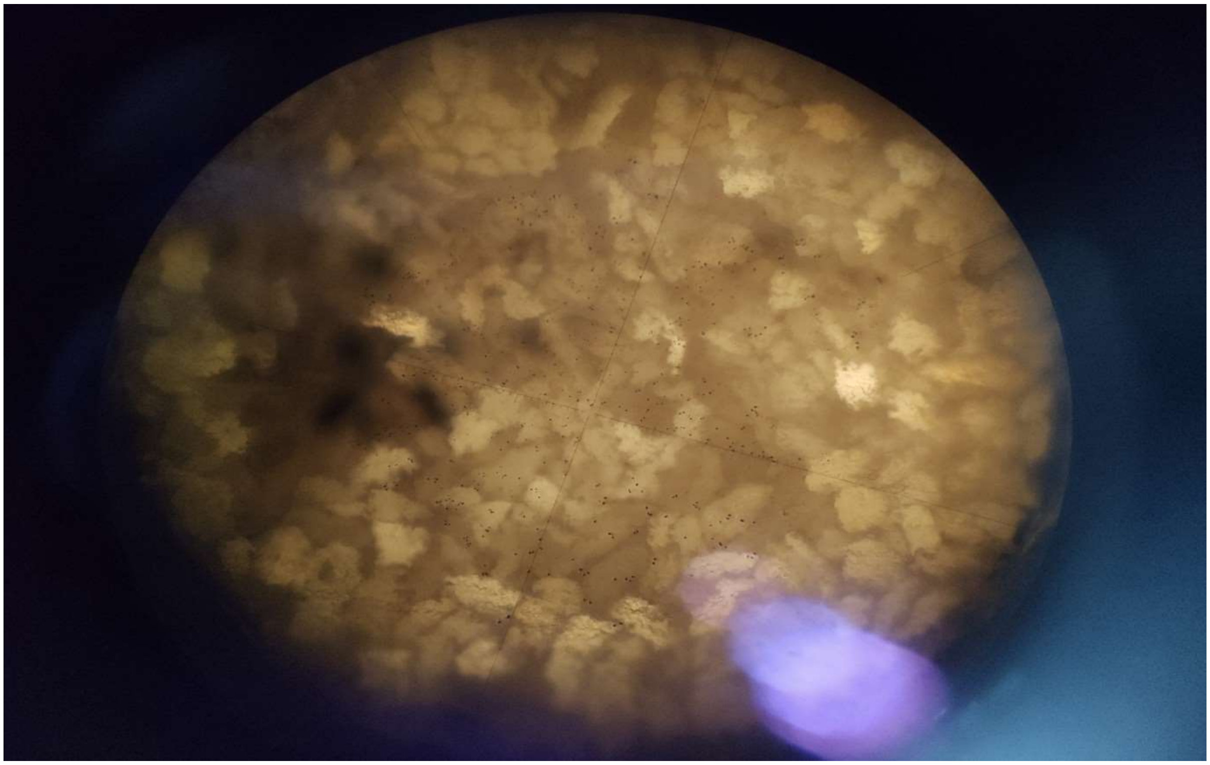
Bamboo fibres: Paper burning smell with formation of ash.

Banana fibres: Paper burning smell with formation of ash.

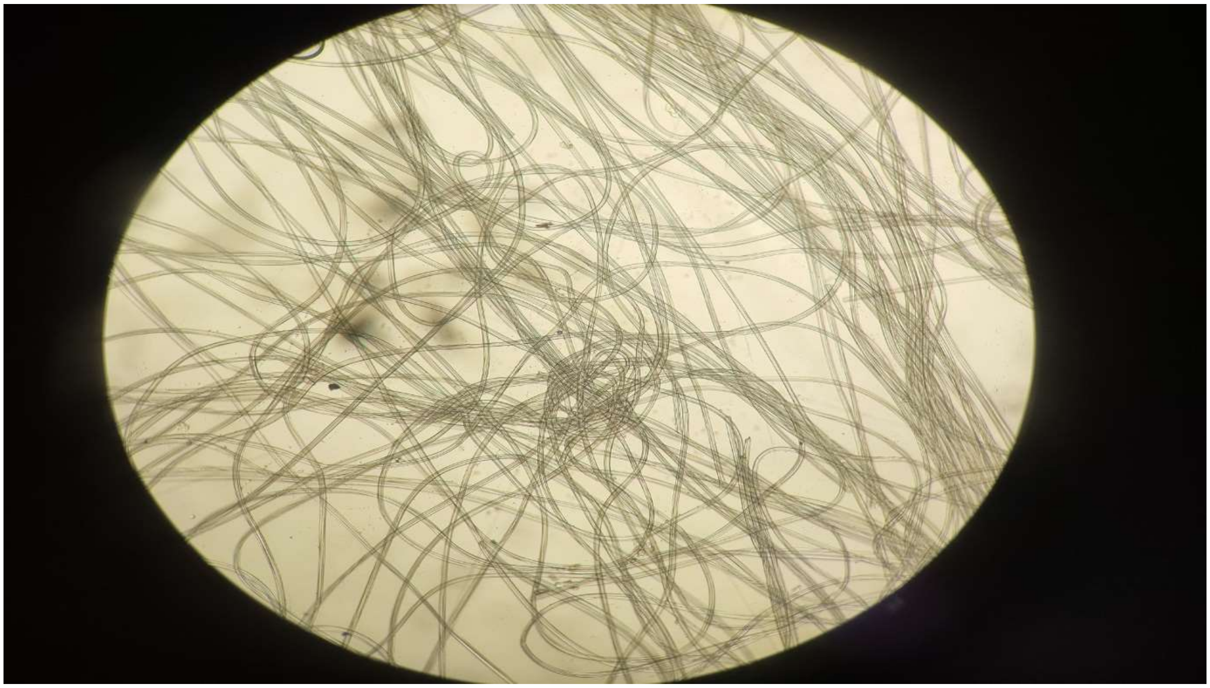
6 Microscopic Analysis

6.1 Prepare the longitudinal & cross section of the specimens. The standard photo graphs are given below:

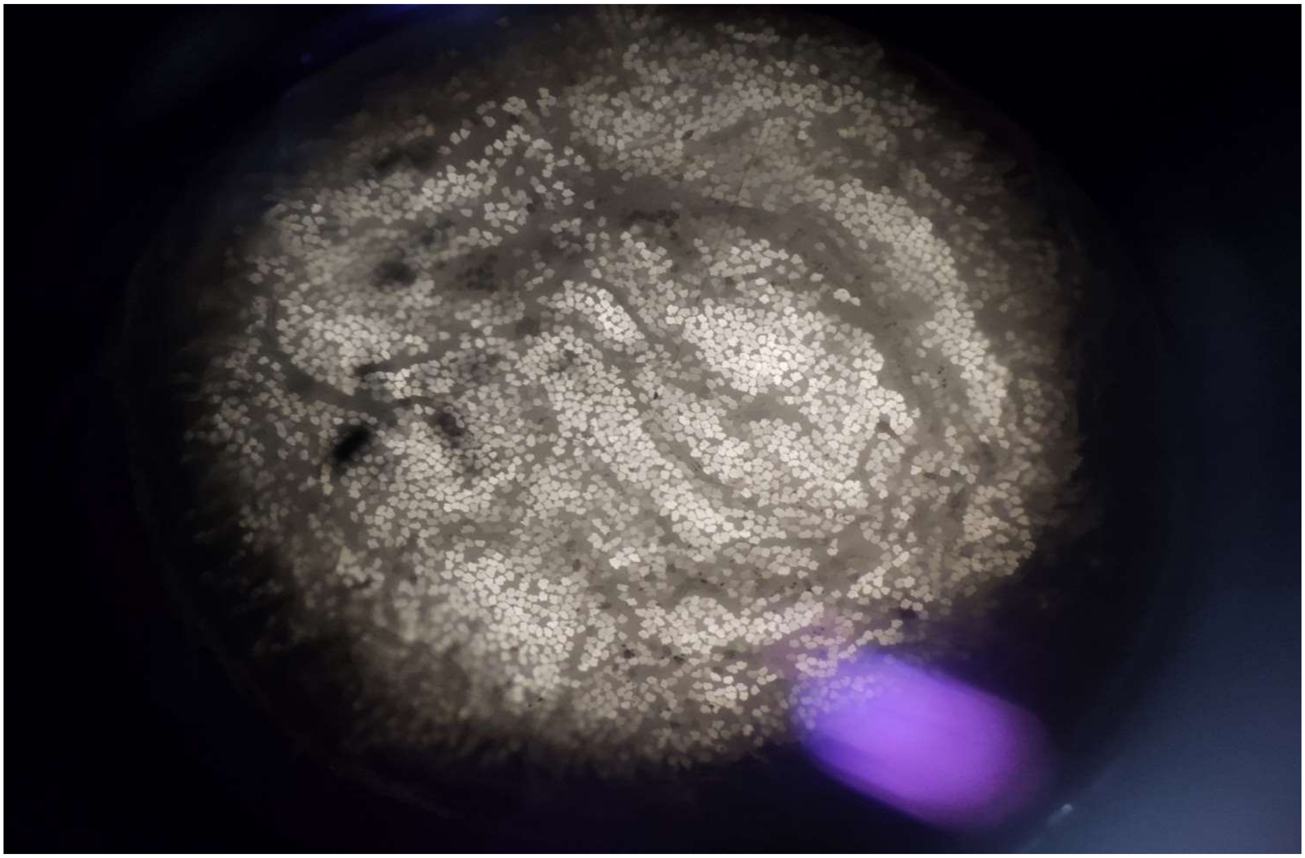
LS of Banana Fibre



CS of Banana Fibre



LS of Banana Fibre



CS of Banana Fibre

6.2 The LS & CS description

Banana : LS Thick with striations & nodes.

CS Multi lobular cloud like

Bamboo: LS Cylindrical with striations

CS Serrated flower like

7 Solubility

7.1 60% Sulphuric Acid: At room temperature

Banana fibres dissolve partially

Bamboo fibres dissolve completely.

7.2 75% Sulphuric Acid: At room temperature

Banana fibres dissolve completely

Bamboo fibres dissolve completely.

8 FTIR Analysis

Take the spectra of the fibres using FTIR & compare with the standard spectras of banana & bamboo fibres.

ANNEX 10

(Item 8.2)

REVIEW OF PUBLISHED STANDARDS

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDRADS
Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024
(*Not to be reproduced without permission of BIS or used as Standard*)
***भारतीय मानक* मसौदा**

वस्त्रादि — सूक्ष्म जीवों के कारण जूट के कपड़ों में क्षति का पता लगाने और अनुमान लगाने की विधियाँ

(आईएस 2010 का *दूसरा पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Methods for Detection and Estimation of Damage in Jute Fabrics Due To Micro-Organisms

(*Second Revision* of IS 2010)

ICS: 59.060.10

Chemical Methods of Test Sectional Committee, TXD 05	last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1962 and revised in 1984 to make it up-to-date on the basis of the experience gained during its use. Changes have been made in the conditioning, sampling and testing clauses so as to bring the standard in line with other similar standards. Preliminary tests involving smelling at the specimens have been deleted because the in hailing of bacteria is very unhygenic and harmful, especially when this is repeatedly done.

This Second revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) ICS number is incorporated in place of udc number.
iii) References to the Indian standard have been updated.
iv) Apparatus and reagents has been updated.

Jute fabrics are liable to be attacked and damaged by microorganisms, such as bacteria and fungi, while in transit, storage or use. The deterioration is promoted by climatic conditions prevalent in tropical and subtropical countries.

Moisture is essential for the development and growth of microorganisms, the amount of moisture required being dependent upon the type of organism. Thus fungi usually develop when the relative humidity of the environment approaches about 75 percent, and the growth is rapid when the relative humidity is above 85 percent. Bacteria, on the other hand, are active only when the substrate on which they are present is itself wet.

Fungi may appear as a fine downy growth or as dark spots or stains causing discoloration of the fabric. The isolated regions of mould growth may show considerable tendering while the rest of the material may indicate little are no tendering. If the fabric had been in contact with soil or had been contaminated with it and then exposed to dampness, the entire material may show rapid and uniform tendering.

The degree of growth of micro—organisms as well as their tendering effect may differ widely even in the immediate neighboring areas in the fabric. It is, therefore, not practicable to submit the results of the tests prescribed in this standard to statistical analysis.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes methods for detection and estimation of damage in jute fabrics due to micro-organisms.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)
IS 1070 : 2023	Reagent Grade Water — Specification (*Fourth Revision*)

3 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

3.1 The specimens for breaking load testing shall be conditioned and tested in the standard atmosphere at 65 ± 2 percent relative humidity and 27 ± 2°C temperature (*see* IS 6359).

3.2 When the specimens have been left in such an atmosphere for 24 hours in such a way as to expose, as far as possible, all portions of the specimens to the atmosphere, they shall be deemed to have reached moisture equilibrium.

4 SAMPLING

4.1 Lot — The quantity of similar jute fabric, delivered to a buyer against one dispatch note shall constitute a lot.

4.2 Samples for test shall be drawn so as to be representative of the lot. Samples drawn in accordance with the material specification or as agreed to between the buyer and the seller shall be taken as representative of the lot.

4.3 The samples shall be first visually examined for the presence of mould growth, indicated by isolated dark portions, stains, discoloration, etc. all the portions showing mould growth shall be clearly marked.

4.4 From the marked portions of the samples, draw at random 10 pieces, each 2.5 × 2.5 cm in size. These shall constitute the test specimens for the purpose of **6.3** and **6.4**.

4.5 From the marked portions of the samples, draw at random 11 pieces, each measuring 33 × 12.5 cm in size. Unravel yarns from both sides of each specimen so that the width of the specimens is 10 cm. These shall constitute the test specimens for the purpose of **7.1** and **7.2** (*see* Note under **4.6**).

4.6 From the unmarked and undamaged portions of the samples, draw at random 11 pieces, each 33 × 12’5 cm in size. Unravel yarn from both sides of each specimen so that the width of the specimens is 10 cm. These shall constitute the control specimens for the purpose of **7.l** and **7.2**.

NOTE—The test and control specimens should be drawn so that the length of all the specimens is in the direction of either warp or weft, preferably in the direction of warp.

5 QUALITY OF REAGENTS

5.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS: 1070) shall be used in tests.

NOTE— ‘Pure chemicals’ shall mean chemicals that do not contain impurities which affect the test results.

6 DETECTION OF DAMAGE

6.1 Apparatus

6.1.1 *Glass Slides* — *15* pairs.

6.1.2 *Microscope* — with a magnification range of 50 to *900,*

6.1.3 *Stopwatch*

6.1.4 *Conical Flask*

6.1.5 *Blotting Paper*

6.2 Reagents

6.2.1 *Lactophenol Solution* — Dissolve 100 g of phenol in 100 ml of water and add to the solution 100 ml each of glycerine and lactic acid.

6.2.2 *Chlorazol Sky Blue (flew Colour Index No.* 24410) *Solution* – 2.5 percent solution in distilled water.
6.2.3 *Acid Erythrosin (New Colour Index No. 45430) Solution* — 1.0 percent solution in distilled water. Dilute 1 part of this solution with 3 parts of distilled water,

6.2.4 *Distilled Water*

6.3 Detection of Fungal Damage

6.3.1 Take 5 test specimens drawn as in **4.4** and unravel yarns from each. Take 5 or 6 yarns from each specimen and tease them gently on a glass slide to separate individual fibres. Treat the fibres with a few drops of Chlorazol Sky Blue solution for 1 to 2 minutes.

6.3.2 Put about 50 ml of distilled water in a 125-ml conical flask and boil it briskly. Steam the fibres for 30 seconds by placing the slide on the mouth of the flask.

6.3.3 At the end of 30 seconds, remove the slide and blot off the excess Chlorazol Sky Blue solution with blotting paper.

6.3.4 Treat the fibers on the slide with a few drops of lactophenol solution. Following the procedure prescribed in **6.3.2** steam the fibers for 30 seconds. Remove the slide and blot off the excess lactophenol solution.

6.3.5 Mount the fibres on a separate slide with a few drops of lactophenol solution. If necessary, separate the fibres by teasing them apart gently. Cover them with a cover slip and examine a small portion of the aggregate under the microscope with a magnification of 50 to 500. Examine 5 slides in all.

6.3.6 If the slides show blue stained hyphae, report the lot to have been damaged by fungal attack.

6.4 Detection of Bacterial Damage

6.4.1 Take the remaining 5 test specimens drawn as in **4.4** and unravel yarns from each. Take 5 or 6 yarns from each specimen and tease them gently on a glass slide to separate individual fibres. Treat the fibres with a few drops of Acid Erythrosin solution for 1 to 2 minutes.

6.4.2 Following the procedure described in **6.3.2** steam the fibres for 30 seconds. Remove the slide and blot off the excess Acid Erythrosin solution with blotting paper. Wash the fibres on the slide several times with distilled water by adding a few drops of distilled water and blotting them off.

6.4.3 Mount the fibres on a separate slide with a few drops of distilled water. If necessary, separate the fibres by teasing them apart gently. Cover them with a cover slip and examine a small portion of the aggregate under the microscope with a magnification of 500 to 900. Examine 5 slides in all.

NOTE — Both damaged and undamaged fibres will be stained red, but the presence of bacteria will be indicated by a comparatively deeper red stain. For reference, undamaged fibres should also be tested.

6.4.4 If the slides show deep red stains, report the presence of bacteria in the fabric under examination.

7 ESTIMATION OF DAMAGE

Estimate the damage in the sample under test by the methods given in **7.1** and **7.2**

NOTE — If the damage is not very great or if only a small quantity of samples is available for testing, only the method prescribed in 6.2 may be used.

7.1 Breaking Load Test

7.1.1 Take 10 test specimens out of the eleven drawn as in **4.5** and condition them to moisture equilibrium in the standard atmosphere. Determine the breaking load of each specimen on a horizontal or vertical type strength testing machine, keeping the distance between the grips of the machine as 20 cm and at a rate of traverse of 45 cm/min. Find the average of all the values.

NOTE — The breaking load of the individual test specimens may vary widely among themselves depending on the degree of tendering of each specimen.

7.1.2 Determine as prescribed in **7.1.1** the average breaking load of 10 control specimens out of the eleven drawn as in **4.6**.

7.1.3 Calculate the loss in breaking load, percent, of the fabric after being damaged (L) by the following formula:

$$L = \frac{100\,(a-b)}{a}$$

Where

a = average breaking load of the control specimens, and

b = average breaking load of the test specimens.

NOTE — If the value of L is more than 20 percent the fabric should be declared as damaged. The degree of damage will increase with the increasing value of L.

7.2 Damage Count Test

7.2.1 *Reagents*

7.2.1.1 *Caustic soda solution* — 10 percent, (*m/v*), in distilled water,

7.2.1.2 *Herzberg's reagent* — Dissolve 2 g of zinc chloride in 10 ml of water. Dissolve separately 2.1 g of potassium iodide and 0.1 g of iodine in 5 ml of water. Mix the two solutions thoroughly.

7.2.2 Procedure

7.2.2.1 Take the remaining 1 test specimen drawn as in **4.5** and unravel yarns from it. Take 5 or 6 yarns, cut them into small lengths and tease them into individual fibres. Mix the fibres thoroughly and cut them into pieces of about 1 cm length. Immerse the cut fibres in 10 percent caustic soda solution for 3 minutes to wet them thoroughly. At the end of this period, remove the fibres from the alkali solution. Wash the fibres thoroughly with several changes of water and squeeze out the excess water by pressing them between pieces of filter paper. Dry the fibres in an air oven at a temperature not exceeding 100°C for a period not exceeding 10 minutes. Roll the dried fibres into a narrow wick and shred into small bits of about 0.5 to 1 mm length.

7.2.2.2 Take a glass slide and place on it a drop of Herzberg's reagent. With the help of a pair of dissecting needles put a portion of the fibres in the Herzberg's reagent. Carefully separate the individual fibres in the reagent with the help of the needles.

7.2.2.3 Boil briskly about 100 ml of distilled water in a conical flask of 250 ml capacity until a continuous stream of steam is produced. Then place the slide on the mouth of the flask and steam the fibres on it for exactly $1\frac{1}{2}$ minutes. At the end of this period, remove the slide.

7.2.2.4 Cover the fibres with a cover slip and examine the slide under the microscope with a magnification of 80.

NOTE —Damaged Fibres appear more or less straight whereas undamaged fibres show a characteristic spiral formation (*see* Fig. 1 and 2). The photomicrographs in Fig. 1 and 2 are taken with a magnification of 200, though a magnification of 80 is sufficient for the purpose of this test.

7.2.2.5 Count separately the number of damaged and undamaged fibres and calculate the damage count of the fibres on the slide by the following formula:

Damage count = $\frac{a}{a+b} \times 100$
where
a = the number of damaged fibres, and
b = the number of undamaged fibres.

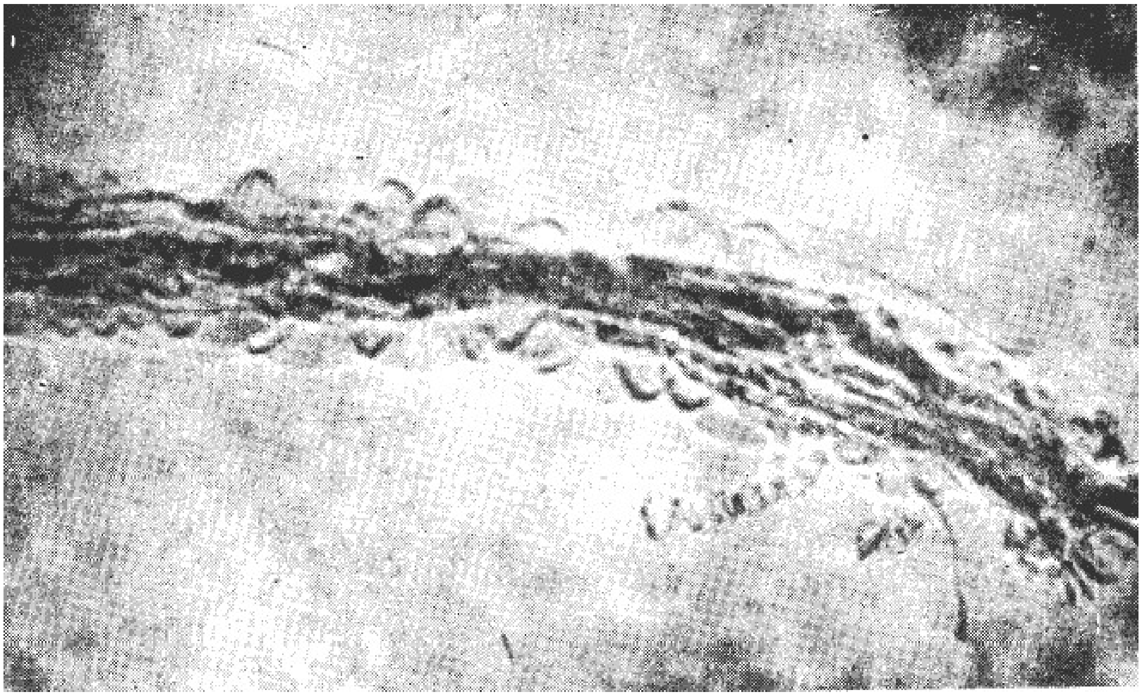


FIG. 1 UNDAMAGED JUTE FIBRE

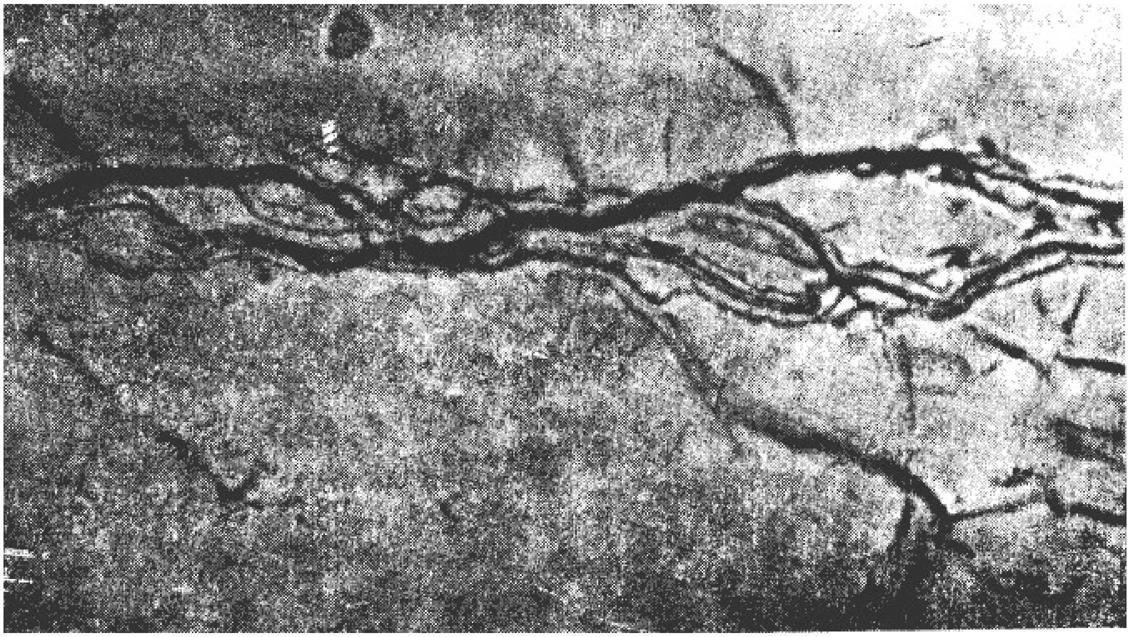


FIG. 2 DAMAGED JUTE FIBRE

7.2.2.6 Examine 5 to 10 slides (covering about 560 fibres in all) and calculate the average of all the values obtained.

7.2.2.7 Following the procedure prescribed in **7.2.2.1** to **7.2.2.6** determine the average damage count of the fibres in the remaining 1 control specimen drawn as in **4.6**.

7.2.2.8 Compare the damage count values obtained as in **7.2.2.6** and **7.2.2.7.**

NOTE—The control specimen shall always show a lower damage count value than the test specimen. If the difference of the damage count of the control and test specimens is more than 10, the fabric should be declared as damaged.

8 REPORT

8.1 The report shall include the following information:

a) Nature and position of the damaged portion of the fabric as examined visually;

b) Whether fungi are present;

c) Whether bacteria are present;

d) Loss in breaking load percent, of the basic fabric after being damaged;

e) Damage count of the test specimen; and

f) Damage count of the control specimen.

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDRADS
Draft for comments only Doc No.: TXD 05 (XXXXX)
XXXX 2024
(*Not to be reproduced without permission of BIS or used as Standard*)
***भारतीय मानक* मसौदा**
वस्त्रादि — सूक्ष्म जीवों के कारण पटसन के सूत और डोरियों में क्षति का पता लगाने और अनुमान लगाने के विधियाँ
(आईएस 2011 का *दूसरा पुनरीक्षण*)
Draft *Indian Standard*

Textiles — Methods for Detection and Estimation of Damage in Jute Yarn and Cordage Due To Micro-Organisms

(*Second Revision* of IS 2011)

ICS: 59.060.10

Chemical Methods of Test Sectional Committee, TXD 05	last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1962 and revised in 1984. The last revision has been brought out with a view to delete the preliminary tests involving smelling at the specimens because the inhaling of bacteria is very unhygienic and harmful, especially when it is repeatedly done. Further, to bring the standard in line with other similar standards, certain changes have been made in the conditioning sampling, and testing clauses.

This second revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

xiv) The Title of the standard has been updated.
xv) ICS number is incorporated in place of udc number.
xvi) References to the Indian standard have been updated.
xvii) Apparatus and reagents has been updated.

Jute yarn and cordage are liable to be attacked and damaged by micro-organisms, such as bacteria and fungi, while in transit, storage or use. The deterioration is promoted by climatic conditions prevalent in tropical and subtropical countries.

Moisture is essential for the development and growth of microorganisms, the amount of moisture required being dependent upon the type of organism. Thus, fungi usually develop when the relative humidity of the environment approaches about 75 percent, and the growth is rapid when the relative humidity is above 85 percent. Bacteria, on the other hand, are active only when the substrate on which they are present is itself wet.

Fungi may appear as a fine downy growth or as dark spots or stains causing discoloration of the yarn or cordage. The isolated regions of mould growth may show considerable tendering while the rest of the material may indicate little or no tendering. If the yarn or cordage had been in contact with soil or had been contaminated with it and then exposed to dampness, the entire material may show rapid and uniform tendering.

The degree of growth of micro-organisms as well as their tendering effect may differ widely even in the immediate neighboring areas in the yarn or cordage. It is, therefore, not practicable to submit the results of the tests prescribed in this standard to statistical analysis.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes methods for detection and estimation of damage in jute yarn and cordage due to micro-organisms.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)
IS 1070 : 2023	Reagent Grade Water — Specification (*Fourth Revision*)

3 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

3.1 The specimens for breaking load testing shall be conditioned and tested in the standard atmosphere at 65 ± 2 percent relative humidity and 27 ± 2°C temperature (*see* IS 6359).

3.2 When the specimens have been left in such an atmosphere, for 24 hours in such a way as to expose, as far as possible, all portions of the specimens to the atmosphere, they shall be deemed to have reached moisture equilibrium.

4 SAMPLING

4.1 Lot — The quantity of similar jute yarn or cordage, delivered to a buyer against one dispatch note shall constitute a lot.

4.2 Samples for test shall be drawn so as to be representative of the lot. Samples drawn in accordance with the material specification or as agreed to between the buyer and the seller shall be taken as representative of the lot.

4.3 The samples shall be first visually examined for the presence of mould growth, indicated by isolated dark portions, stains, discoloration, etc.; all the portions showing mould growth shall be clearly marked.

4.4 From the marked portions of the samples, draw at random 10 pieces, each not less than 10 cm in length. These shall constitute the test specimens for the purpose of **6.3** and **6.4**.

4.5 From the marked portions of the samples, draw at random 10 pieces, each of length not less than 1 m in the case of yarn and 25 cm in the case of cordage (*see* Note). These shall constitute the test specimens for the purpose of **7.1**.

From the unmarked portions of the samples, draw at random 10 pieces, each of length not less than 1 m in the case of yarn and 25 cm in the case of cordage. These shall constitute the control specimens for the purpose of **7.1**.

NOTE — The individual yarn specimens may be carefully tied together at both ends immediately after being drawn from the samples so that their twist is not affected during subsequent handling.

4.6 From the marked portions of the samples, draw at random one piece not less than 1 m in length. This shall constitute the test specimen for the purpose of **7.2.**

From the unmarked portions of the samples, draw at random one piece not less than 1 m in length. This shall constitute the control specimen for the purpose of **7.2**.

5 QUALITY OF REAGENTS

5.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS: 1070) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

6 DETECTION OF DAMAGE

6.1 Apparatus

6.1.1 *Glass Slides* — 15 pairs.

6.1.2 *Microscope* — with a magnification range of 50 to 900.

6.1.3 *Stopwatch*

6.1.4 *Conical Flask*

6.1.5 *Blotting Paper*

6.2 Reagents

6.2.1 *Lactophenol Solution* — Dissolve 100 g of phenol in 100 ml of water and add to the solution 100 ml each of glycerine and lactic acid.

6.2.2 *Chlorazol Sky Blue (New Colour Index No. 24410) Solution — 2.5* percent solution in distilled water.

6.2.3 *Acid Evythrosin (New Colour Index No. 45430) Solution* — 1.0 percent solution in distilled water. Dilute one part of this solution with three parts of distilled water.

6.2.4 *Distilled Water*

6.3 Detection of Fungal Damage

6.3.1 Take 5 test specimens drawn as in **4.4** and, in the case of cordage, unravel single strands from each specimen. Take 5 or 6 strands from each specimen and tease them on a glass slide to separate individual fibres. Treat the fibres with a few drops of Chlorazol Sky Blue solution for 1 to 2 minutes.

6.3.2 Put about 50 ml of distilled water in a 125 ml conical flask and boil it briskly. Steam the fibres for 30 seconds by placing the slide on the mouth of the flask.

6.3.3 At the end of 30 seconds, remove the slide and blot off the excess Chlorazol Sky Blue solution with blotting paper.

6.3.4 Treat the fibres on the slide with a few drops of lactophenol solution. Following the procedure prescribed in **6.3.2** steam the fibres for 30 seconds. Remove the slide and blot off the excess lactophenol solution.

6.3.5 Mount the fibres on a separate slide with a few drops of lactophenol solution. If necessary, separate the fibres by teasing them apart gently. Cover them with a cover slip and examine a small portion of the aggregate under the microscope with a magnification of 50 to 500. Examine 5 slides in all.

6.3.6 If the slides show blue stained hyphae, report the lot to have been damaged by fungal attack.

6.4 Detection of Bacterial Damage

6.4.1 Take the remaining 5 test specimens drawn as in **4.4** and, in the case of cordage, unravel single strands from each. Take 5 or 6 strands from each specimen and tease them gently on a glass slide to separate individual fibres. Treat the fibres with a few drops of Acid Erythrosin solution for 1 to 2 minutes.

6.4.2 Following the procedure prescribed in **6.3.2**, steam the fibres for 30 seconds. Remove the slide and blot off the excess Acid Erythrosin solution with a blotting paper. Wash the fibres on the slide several times with distilled water by adding a few drops of distilled water and blotting them off.

6.4.3 Mount the fibres on a separate glass slide with a few drops of distilled water. If necessary, separate the fibres by teasing them apart gently. Cover them with a cover slip and examine a small portion of the aggregate under the microscope with a magnification of 500 to 900. Examine 5 slides in all.

NOTE—Both damaged and undamaged fibres will be stained red, but the presence of bacteria will be indicated by a comparatively deeper red stain.

6.4.4 If the slides show deep red stains, report the presence of bacteria in the material under examination.

7 ESTIMATION OF DAMAGE

Estimate the damage in the sample under test by the methods given in **7.1** and **7.2**.

NOTE — If the damage is not very great or if only a small quantity of samples is available for testing, only the method prescribed in **6.2** may be used.

7.1 Breaking Load Test

7.1.1 *Yarn Specimens* — Take the test specimens drawn as in **4.5** and condition them to moisture equilibrium in the standard atmosphere. Determine the breaking load of each specimen on a vertical type yarn strength testing machine at a rate of traverse of 30 cm/min and keeping the distance between the grips of the machine as 60 cm. Find the average of all the values.

NOTE — The breaking load of the individual test specimens may vary widely among themselves depending on the degree of tendering of each specimen.

7.1.2 *Cordage Specimen—Take* — the test specimens drawn as in **4.5** and condition them to moisture equilibrium in the standard atmosphere. Determine the breaking load of each specimen on a vertical or horizontal type rope strength testing machine at a rate of traverse of 30 cm/min and keeping the distance between the grips of the machine as 12.5 cm. Find the average of all the values (*see* Note under **7.1.1**).

7.1.3 Determine as prescribed in **7.1.1** or **7.1.2**, as applicable, the average breaking load of the control specimens drawn as in **4.5.**

7.1.4 Calculate the loss in breaking load, percent, of the basic yarn or cordage after being damaged (L) by the following formula:

$$L = \frac{100\,(a-b)}{a}$$

where
a = average breaking load of the control specimens, and
b = average breaking load of the test specimens.

NOTE — If the value of L is more than 20 percent, the material should be declared as damaged. The degree of damage will increase with, the increasing value of L.

7.2 Damage Count Test

7.2.1 *Reagents*

7.2.1.1 *Caustic soda solution* — 10 percent (*m/v*), in distilled water.

7.2.1.2 *Herzberg's reagent* — Dissolve 2 g of zinc chloride in 10 ml of water. Dissolve separately 2.1 g of potassium iodide and 0.1 g of iodine in 5 ml of water. Mix the two solutions thoroughly.

7.2.2 *Procedure*

7.2.2.1 Take the test specimen drawn as in **4.6**. If the lot consists of yarn, cut the specimen into small lengths. If the lot consists of cordage, unravel yarns from the specimen and cut them into small lengths. Tease the yarn pieces into individual fibres. Mix the fibres thoroughly and cut them into pieces of about 1 cm length. Immerse the cut fibres in 10 percent caustic soda solution for 3 minutes to wet them thoroughly. At the end of this period, remove the fibres from the alkali solution. Wash the fibres thoroughly with several changes of water and squeeze out the excess water by pressing them between pieces of filter paper. Dry the fibres in an air oven at a temperature not exceeding 100°C for: a period not exceeding 10 minutes. Roll the dried fibres into a narrow wick and shred into small bits of about 0.5 to 1 mm length.

7.2.2.2 Take a glass slide and place on it a drop of Herzberg's reagent. With the help of a pair of dissecting needles put some portion of the fibres in the Herzberg's reagent. Carefully separate the individual fibres in the reagent with the help of the needles.

7.2.2.3 Boil briskly about 100 ml of distilled water in a conical flask of 250 ml capacity until a continuous stream of steam is produced. Then place the slide on the mouth of the flask and steam the fibres on it for exactly $1\frac{1}{2}$ minutes. At the end of this period, remove the slide.

7.2.2.4 Cover the fibres with a cover slip and examine the slide under the microscope with a magnification of 80.

NOTE — Damaged fibres appear more or less straight whereas undamaged fibres show a characteristic spiral formation (*see* Fig. 1 and 2). The photomicrographs in Fig. 1 and 2 are taken with a magnification of 200, though a magnification of 80 is sufficient for the purpose of this test.

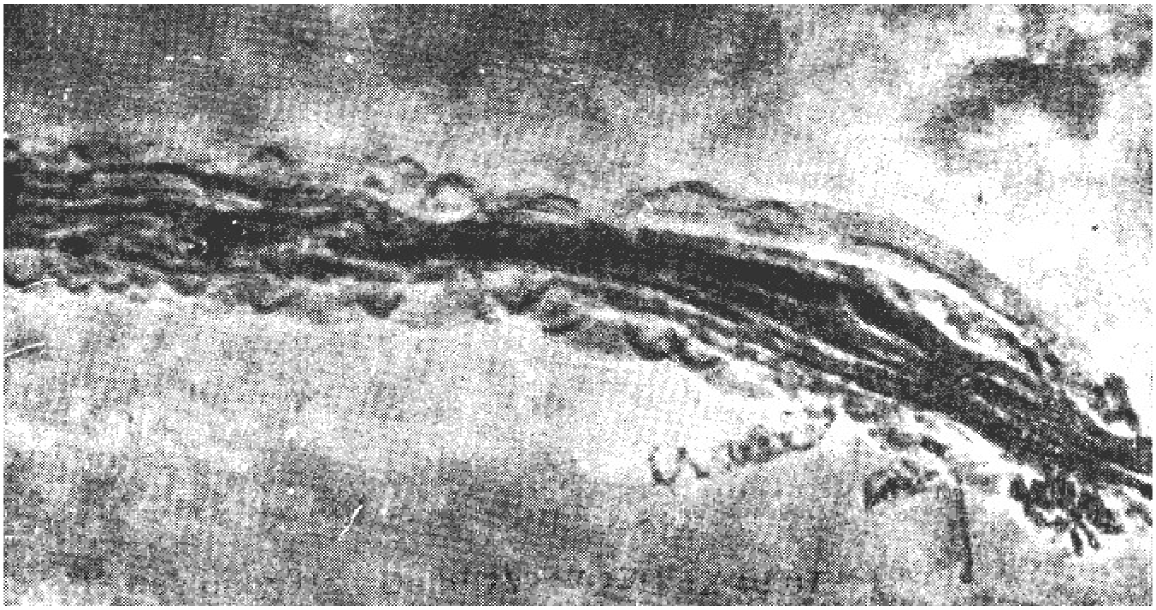


FIG. 1 UNDAMAGED JUTE FIBRE

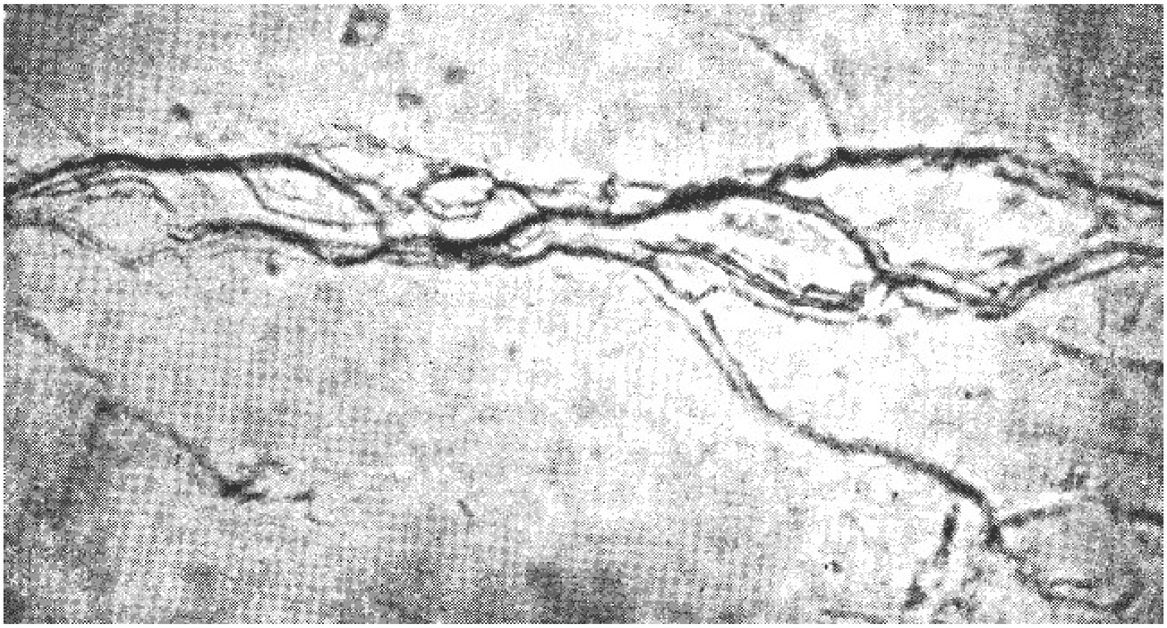


FIG. 2 DAMAGED JUTE FIBRE

7.2.2.5 Count separately the number of damaged and undamaged fibres and calculate the damage count of the fibres on the slide by the following formula:

Damage count = $\frac{a}{a+b} \times 100$

where

a = the number of damaged fibres, and

b = the number of undamaged fibres.

7.2.2.6 Examine 5 to 10 slides (covering about 500 fibres in all) and calculate the average of all the values obtained.

7.2.2.7 Following the procedure prescribed in **7.2.2.1** to **7.2.2.6**, determine the average damage count of the fibres in the control specimen drawn as in **4.6.**

7.2.2.8 Compare the damage count values obtained as in **7.2.2.6** and **7.2.2.7**.

NOTE—The control specimen shall always show a lower damage count value than the test specimen. If the difference of the damage count of the control and test specimen's is more than 10, the fabric should be declared as damaged.

8 REPORT

8.1 The report shall include the following information:

a) Nature of damage in the yarn or cordage;

b) Whether fungi are present;

c) Whether bacteria are present;

d) Loss in breaking load, percent, of the basic yarn or cordage after being damaged;

e) Damage count of the test specimen; and

f) Damage count of the control specimen.

AMENDMENT NO. 1 JANUARY 1999
TO
IS 2969: 1974 METHOD FOR DETERMINATION OF OIL CONTENT OF JUTE YARN AND FABRICS
(*First Revision*)

FOREWORD

(This amendment has been issued to accommodate the use of *n*-hexane as an extracting reagent.)

(*Page* 3, *clause* **2.1**) — Substitute the following for the existing:

'**2.1** A known amount of the sample is extracted with trichloroethylene or light petroleum or *n*-hexane in Soxhlet apparatus. The solvent is removed by distillation and the extract is weighed. The mass of the extract is expressed as a percentage of the oven dry mass of the extracted specimen or conditioned mass of test specimen before extraction.'

(*Page* 5, *clause* **7.2.2**) — Insert **7.2.3** as under:

'**7.2.3** *n-hexane'*

(*Page 5, clause* **8.1.1**) — Substitute the following for the existing:

'**8.1.1** Take a test specimen, weigh it to the nearest milligram and place it in the thimble of the Soxhlet apparatus. Take about 100 ml of trichloroethylene or light petroleum or *n*-hexane in the extraction flask previously cleaned, dried and weighed correct to 1 mg. Extract the test specimen for 1.5 to 2 hours with a minimum of 10 siphonings per hour. Disconnect the apparatus.'

(*Page* 5, *clause* **8.1.2**) — Substitute the following for the existing:

'**8.1.2** Recover the excess of the solvent by heating the flask in a water-bath, maintained at 90 to 95°C if the solvent is trichloroethylene, 60 to 65°C if the solvent is light petroleum and 70 to 75°C if the solvent is *n*-hexane, and simultaneously allowing a stream of air to pass through the flask by means of a tube terminating just below its neck. Remove all traces of moisture by heating the flask at 105 ± 3°C for 30 min. Weigh the flank and determine the mass of the extract (M_e) correct to 1 mg.'

(*Page* 5, *clause* **8.2.1**) — Substitute the following for the existing:

'**8.2.1** Take a test specimen, weigh it to the nearest milligram and place it in the thimble of the Soxhlet apparatus. Take about 150 ml of trichloroethylene or light petroleum or *n*-hexane in the extraction flask previously cleaned, dried and weighed correct to 1 mg. Extract the test specimen for 1.5 to 2 hours with a minimum of 6 siphonings per hour. Disconnect the apparatus.'

Indian Standard

METHOD FOR DETERMINATION OF OIL CONTENT OF JUTE YARN AND FABRICS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 4 October 1974, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 This standard was first published in 1964. It has now been revised to include the method for determining the oil content of jute yarn and fabrics on the basis of conditioned mass of the test specimens, which is widely used in countries importing jute products from India.

0.3 During conversion of jute fibres into yarn considerable amount of oil, commonly known as batching oil, is used in the form of its emulsion in water. Some or all of the oil is present in the later stages of manufacture of jute goods. The finished jute goods usually contain 5 to 9 percent oil. In the case of special goods, the oil content may be up to 1 percent only.

0.4 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS: 2-1960*.

1. SCOPE

1.1 This standard prescribes two methods for determination of oil content of all types of jute yarn and fabrics, namely conditioned-mass method and oven-dry method.

2. PRINCIPLE

2.1 A known amount of the sample is extracted with trichloroethylene or light petroleum in Soxhlet apparatus. The solvent is removed by distillation and the extract is weighed. The mass of the extract is expressed as a percentage of the oven-dry mass of the extracted specimen or conditioned mass of the test specimen before extraction.

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

3. SAMPLING

3.1 Lot — The quantity of jute yarn or fabric purporting to be of one definite type and quality delivered to one buyer against one dispatch note shall constitute a lot.

3.2 Samples from the lot shall be so drawn as to be representative of the lot. Samples drawn in accordance with the procedure laid down in the specification for the material or as agreed to between the buyer and the seller shall be held to be representative of the lot.

4. PREPARATION OF TEST SPECIMENS

4.1 From each bundle of yarn or cut of fabric selected, draw a test specimen weighing 6 to 8 g.

5. ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

5.1 Conditioned-Matt Method — The test shall be carried out in the standard atmosphere after conditioning the test specimens as prescribed in IS: 6359-1971*.

5.2 Oven-Dry Method — The test may be carried out in the prevailing atmosphere.

6. APPARATUS

6.1 Soxhlet Apparatus

6.2 Drying Oven — capable of maintaining a temperature of 105 ± 3°C.

6.3 Weighing Balance — capable of weighing to an accuracy of 1 mg.

7. REAGENTS

7.1 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in test and distilled water (*see* IS: 1070-1960†) shall be used where the use of water as a reagent is intended.

NOTE — ' Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

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* Method for conditioning of textiles.
† Specification for water, distilled quality (*revised*).

7.2 The reagents to be used in the test shall be as follows.

7.2.1 *Trichloroethylene*

7.2.2 *Light Petroleum* — boiling range 40 to 60°C.

8. PROCEDURE

8.1 Conditioned-Mass Method

8.1.1 Take a test specimen conditioned in the standard atmosphere (*see* **5.1**), determine its mass (M_e) correct to 1 mg and place it in the thimble of the Soxhlet apparatus. Take about 100 ml of trichloroethylene or light petroleum in the extraction flask previously cleaned, dried and weighed correct to 1 mg. Extract the test specimen for 1½ to 2 hours with a minimum of 6 siphonings per hour. Disconnect the apparatus.

8.1.2 Recover the excess of the solvent by heating the flask in a water-bath, maintained at 95 to 95°C if the solvent is trichloroethylene and 60 to 65°C if the solvent is light petroleum, and simultaneously allowing a stream of air to pass through the flask by means of a tube terminating just below its neck. Remove all traces of moisture by heating the flask at 105 ± 3°C for ½ hour Weigh the flask and determine the mass of the extract (M_c) correct to 1 mg.

8.1.3 Repeat the test with the remaining test specimens.

8.2 Oven-Dry Method

8.2.1 Take a test specimen, weigh it to the nearest milligram and place it in the thimble of the Soxhlet apparatus. Take about 100 ml of trichloroethylene or light petroleum in the extraction flask previously cleaned, dried and weighed correct to 1 mg. Extract the test specimen for 1½ to 2 hours with a minimum of 6 siphonings per hour. Disconnect the apparatus.

8.2.2 Withdraw the specimen from the apparatus, open it out and allow the excess solvent to evaporate. Dry the specimen for 4 hours at 105 ± 3°C in the drying oven. Transfer the dried specimen to a tared airtight container, cool and weigh. Determine the oven-dry mass of the specimen (M_d) correct to 1 mg.

8.2.3 Proceed further as in **8.1.2.**

8.2.4 Repeat the test with the remaining test specimens.

9. CALCULATIONS

9.1 Calculate the oil content percent of each specimen to the nearest 0.1 percent as follows:
Conditioned-mass basis:

$$\text{Oil content percent} = \frac{M_e}{M_c} \times 100$$

where
M_e = mass in milligrams of the extract (**8.1.2**), and
M_c = mass in milligrams of the conditioned specimen (**8.1.1**).

Oven-dry-mass basis:

$$\text{Oil content percent} = \frac{M_e}{M_d} \times 100$$

where
M_e = mass in milligrams of the extract (**8.2.3**), and
M_d = mass in milligrams of the oven-dry de-oiled specimen (**8.2.2**).

9.2 Calculate the average of all the values obtained as in 9.1 to the nearest 0.1 percent.

10. REPORT

10.1 The report shall include the following information:

a) Average oil content percent,

b) Method followed, and

c) Number of specimens tested.

Indian Standard

GLOSSARY OF TERMS PERTAINING TO TEXTILE PROCESSING

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 September 1980, after the draft finalized by the Chemical Methods of Tests Sectional Committee had been approved by the Textile Division Council.

0.2 This Standard has been prepared with a view to eliminating ambiguity or confusion arising from various interpretations of definitions of terms relating to different types of textile processes and processed fabrics.

1. SCOPE

1.1 This standard prescribes definitions of terms pertaining to textile processing and processed textiles.

2. DEFINITIONS

Anti-Shrink Fabric (or Pre-shrunk, Shrink-Resistant Stabilized Fabric) — A fabric which has dimensional stability of ± 1 percent both in warpway and weftway.

Bleaching — The procedure, other than by scouring only, of improving the whiteness of textile material by decolourizing it by chemical treatment from the grey state. Treatment with optical whitening agents should not be considered as bleaching.

Bleached Fabric — A fabric which has undergone bleaching treatment.

Blended Fabric — A fabric made from yarns spun with mixed fibres or filament yarn provided the fibre component is 10 percent or more (*see also* union fabric).

Calendered Fabric — A fabric which has passed through a calender normally to smoothen and flatten it, to close the intersections between the yarns or to confer surface glaze. Special calenders with an engraved heated bowl imprint a pattern in relief or modify the fabric surface to high lustre (*see also* felt calendered fabric).

Crease Resistance — A term used to indicate the capacity of a textile material to resist and/or recover from, creases incidental to its usage.

Crease-Resist Finish (or Easy-Care Finish) — A finishing process, mainly for cellulosic fabrics, that confers the characteristic or increased recovery from creasing, a property not inherent.

Crepe Fabric — A fabric characterized by a crinkled surface. The effect may be produced in a variety of ways, for example, by the use of *S*- and Z-hard-twisted yarns, crepe weave or by chemical or thermal treatment.

Dyed Fabric — Fabric on which a dye or pigment has been uniformly applied and fixed.

Easy Care Finish — *See* Crease-Resist Finish.

Felt Calendered Fabric — A fabric which is processed through a felt calender (*see also* calendered fabric).

Finish — A term used to impart the desired characteristics to textile materials.

Finishing — All operations physical or chemical, to impart desired characteristics to textile materials.

NOTE — The yarn sizing for weaving should not be considered as finishing.

Grey Fabric — A woven or knitted fabric as it leaves the loom or knitting machine which has received no scouring, bleaching, dyeing or printing treatment.

NOTE — Any removal of stains or rectifying of weaving faults by dressing the goods should not be considered as additional process on grey fabric.

Mercerization — The treatment of cellulosic textiles and blends in yarn or fabric form with caustic soda solution of desired strength whereby the yarns or fabrics are swollen, dye affinity and lustre of the materials are increased.

Mercerized Fabric — A fabric which has undergone mercerization treatment.

Organdie — A plain-weave translucent fabric of light weight with a permanently stiff finish.

Perchmentizing — A finishing treatment predominantly given to cellulosic fabrics comprising a short contact with, for example, sulphuric acid of high concentration, to produce a variety of effects depending on the type of fabric and the conditions used, varying from a linen-like handle to a translucent organdie effect (applied mainly to cotton fabrics). Reagents other than sulphuric acid can also produce the effect.

Pre-Shrink Fabric — (*see* anti-shrink fabric).

Printed Fabric — Fabric on which a colour pattern has been produced with or without a definite repeat.

Scouring — Treatment of textile materials in aqueous or other solutions in order to remove natural fats, waxes, proteins and other constituents, as well as dirt, oil and other impurities.

Shrink-Resistant, Shrink-Resisting, Shrink-Resist Fabric — (*see* antishrink fabric).

Stabilized Fabric — (*see* anti-shrink fabric).

Union Fabric — A cloth made of warp of one kind of fibre and weft of another.

Waterproofing — Process in which the interstices of the fabric as well as the surface of the material are covered with a film or skin in such a manner that the treated material is not only water-repellent, but impermeable to air and moisture.

Water-Repellent — Process whereby the fibres of the material are made water-repellent through coating with a hydrophobic substance or by a chemical reaction, but the fabric remains porous to air and does not allow wetting to take place.

Indian Standard

GLOSSARY OF TERMS PERTAINING TO TEXTILE PROCESSING

PART 2

0. FOREWORD

0.1 This Indian Standard (Part 2) was adopted by the Indian Standards Institution on 15 November I 985, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 A large number of technical terms are being used in textile processing and their interpretation differs very widely in the industry and outside. This may be due to insufficient information given by the interpretor, or due to the change of technology, trade or business. This standard has been prepared with a view to eliminate ambiguity or confusion arising from various interpretations of definitions of terms relating to different types of textile processes and processed fabrics. It also aims at supplying the most acceptable definitions for such textile terms.

0.3 Some of the important terms have already been covered in Part 1 of this standard.

1. SCOPE

1.1 This standard (Part 2) lays down definitions of terms pertaining to textile processing and processed textiles.

2. DEFINITIONS

A

Accelerant - A substance, which, when added to a treatment bath, speeds up the processing treatment.

Acetylation - The process of introducing an acetyl radical into an organic compound/polymer containing hydroxyl group.

NOTE 1 - The term acetylation is used to describe the process of combining cellulose with acetic anhydride.

NOTE 2 - A partial acetylation is sometimes applied to cotton in the form of fibre, yarn or fabric to give it special properties.

Acid Ageing - Ageing in which a volatile acid is present in the vapour.

Acid Dye - An anionic dye characterized by relatively high substantively for protein fibres and usually applied from an acid dyebath.

Affinity - The quantitative expression of substantively. It is the difference between the chemical potential of the dye in its standard state in the fibre and the corresponding chemical potential in the dyebath.

Ageing - A process in which fabric is exposed to moist, or saturated steam in absence of air.

Ager - A chamber used for ageing.

Aoionic Dye- A dye that dissociates in aqueous solution to give a coloured, negatively charged ion.

Anti-chlor - A chemical used to remove residual traces of active chlorine from materials that have been bleached, chlorinated, or otherwise treated by means of hypochlorite or other oxidizing liquors containing active chlorine. Examples are sodium bisulphite or thiosulphate, sulphurous acid and peroxides.

Anti-static Agent - A substance capable of preventing, reducing, or quickly dissipating electrical charges that might otherwise be produced.

Azoic Dyeing - The production of an insoluble azo compound on a substrate by interaction of diazotized amino (azoic diazo component) and a coupling component (azoic coupling component).

B

Back Grey - A cloth used to support and carry fabric being printed, and also to protect the blanket from contamination by surplus print paste.

Backwashing - The washing of dyed or undyed wool or man-made fibre sliver before or after gilling and/or combing.

Basic dye - A cationic dye characterized by its relatively high substantively for the acidic types of acrylic fibres and for tannin mordanted cotton.

Batchwise Processing - Processing of materials as lots or batches in which the whole of each batch is subjected to one stage of the process at a time.

Batik -A method of dyeing fabric by which characteristic varied effects are obtained by means of randomly cracked wax resists.

Baulk Finish - A finish in which the material is milled in the grease to the desired dimensions, scoured, dyed, tentered to width, and lightly pressed.

NOTE - The object of this finish which is applied only to woollen materials, is to preserve the original character of the cloth. The material is finished without raising.

Beam Dyeing - The dyeing of yarn or fabric wound on a perforated beam.

Bleeding - Loss of dye from a coloured material in contact with a liquid (for example, water, detergent or chemicals) leading to colouration of the liquid, or of adjacent areas of the same or other material.

Blinding - A marked and undesirable loss of lustre of fibres caused by wet processing.

NOTE - This may be caused by the formation, within or on the fibre, of dyes or other particles that scatter light, or by an alteration in the physical structure of the dye.

Blotch - Any relatively large area of uniform colour in a printed design.

Blowing (Steam) - A process in which steam is blown through cloth usually wound on a perforated roller.

Blown Finish - A finish applied to wool materials, obtained by blowing dry steam through the fabric which is wrapped on a perforated cylinder with an interleaving cotton fabric.

Blueing - A process to enhance the appearance of bleached textiles by the use of a blue colouring matter with or without flourescent brightening agent.

Boarding - A process involving heating under moist or dry conditions carried out to confer a desired shape or size on a stocking or knitted garment.

Bottoming - A thorough scouring usually in preparation for bleaching, dyeing or printing.

Bowl - A roller forming part of a nip through which fibre, yarn or fabric is passed in textile processing.

Bar1 Dyeing - The coloration of cellulosic impurities in wool piece goods.

C

Calendering- A process in which a fabric is passed through a calender, normally to smooth and flatten it, to close the intersections between the yarns, or to confer surface glaze.

Carbonizing - A process involving the use of acids, acid producing chemicals or acidic gases to eliminate cellulosic matter from mixtures with animal or synthetic fibres.

Carrier (dyeing) - A product added to a dye bath to promote the dyeing of hydrophobic synthetic fibres and characterized by affinity for, and ability to swell the fibre.

Cationic Dye - A dye that dissociates in aqueous solution to give a coloured ion that is positively charged (*see* basic dye).

Chemicking - Bleaching non-protein-fibre materials by means of a dilute hypochlorite solution.

Chlorination -When used with reference to textile processing, a term indicating the reaction of a fibre with chlorine.

Chromate Process - A method of dyeing in which the fibre is treated in a dyebath containing a suitable chrome dye together with ammonium chromate, where by a chromium complex is formed within the fibre.

Chrome Dye - A mordant dye that is capable of forming a chelate complex with a chromium atom.

Chrome Mordant Process - A method of dyeing in which the fibre is pretreated in solution of a chromium compound and subsequently dyed with a chrome dye to yield a dye-chromium complex within the fibre.

Clearing - A treatment applied to printed fabrics with the object of removing traces of unwanted dyestuff from, and improving the whiteness of the uncoloured area. The term is also used to denote an anti-chlor treatment given to wool goods that have been chlorinated. The term is also applied for removal of unfixed dyestuff from dyed goods.

Colour:

a) That characteristic of the visual sensation which enables the dye to distinguish difference in its quality, such as may be caused by difference in the spectral distribution of the light rather than by differences in spatial distribution or fluctuations with time.

b) As (a), but applied directly to the stimulus or the source (primary or secondary) giving rise to the sensation. For brevity, the stimulus is often referred to as the colour.

c) That property of an object or stimulus, or quality of a visual sensation, distinguished by its appearance of redness, greenness, etc, in contradiction to whiteness, greyness, or blackness (that is, chromatic colour in contradiction to achromatic colour).

Colour Quality - A specification of colour in terms of both hue and saturation, but not luminance.
Colour Value - The ratio between the strengths of the dyes yielding dyeings of equal, visual strengths. In printing, this term is synonymous with tinctorial value.

Compatible Dyes - Dyes which, when mixed together, behave in dyeing as a homogeneous dye having similar hue and fastness properties.

Condense Dye - A dye which, during or after application, reacts covalently with itself or other compounds, other than the substrate, to form a molecule of greatly increased size.

Crabbing - A process to set the woollen fabric to avoid any further creasing during subsequent wet processing.

Crepe Embossing - The embossing of a fabric with a pattern resembling a true crepe. The effect may be either permanent or not according to:

a) the nature of the fibre;
b) the conditions of embossing; and/or
c) the post-finishing treatment.

Creping:

a) A suitable wet treatment that allows the relaxation of the strain of highly twisted crepe yarns and so produces the characteristic crepe effect in the fabric.

b) A chemical treatment designed to produce an effect similar to (a).

Cross Dyeing- A dyeing of one component of a mixture of fibres after at least one of the others has been dyed already.

Curing-The heat-treatment of textiles (fibres, yarns, and fabrics but mainly fabrics) designed to complete the polymerization of condensation reaction of added substances.

D

Decatizing - A finishing process, chiefly to improve the handle and appearance of fabric, in which the fabric tightly wound on a perforated roller, is either immersed in hot water, which is also circulated through the fabric (wet decatizing), or has steam blown through it (dry decatizing).

Deep-dye - Descriptive of a process for dyeing or printing carpets, characterized by complete penetration of the dye into the pile.

Deep Dyeing - Descriptive of fibres modified so as to have greater uptake of selected dyes than normal fibres, when the two are dyed together.

Degreasing:

a) The removal of grease, suint, and extraneous matter from wool by an aqueous or solvent process.

b) The removal of natural fats, waxes, grease, oil and dirt from the textile materials by extraction with an organic solvent.

Delustring - A process to subdue the lustre of textile fibres or fabrics by chemical or physical methods.

Depth - That colour quality an increase in which is associated with an increase in the quantity of colourant present, all other conditions (viewing, etc) remaining the same.

Desized Fabric - A fabric from which minimum 80 percent of the initial size has been removed.

Developing - A stage in dyeing or printing during which a leuco compound or dye in an intermediate stage is converted by chemical reaction into a stable dye within the fibre.

Differential Dyeing -Usually descriptive of fibres of the same generic class, but have potentially different dyeing properties from the standard fibre.

Diffusion - A movement of molecules or ions through a solution or fibre due to the existence of a concentration gradient.

Dip - An immersion for relatively short duration, of a textile in a liquid.

Direct Cotton Dye, Direct Dye - An anionic dye having relatively high substantivity for cellulosic fibres when applied from an aqueous dyebath containing an electrolyte.

Direct Style - A style of printing in one or several colours where the dyes are applied to the fabric and then fixed by ageing or other appropriate means. The fabric is usually *white* but may sometimes be previously dyed.

Discharge Style - Style of printing in which dyed fabric is printed with a chemical composition which destroys the dye locally to give a white pattern or in which a second dye, applied simultaneously with the discharge, produces a pattern of contrasting colours.

Discharging - The destruction by chemical means of a dye or mordant already present on a material to leave a white or differently colour pattern.

Disperse Dye - A class of water-insoluble dyes suitable for dyeing cellulose acetate and hydrophobic fibres usually applied from the aqueous suspensions.

Drawn Pile Finish -A finish given to textile fabric to produce a surface nap or pile that is laid in one direction. The effect is usually produced by raising the wet or damp cloth on a teasle gig.

Dress-face Finish (on Wool Fabric) - A finish characterized by a close cropped surface and high lustre.

Dry Clean-To remove grease, oil and dirt from garments or fabrics by treating them in an organic solvent, as distinct from aqueous liquors. Examples of suitable solvents are white spirit, trichloroethylene, perchloroethylene.

Drying Cylinder, Drying Can - A heated hollow cylinder over which textile material is passed as a means of drying.

Dull, Matt - Term applied to textile materials, the normal lustre of which has been reduced by physical or chemical means.

Dullness- The colour quality, an increase in which may be compared with the effect of the addition of a small quantity of neutral grey dye to the dyestuff, whereby a match cannot be made by adjusting the strength.

Durable Finish - Any type of finish reasonably resistant to normal usage (washing, and/or dry-cleaning).

Durable Press - A finishing treatment designed to impart to a textile material or garment the retention of specific contours including creases and pleats, resistant to normal usage, washing, and/or dry cleaning.

Dye - A colorant that has substantivity for a substrate, either inherent or induced by reactants.

Dye-fixing Agent-A product that is capable of reacting with a dye on a fibre to give improved fastness to water or washing.

NOTE - Dye-fixing agents are normally applied as after-treatments to dyes that already have some affinity for the textile substrate and are so distinguished from mordants.

E

Embossing-A process to produce a pattern in relief on fabrics by pressure with the use of engraved rollers.

Ending - Uneven dyeing consisting in a continuous change in colour from one end of a length of fabric to the other, or a difference in colour between the bulk and the end of a length of fabric. It is also known as tailing.

Exhaustion - The ratio at any stated stage between the amount of dye or other substance taken up by the substrate and the amount originally available.

Expression (percent) - The mass of the liquid retained by textile material after mangling. This term is also known as retention and is calculated as percentage usually of the air-dry mass of the goods. (If the dry mass is used, this should be indicated).

F

Fastness - The property of resistance to the agency named (for example, washing, light, rubbing, etc.).

NOTE- On the standard scale, five grades are usually recognized from No. 5 signifying unaffected to No. 1 grossly changed. For light-fastness, eight grades are used, No. 8 representing the highest degree of fastness.

Felting- The matting together of fibres during processing or wear (*see* Milling).

Filling - Non-substantive and generally insoluble materials such as china clay, gypsum, etc, added together with starches or gums during finishing to add weight or to modify the appearance and handle of the fabrics.

Flock Printing - A method of cloth ornamentation in which adhesive is printed on the fabric and finely chopped fibres are applied all over by means of dusting-on, an air-blast, or electrostatic attraction. The 6bres adhere only to the printed areas and are removed from the unprinted areas by mechanical action.

Fluidity - The reciprocal of the viscosity expressed in poises (where 1 CP 1 mPa s).

Fluorescent Brightener - A substance that is applied to an uncoloured or a coloured textile material to increase the apparent reflectance in the visible region by conversion of ultra-violet radiation into visible light and so to increase the apparent whiteness or brightness of the textile material.

Friction Calendering - The process of passing fabric through a calender in which a highly polished heated steel bowl rotates at a higher surface speed than the softer (for example, cotton or paper filled or rubber coated) bowl against which it works, thus producing a glaze on the face of the fabric that is in contact with the steel bowl. The friction ratio is the ratio of the peripheral speed of the faster steel bowl to that of the slower bowl and is normally in the range l.5: 1 or 2: 1.

G

Gas - To singe, that is, remove unwanted surface fibres, by passage through flame.

Grey Scale - A series of pairs of neutrally coloured chips showing increasing contrast within pairs, used visually to assess contrast between other pairs of patterns; for example, the ISO (International Organization for Standardization) grey scales comprise two series of chips against which the magnitude of the change in colour of a specimen submitted to fastness test and of staining of adjacent uncoloured material can be visually assessed and rated on a 1-5 scale.

H

Handle-The subjective assessment of a textile material obtained from the sense of touch. It is concerned with the subjective judgement of roughness, smoothness, harshness, pliability, thickness, etc.

Hand-printed Fabric - A fabric printed by hand, (a) by block, (b) by screen, (c) by stencil, or (d) by a combination of these methods.

High-temperature Dyeing - Dyeing under super atmospheric pressure with the object of raising the temperature of the dye liquor above its normal boiling point.

Hue - That attribute of colour whereby it is recognized as being predominantly red, green, blue, yellow, etc.

I

Insolobilizing (Man-made, Regenerated, Protein Filaments) - The process of rendering the filaments resistant to or insoluble in, hot acid baths.

J

J-box:

a) A J-shaped trough or vessel for the processing of textiles from one process to another. The long limb of the J-box forms an inclined plane on which the material accumulates during the dwell period, being withdrawn from the radial portion.

b) An upright J-shaped vessel for continuous wet processing of textiles.

Jet-dyeing - A process for dyeing fabric in rope form in which the fabric is carried through a narrow opening by dye-liquor circulated at a high velocity.

Jig, Jigger - A dyeing machine in which fabric in open width is transferred repeatedly from one roller to another and passes each time through a dyebath of relatively small volume. Jigs are also frequently used for scouring, bleaching, dyeing and finishing.

K

Kier Boil (Kiering) - The process of prolonged boiling of cellulose and their blends with alkaline liquors in a suitable large container known as a kier, either at or above atmospheric pressure.

L

Lawn Finish-A medium starch finish applied to lawns and other fine-yarn plain cloths to give a crisp finished fabric.

Leuco Dye - A reduced form of dye from which the original dye may be regenerated by an oxidation process.

Levelling - Migration leading to uniform distribution of dye in a dyed material.

Liquor Ratio - The ratio of the mass of liquor employed in any treatment to the mass of fibrous material treated.

Listing - An uneven dyeing effect consisting of a variation in colour between the selvedges and the centre of a dyed fabric.

M

Malange Printing - A printing process in which bands of thickened dye Paste, with intervening blank areas, are applied across slubbing of wool or other fibres. The slubbing is subsequently steamed, washed, and then combed to produce a very even mixture of dyed and undyed lengths of fibres (also known as Vigoureux Printing).

Mangle -A machine whose purpose is to express liquid from moving textiles by passage through a nip. The textile may be in rope form or in open width, and the mangle may consist of two or more rollers (bowls) running in contact.

Mass Pigmented Yarn - Yarn produced by the extrusion of the dope containing finely divided dye or pigment particles.

Matching - A process in which the proportions of the dyes present in a material are adjusted so that the final colour resembles to that of a given sample as closely as possible.

Metameric - Descriptive of objects that exhibit metamerism.

Metameric Match - A match that is judged to be satisfactory under a particular illuminant but not under other illuminants of different spectral composition.

Metamerism - A marked change in the colour of an object with a change in the spectral composition of the light by which it is viewed.

NOTE - Metamerism can be judged only with reference to the changes occurring in other objects in the liclds of view as the illumination is changed.

Milling - A process for consolidating or compacting woven or knitted fabrics primarily containing wool.
Milling Dyes, Acid Milling Dyes - Acid dyes having high fastness to wet processes on wool (particularly to milling) and normally applied to protein fibres from weakly acid or neutral dyebaths.

Mordant - A substance that is applied to a fibre for the purpose of forming a complex with a mordant dye within or on the fibre.

Mordant Dyes - Dyes capable of forming a complex with a mordant on a fibre; the dyes may or may not have an intrinsic affinity for the fibre.

N

Neutral-Dyeing Acid Dye - An acid dye that has relatively high substantivity for wool from a neutral dyebath.

Non-ionic Dye - A (water-soluble) dye that does not dissociate electrolytically in aqueous solution.

Onium Dye - A cationic dye that is solubilized by a liable ammonium, sulphonium, phosphonium, or oxonium substituent, which splits off during fixation to leave an insoluble colourant in the fibre.

O

Open Boil - Scouring of cellulosic or their blended textiles with alkaline liquors in open vessels at or near to boiling point.

NOTE-Scours at temperatures lower than the boil are usually referred to as ‘steeps’.

Optical Bleaching, Brightening, or Whitening Agent - Preferably referred to as *fluorescent brightener.*

Oxidized Oil Staining, Gilding - Staining of textiles caused by oxidation of oil acquired or applied during processing.

P

Package Dying - The forced circulation of dye liquor through packages of fibre, yarn, or cloth without limitation of temperature. The use of the term pressure dyeing in this connection is depreciated (see also high temperature dyeing).

Padding - The application of a liquor or paste to textiles, either by passing the material through a bath and subsequently through squeeze rollers, or by passing it between squeeze rollers, the bottom one of which carries the liquor or paste.

Padding Mangle - A form of mangle for impregnation of textiles in open width in which the textile is passed through one or more nips. The textile may be saturated before passing through the nip, as in slop padding, or the impregnating liquid may be carried as a film on the surface of one of the bowls forming the nip and transferred to the textile as it passes through the nip, as in nip padding. In case of textile dip padding, the textile is passed through a trough containing impregnating liquid.

Pad-steam Process - A process of continuous dyeing in which fabric in open width is padded with dyestuff and, if necessary, with a reducing agent, and is then steamed (*see* Padding).

Piece Dyeing -The dyeing of fabrics in the piece form.

Pigment - A substance in particulate form, which is subtantially insoluble in a medium, but which can be mechanically dispersed in this medium to modify its colour and light-scattering properties.

Pigment Padding - The application of dyes or pigments to fabric by padding through an aqueous dispersion.

Post-Boarding - Boarding after dyeing to confer durable set.

Potting - A finishing process applied mainly to woollen fabrics consisting of treating the fabric on a roller in water at elevated temperatures.

Precreping:

> **a)** The embossing of a fabric containing crepe yarns with a design to influence the uniformity and fineness of the resultant crepe effect produced in subsequent treatment.
>
> b) See Crepe Embossing.

Pressure Boil - Scouring of cellulose or their blended textiles with alkaline liquors in closed vessels under pressure.

Proofed Fabric:

a) *Fire* -A fabric resistant to rapid combustion.
b) *Flame* - A fabric resistant to the propagation of a flame beyond the edges of the charred area produced by the application of a test flame.
c) *Shower} Water Repellant* - A fabric resistant to the absorption and penetration of water at the same time retaining a degree of permeability to air.
d) *Smoulder* - A fabric resistant to flameless combustion (glowing or mouldering) after withdrawal or extinction of a test flame.
e) *Water -A* fabric highly resistant to absorption and penetration of water possessing a low degree of permeability to air.
f) *Moth -A* fabric resistant to the degradative action of moth larvae.
g) *Rot* - A fabric resistant to the degradative action of bacteria in soil or water.
h) *Mildew* - A fabric resistant to the action of fungal microorganisms.

R

Raising -A process to produce a layer of protruding fibres on the surface of woven, knitted or felt fabrics.

Random Dyeing - A form of space dyeing.

NOTE - It is so called because it can be used to produce random colouration in the final fabric.

Rate of Dyeing - The rate at which a standard mass of dye is absorbed by a standard mass of substrate under specified conditions. It may be expressed quantitatively in several ways, such as the mass dye absorbed in unit time, the percentage of dye absorbed in unit time, or the time taken for the substrate to absorb a given fraction of the amount of dye that it will absorb at equilibrium.

Reactive Dye- A dye that, under suitable conditions, is capable of reacting chemically with a substrate to form a covalent dye-substrate linkage.

Relaxation - The releasing of strains and stresses in textile materials.

Resist Dyeing or Printing - A substance applied to a substrate to prevent the uptake or fixation of dye during a subsequent operation.

Resist Style - Style of printing in which undyed material is printed with suitable compounds to give on subsequent dyeing a white pattern on a coloured ground, or a pattern of contrasting colours to the ground by incorporating suitable dyes of colour-producing substances in the resist print paste.

Restraining Agent - A product which, when added to a dyebath, reduces the rate of equilibrium exhaustion.

Retarding Agent-A product which, when added to a dyebath, reduces the rate of dyeing but does not affect the final exhaustion.

Roller Printing - This is a fast and continuous method of registration of variety of colours using engraved copper rollers.
Rope Marks, **Running Marks -** Crease marks in undyed or finished goods ruining approximately in the warp direction.

Rotary Screen Printing - A continuous method of printing using rotary metal screens generally made from nickle.

S

Salt Sensitivity:
a) (In dyeing) the extent to which the dyeing properties of dye are affected by the addition of a neutral electrolyte.
b) (Of dyed fabric). The susceptibility to colour change of a dyed material when it is spotted with aqueous solutions of neutral electrolytes.

Scoured Fabric - Fabric which is freed from natural waxes, proteins and added sizing materials by chemical treatments.

Screen Printing - The production of a coloured design on a substrate by the application of a colourant by forcing printing paste or ink through the unblocked areas of a thin gauge screen in contact with the substrate during printing.

Seer Sucker - A fabric characterized by the presence of puckered and relatively flat sections, particularly in stripes, but also in checks.

Shade (n) -A common term loosely employed to describe broadly a particular colour of depth, for example, pale shade, 2 percent shade, fashion shade.

Shade (v) - To bring about relatively small modifications in the colour of a substrate in dyeing by adding a further small amount of dye, especially with the object of matching more accurately with a given pattern.

Sheer:

a) To cut the fleece from a sheep.
b) To cut a nap or pile to uniform length or height (also called Crop).
c) To cut loose fibres or yarns from the surface of a cloth after weaving (also called Crop).

Shrinkage - The reduction in length (or width) of a fibre, yarn or fabric. It may be induced by, for example, wetting, steaming, alkali treatment, wet processing, laundering or dry heat.

Sighting - Temporary colouration of textile materials either for visual identification of a particular fibre or quality or to enable the printer to see the pattern when applying colourless substances.

NOTE - The term tinting is also used in this context.

Size - A film-forming substance, in solution or dispersion, applied normally to warp but sometimes to weft, generally before weaving.

Sizing Dry - The application to textile yarns of suitably compounded siring materials in solid form which melt at elevated temperatures.

Skitteriness - An undesired speckled effect in a yarn or fabric arising from differences in depth of dyeing between adjacent fibres or portions of the same fibre.

Soaping -A process of removing unfixed dyestuffs from the substrate by using soap/detergent solutions and of obtaining true shade.

Solvent-assisted Dyeing - Dyeing carried out from an aqueous dyebath containing a small proportion of an organic solvent in solution/emulsion which normally acts to accelerate dyeing.

Solvent Dyeing- Dyeing carried out from a continuous non-aqueous phase.

NOTE - Water may be added to assist the dyeing process.

Soupling - A softening process applied to continuous-filament silk yarns that are to be dyed in the gum. The yarns are treated in warm soap solution, and softened in an acid tartrate bath. Such treatments normally remove some of the gum, leaving 10 percent to 15 percent of gum on the fibre.

Sour - To treat textile materials in a bath of dilute acid.

Space Dyeing - The production of multicolour yarns by the application of various colourants at intervals along a yarn by printing or other methods.

Spray Dyeing - The application of colourant to a substrate by using a spray gun with the object of producing ombre effects.

Spray Printing - A form of stencil *printing* where application of colourant is done by spraying only (see Stencil Printing).

Stabilized Finish - Treatment applied to a textile material to increase its resistance to dimensional changes during washing and use. Staining:

a) Any adventitious (undesirable) colour, for example, dye, dirt, oil and metallic contamination on textile material.
b) The fugitive or permanent colouring of material, for example, in histology for identification.

Starch -A carbohydrate component of plants used in sizing (*see* Size) and finishing. Its use in these operations depends on its adhesive or filmforming power.

Steeping - To apply starch in finishing or laundering.

a) General -The treatment of textile materials in a bath of liquid usually, though not necessarily, without continuous or intermittent agitation. The term is also applied to processes whereby the materials are impregnated with a liquor, highly squeezed, and then allowed to lie.

b) The process of retting flax straw by immersion in an aqueous liquor is sometimes known as steeping.

Stencil Printing -The application of colourant to a substrate by brushing on or spraying through a stencil usually cut in thin sheet metal or waterproofed paper.

Stenter; Tenter - An open-width fabric-finishing machine in which the selvedges of a textile fabric are held by a pair of endless travelling chains maintaining weft tension.

NOTE 1 - Attachment may be by pins (pin stenter) or clips (sliip stenter).

NOTE 2 - Such machines are mainly used for:

a) drying,
b) heat-setting of thermoplastic material, and
c) fixation of chemical finishes.

Stoving - Bleaching of wool, silk, hair or other keratinous materials in a moist condition with sulphur dioxide in a chamber. (Wet staving is the treatment of a material with a solution of a sulphite or bisulphite).

Strike - The initial rate of dyeing.

Stripping - The removal of dye from fibre.

Style, Printing -A concise, though not necessarily complete, indication of the method of production of a print in terms of the process or the class or classes of dye used (or both).

Sublimation Printing - A process employing dyes that sublime readily and have substantivity for the substrate to which they are applied.

Substantivity - The attraction between a substrate and a dye or other substance under the precise conditions of test whereby the latter is selectively extracted from the application medium by the substrate.

Suede Cloth - A fabric finished in such a way as to imitate suede leather.

Snlphur Dye - A dye that is normally applied from sodium sulphide solution.

Sarfactant - An agent soluble or dispersible in a liquid, which reduces the surface tension of the liquid. (A contraction of 'surface-active agent')
Swealing:

a) Migration of dye into the angles of folds and creases during drying of a fabric.
b) Partial removal of colour, dirt, or a grease into the surrounding fabric, caused by improper technique in removing stains by hand from a fabric by aqueous or solvent treatment.

NOTE - The resulting mark is frequently referred to as a 'sweal-mark'.

Swelling agent - A substance that causes the total liquid imbibition of a fibre to increase.

Syndet - A detergent that is not a soap (A contraction of 'synthetic detergent').

T

Temperature Range Properties - A qualitative technical evaluation of the behaviour of a dye obtained by examination of the influence of temperature on the uptake of dye in a given time under specific conditions.

Tinted Fabric - A fabric which is coloured with fugitive or easily removable colouring matter commonly used for the purpose of identification.

Tippy Wool - Wool in which the tip portions of the fibres have been so damaged by natural weathering as to have markedly different dyeing Properties from the root portions.

Top Dyeing -*The* dyeing of wool or other fibres as slubbing or top in package form,

Topping - The application of further colouring matter, not necessarily of the same hue or class, to a dyed substrate in order to adjust the latter to the desired final colour.

Transfer Printing - Transfer of a coloured design from paper to another substrate, normally under the influence of heat and/or pressure.

U

Union Dye - A dye or mixture of dyes designed to yield a uniform dyeing on the fibre mixture for which it is devised.

V

Vat - A large vessel for holding textiles processing liquor used for bleaching, dyeing, finishing, etc.

Vat Dye - A water-insoluble dye, usually containing keto groups, Which is normally applied to the fibre from an alkaline aqueous solution of a reduced enol (leuco) form, which is subsequently oxidized in the fibre to the insoluble form.
Vigonreox Prhdiag - See Melange Printing.

Viscosity (General) - The internal resistance to flow of a fluid.

NOTE - A term applied specifically to signify the viscosity of a standard solution of cellulose in cuprammonium hydroxide solution, of specified copper and ammonia content; size mixings, printing paste, finishing liquors, etc.

W

Washing Liquor - An aqueous solution employed for the physical removal of extraneous substances from textile material.

Washing-off-Treatment of textile material in water or detergent solutions to remove substances employed in previous processes.

Water-mark (Defect)

a) An unwanted *moire* effect produced by the pressure of the surface of one layer of fabric on another.
b) An unwanted light mark on a fabric caused by contamination with water prior to tinting or dyeing on a pad mangle, which results in a reduction in uptake of dye liquor.

Weighting -A process for adding weight to the yarn or fabric by loading with chemical or other substances.

Winch Dyeing -A dyeing process in which one or more endless lengths of fabric are drawn through the dyebath by a reel or drum rotating above the surface of the dye liquor.

Y

Yellowing- The yellow discolouration that may develop on textile materials during processing, use or storage over a long period.

Indian Standard

GLOSSARY OF TERMS
PERTAINING TO TEXTILE PROCESSING
PART 3

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 15 October 1986, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 Some of the important terms pertaining to textile processing have already been covered in Parts 1 and 2 of this standard. This standard covers a large number of other terms commonly used in textile trade and industry. These are expected to assist in proper interpretation and avoid confusion arising from various interpretations of definitions of these terms.

0.3 While purporting to give the generally accepted meaning of a term, a definition should not be regarded as in any case taking the place of a specification.

1. **SCOPE**

1.1 This standard prescribes definitions of terms pertaining to textile processing and processed textiles.

2. DEFINITIONS

A

2.1 After-Chrome Process - A method of dyeing in which the fibre is first dyed with the dye and then worked in a separate bath containing the chromium mordant or in the same bath by adding the mordant after exhausting the dye.

2.2 After Glow - Persistence of glow in a material under specified test conditions, after the removal of an external ignition source or after the cessation (natural or induced) of flaming of the material.

2.3 After Treating - Usually a process to fix/remove/improve the colour/resin on previously treated material.

2.4 Ammonia Process - A process used for cotton for increased dye uptake, lustre and strength in which the cotton material is treated in liquid ammonia at - 33°C.

2.5 Aniline Black - A fast black colour produced by oxidation of aniline on a textile material.

2.6 Aniline Salt - Chemically known as aniline hydrochloride.

2.7 Antidiazotate - A stabilized diazonium compound which is obtained by stabilization of diazonium salt in a strong solution of sodium hydroxide (106°Tw).

B

2.8 Bagging (Finishing) - Tacking together of two selvedges of a fabric to form a tube in order to prevent the selvedges from curling during wet processing.

2.9 Beetling - A finishing process used on linen and cotton fabrics to close up the spaces between threads and improve the appearance and handle by subjecting the previously dampened cloth to a hammering by a series of wooden mallets or 'fallers' which flattens the threads, improve the lustre and eliminates any 'thready' open appearance.

2.10 Blanket Mark - A crimped, wavy, or pebbled mark embossed on a fabric by the blanket that covers the heated cylinder used in certain finishing processes.

2.11 Block Printing - The printing of fabrics by hand with carved/ designed wooden blocks.

2.12 Brilliance - That attribute of a colour which measures its luminosity or the degree of its lightness or darkness.

2.13 Bronzing (Defect) - A bronze-like appearance on dyed textile materials caused by precipitation/agglomeration of the dye during the dyeing process.

C

2.14 Carrotting - The modification of the tips of fur fibre by chemical treatment to improve their felting capacity.

2.15 Caustic Soda Crepe - A puckered or crepe effect made by shrinking action of caustic soda on selected portions of cotton fabrics.

2.16 Cellulose Imago Print - A cellulosic fabric printed with a dispersion of pigment in a cellulose solution to produce a white on white, or an opaque effect on white or pasta1 background.

2.17 Chafe Mark - A streak or mark cau:ed by friction in dyeing or finishing of piece goods.

2.18 Char Length - The distance from edge of the specimen exposed to the flame under specified test conditions, to the upper edge of the charred section of the specimen, expressed in metric units.

2.19 Chasing - A cloth finishing operation usually for cotton and linens done on a calender having five or more rolls. Two layers (in some cases, more) of the cloth are run through the machine at the same time and face to face which gives a characteristic threadiness with a subdued lustre and the threads are not flattened.

2.20 Chromatic Colours - Those colours which possess hue, such as red, yellow, blue, etc, as distinguished from the achromatic colours such as white, grey, slate, black.

2.21 Chromosol Process - A method of dyeing similar to metachrome process except that here mordant used is a double oxalate of chromium and sodium or potassium known as chromosol mordant.

2.22 Cloudiness

a) In a dyed fabric, a defect consisting of random faintly defined uneven dyeing.

b) In a bleached fabric, a defect consisting of opaque patches, usually visible only in transmitted light, due to residues remaining after bleaching.

2.23 Coloured Lake - An insoluble compound produced with suitable dyestuffs and metallic salts or bases by means of a precipitating agent.

2.24 Colour Discharge Printing - The production of coloured design on dyed textile fabrics by printing with a composition containing the discharging agent and other dye resistant to discharging action of the discharging agent.

2.25 Coloured Resist Printing - The production of multi-coloured design on textile fabric by dyeing, printing with a resisting agent and another dye resistant to effect of resisting agent and then developing so as to obtain coloured effect on a coloured background,

2.26 Copper Number - The mass in mg of copper reduced from the cupric to cuprous state by 100 g of cotton under specified conditions. This is used as a measure to assess the reducing power of cotton.

2.27 Coupling - To combine a suitable organic component, usually a phenol, with a diazonium salt in such a way as to form an azo compound.

2.28 Crimping/Texturizing - Processes usually applied to continuous filament yarns made from or containing thermoplastic fibres to impart high stretch character.

2.29 Cracking - A synonym for ‘rubbing’ in the sense of fastness to rubbing of dyes.

2.30 Crofting - The oldest process of bleaching linen by soaking in an alkaline solution and drying in presence of Sun on grass until it becomes white.

2.31 Crow's Feet (Defect) - Cloth breaks or wrinkles of varying degrees of intensity and size, resembling bird's foot prints in shape and occurring during the wet processing of fabrics.

D

2.32 Desizing - A process for removing size from grey goods in preparation for bleaching, dyeing, etc, by means of an acid or enzyme or by any other means.

2.33 Diazotization - A chemical reaction to convert an aromatic amine into a diazonium compound.

2.34 Doctor Streak - A warp-way streak on a coated or printed fabric caused by the irregularity between the edge of the doctor blade and the fabric surface.

2.35 Duplex Printing - A method for printing the same design on face and back of cloth, done in two distinct operations.

2.36 Duration of After Glow (After Glow Time) - The time for which a material continues to glow, under specified test conditions, after cessation of flaming, or after removal of ignition source.

2.37 Duration of Flame (After Flame Time) - The length of time for which a material continues to flame, under specified test conditions, after the ignition source has been removed.

2.38 Dyeing - The process of colouring textile or other materials in such a way that the colour appears to be a property of the dyed material and does not give superficial effect such as that produced by painting.

E

2.39 Emulsion - A finely divided suspension of an oil in water or water in oil.

2.40 Enamelled Cloth - A heavy cotton cloth, such as drill or warp satin, treated with oil, pyroxylin, etc, and given a glazed finish to resemble patent leather.

2.41 Etching - A process for producing design on metallic roller used in a printing machine by chemical dissolution of the metallic surface.

2.42 Extent of After Glow - The area of specimen in which the after glow spreads beyond the area damaged by flaming.

F

2.43 Fast Base - An aromatic amine which on diazotization will combine with naphthol to form an azoic pigment.

2.44 Fast Colour Salt - A stabilized diazo compound, active or passive, stabilized as sulphate or chloride or aromatic sulphonate or as complex salt of diazo compound used as a component of the rapid fast or rapidazol or rapidogen dye and applied by dissolving in cold water and subsequently coupled with the azoic coupling component (naphthol).

2.45 First Printed Resist - A process where the resisting agent is printed on the fabric which is then dried and padded with the dye solution followed by drying and developing.

2.46 Fixing Agent - Any chemical used in dyeing, printing or finishing which combines with a soluble compound to form an insoluble compound upon the fibre.

2.47 Flame - As related to textile flammability, a hot, luminous zone of gas or matter in gaseous suspension, or both, that is undergoing combustion, which is relatively constant in size and shape and which produces a relatively low heat flux.

2.48 Flame-Proof Fabric - A fabric which does not propagate flame, that is any flame goes out quickly when the igniting flame is withdrawn.

2.49 Flame Resistance - The property of a material whereby flaming combustion is prevented, terminated or inhibited following application of a flaming or non-flaming source of ignition, with or without subsequent removal of the ignition source. The degree of flame resistance exhibited by a specific materia1 during testing may vary with different test conditions.

2.50 Flame-Resistant - The material having flame resistance.

NOTE - ‘Flame resistant’ is a mandatory description for a product that meets established conformance standard when the product is tested by a specific method. Where no conformance standard exists, it is a relative term and is used to compare one material with another.

2.51 Flame-Retardant - A chemical used to impart flame resistance.

2.52 Flame-Retardant Finish - A process for incorporating or adding flame retardant(s) to a material or product.

2.53 Flammability - The characteristics of a material which pertain to its relative ease of ignition and relative ability to sustain combustion.

G

2.54 Greasy Milling (Wool) - The process of milling the cloth before it is scoured.

2.55 Gypsum - Hydrous sulphate of calcium which is used for weighting and dresqng of cotton goods.

H

2.56 Hard Finish - A finish usually for woollen and worsted fabrics without a nap of any kind.

2.57 Holland Finish - A glazed or unglazed finish applied to certain cotton fabrics by applying an oil and filling material followed by a thorough calendering to make them more or less opaque.

2.58 Hydro-Extraction - An operation for squeezing out excess liquid, generally water, from a textile material. It neither brings about any change in the basic character of the textile material nor involves any chemical treatment.

I

2.59 Ice Colours - A term applied to azoic dyes because the diazotized base solution has to be kept at low temperature by adding ice to prevent its premature decomposition.

2.60 Indigo Dye - A dye capable of giving rich permanent blue colour after oxidation in air of the yellow juice applied on textile material and obtained from *indigoferae* plant leaves.

2.61 Indigosol Dye - *See* **2.105.**

2.62 Ingrain Colours - Dyes which are developed *in situ* on the fibre.

K

2.63 KD Finish - Treatments given to woollen fabrics to improve handle, appearance and shrinkage resistance by passing through heated perforated cylinders.

2.64 Knit-Deknit Finish - A finish used for thermoplastic fibres for introducing a very high degree of curliness or crimp which gives extremely high stretch and bulk and hence adds greatly to the appeal of fabric, by first knitting the filament yarns into a tubular fabric and then setting permanently by steaming at 25 psi pressure.

L

2.65 Lacquer Finish - An extremely smooth, highly glazed finish forming a thin film on the surface of the fabric produced by means of nitrate cellulose derivatives, synthetic resins, etc.

2.66 Lacquer Printing - *See* **2.86.**

2.67 Levelling Acid Dyes - Acid dyes having good levelling properties. .

2.68 London Finish - A finishing process applied to fabrics in which the fabric is thoroughly moistened and then allowed to dry naturally in the absence of tension, steamed and pressed.

M

2.69 Madder Bleach - A very thorough bleach given to cotton goods by several long alkali boils and bleaching with bleaching powder to give full white and is generally used for goods to be printed.

2.70 Mangling - The process of extracting liquid by passing the wet textile material in rope form or open width form through one or more nips of the mangle.

2.71 Market Bleach - The bleach given to cotton fabrics that are sold in this state and not later dyed or printed.

2.72 Metachrome or Chromate Process - A method of dyeing in which the dye and the mordant (in the form of chromate which does not form lake with the dye and which **is** gradually converted into dichromate) are applied to the fibre from the same bath when present simultaneously.

2.73 Metal Complex Dye - A water soluble pre-metallized dye in which one metal atom (either chromium or cobalt) is complexed with dyestuff molecule(s) which is applied from neutral or acidic dye bath and has very good all round properties.

2.74 Mineral Dyes - A class of dyes consisting of mineral pigments precipitated more or less mechanically in the fibre.

2.75 Mineral Khaki - A mixture of hydrated ferric hydroxide and chromium hydroxide giving khaki colour by padding the cotton fabric in solution containing ferrous sulphate and chrome alum and then treating with alkali to form metal hydroxides.

2.76 Moire Effect - A defect in dyeing arising from non-uniform dyeing and difference in reflection of different parts of the fabric which gives it a rippled appearance.

2.77 Moire Finish - A finish to produce wavy effect by passing two superimposed layers of cloth through a calender under heat and heavy pressure.

O

2.78 Oligomer - A simple polymer having small number of monomeric units combined, the number of monomeric units of which it is composed, may be known.

2.79 Organdie Finishing - A finishing treatment given to cotton fabrics comprising a short contact of fabric with sulphuric acid of high concentration, to produce a stiff and transparent effect.

2.80 Overprinted Resist - The treatment in which the fabric is impregnated with the dye solution, dried and printed with the resisting agent followed by development.

2.81 Oxidation Colour - Colour obtained by oxidation of aromatic amines (used as their salts with inorganic acids like hydrochloric acid to make them soluble in water) in the fibre substance in an acidic medium, for example, aniline black, diphenyl black, solaniline black, paramine brown and fuscamine brown, etc.

P

2.82 Palmering - A finishing process done on Palmer Calender to impart a soft mellow handle to fabrics.

2.83 Paper Finish - Treatment given to woollen/worsted fabrics by pressing between layers of papers under pressure to improve handle, appearance and lustre of the fabrics.

2.84 Persian Print - A low grade, plain woven cotton fabric printed in large patterns and brilliant colours.

2.85 Photoengraving - A method used for preparing designs for textile printing by photographic techniques.

2.86 Pigment Printing - Printing of textile fabric with an emulsion of pigment along with a binder and curing the binder to fix the pigment.

2.87 Pilling - Small accumulations of fibres on the surface of a fabric and held to the surface by an entanglement with the surface fibres and composed of the same fibres as those from which the fabric is made.

2.88 Preservative - A compound used ***to*** inhibit the growth of mould, mildew, bacteria, etc.

2.89 Pressure Mark - An impression or an area of greater lustre in fabric, caused by irregularities of pressure during the finishing process.

2.90 Printing - The process of localized dyeing, producing designs of one or more colours on a fabric by means of roller, block, screen, etc, using any of the printing styles such as direct, discharge, resist, transfer and spray.

R

2.91 Raised Fabric - A fabric with raised, brushed or napped surface or with cut or uncut pile.

2.92 Rapid Fast Dye - A suitable mixture of selected stabilized antidiazotate and selected azoic coupling component (naphthol).

2.93 Rapidazole Dye - A suitable mixture of inactive stabilized diazo compound such as diazosulphonate or diazosulphonic acid or diazosulphite, and a suitable azoic coupling component (naphthol) applied by dissolving in an aqueous solution.

2.94 Rapidogen Dye - A suitable mixture of stabilized diazoamino or diazoimino compound (fast salt) and a selected azoic coupling component (naphthol) applied by dissolving in an aqueous solution.

2.95 Reduced Vat Process or Leuco Vat Process - A method of dyeing in which the vat dye is first converted into soluble and substantive leuco form by reduction and then applied to textile material.

2.96 Reduction Clearing - See 'clearing' in Part 2 of IS**: 9603.**

2.97 Residual Shrinkage - The potential shrinkage remaining in a fibre, yarn, or fabric after treatment.

2.98 Resist Yarn - Yarn which has been treated to resist the action of dyestuffs.

2.99 Retting (Flax) - The subjection of crop or deseeded straw to chemical or biological treatment to make the fibre bundles more easily separable from the woody part of the stem. Flax is described as waterretted, dewretted or chemically retted, etc, according to the process employed.

S

2.100 Saturation/Purity/Intensity/Chroma of a Colour – That attribute of chromatic colours which determines its degree of difference from a grey of the same brilliance.

2.101 Scotch Finish - A closely shorn nep finish on heavy woollen fabrics.

2.102 Scrooping - A finishing process usually associated with silk but also given to cellulosic fibres, yarns or fabrics to give high coefficient of static friction relative to dynamic coefficient which results in a highpitched sound when the material is compressed normally due to the presence of a long chain fatty component and a crystalline organic acid, for example, soap and tartaric acid.

2.193 Seam Mark - A particular form of pressure mark in the cloth, produced by the thickness of a seam during bleaching, dyeing, printing or finishing process.

2.104 Setting - The process of conferring stability on fibres, yarns or fabrics of all textiles, generally by means of moist or dry heat.

2.105 Solubilized Vat Dye - A water soluble dye obtained by treating vat dye with suitable chemicals to make it in soluble and substantive form and is generally a sodium salt of sulphuric ester of leuco vat dye which is applied on textile material in the presence of sulphuric acid and sodium nitrite or potassium dichromate.

2.106 Speckle Printing - Printing of an encapsulated dye where the capsule breaks during the process of development.

2.107 Sponging - The process of steaming piece goods on aiperforated steel steam box to obtain shrinkage,

2.108 Spotting - A process of removing by special solvents or agents, the spots or stains on a textile material.

2.109 Standing Bath - A bath that is preserved for further use and freshened up by the addition of necessary amount of dyestuff and/or chemicals.

2.110 Stock Solution - A relatively concentrated solution of a dye or a chemical which is diluted with water considerably when used.

2.111 Substantive Dyes - Same as direct dyes.

2.112 Sulphur Black Tendering - It denotes the degradation of sulphur black dyed cotton materials during storage due to the formation of sulphuric acid.

T

2.113 Thermosol Dyeing (Thermosoling) - A continuous dyeing process used for thermoplastic fibres by which the dye is first deposited on the fibre surface by padding in aqueous dispersion of dye and then diffused and dissolved in the fibre by the application of dry heat for 30 to 60 seconds at 180 to 230°C depending upon the particle size of the dye, volatility of the dye and solubility of the dye in the fibre and the thermal properties of the fibre.

2.114 Thickener - A substance of a gelatinous or gummy nature that is used to increase the viscosity of printing, dyeing, finishing pastes or liquors.

2.115 Tie and Dye Method (Tie Dyeing) - A handcraft method of producing patterns on a fabric by gathering small portions of the cloth and dyeing them with thread into compact knots by virtue of which the tied areas resist the penetration of the dye on subsequent dyeing and thus remain undyed, forming a pattern of small dots on a dyed ground. These dots may be white or coloured depending upon the original fabric used.

2.116 Tinting

a) A process of colouring fibres with a fugitive dye.

b) The colouring of yarns, fabrics, etc, to a very light shade.

2.117 Top Dyed - Fibres dyed in top form.

U

2.118 Unraised Fabric or a Fabric of Plain Surface - A fabric having a surface significantly free from raised fibres, nap or pile.

V

2.119 Vat Acid Process - A method of dyeing in which the vat dye is first converted in a very fine state of division by reducing the vat dye and neutralizing the alkali used in reduction by acetic acid in the presence of acid stable dispersing agent and subsequently this non-substantive dispersed dye is deposited on the fibre material and then the fibre material is developed in a bath containing sodium hydroxide and sodium hydrosulphite.

2.120 Vatting - A process of conversion of insoluble vat dye into soluble substantive form under alkaline reducing conditions.

2.121 Vegetable Dyes - A dye obtained from various forms of vegetable matter such as, wood, bark, roots, barriers, etc, for example, logwood, cutch, indigo, madder, quericitron.

W

2.122 White Discharge Printing - The production of coloured design on textile fabrics by dyeing and then printing with discharging agents which destroy the dye by reduction or oxidation zit the printed portions.

2.123 White Resist Printing - The production of coloured design on textile fabrics by dyeing it with dyes (which are fixed in two steps, that is, dyeing and developing) and then printing with resisting agent which prevents the development at the printed portions during developing and thus gives a white effect on coloured background.

2.124 Wigan Finish - A firm, starched, plain calendered finish without lustre, applied to light weight sheetings and printed clothes.

Draft for comments only Doc No.: TXD 05 (XXXX)
XXXX 2024

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भारतीय मानक मसौदा

वस्त्रादि — एसीटेट या ट्राईएसीटेट फाइबर सामग्री की एसिटिक एसिड सामग्री के निर्धारण के लिए विधि

(आईएस 12135 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Determination of Acetic Acid Content of Acetate or Triacetate Fibre Materials

(*First Revision* of IS 12135)

ICS: 59.060.01

Textiles Chemical Methods of Test
Sectional Committee, TXD 05

last date for receipt of comments is
XXXX 2024

FOREWORD

(Formal clauses will be added later)

This standard was first published in 1987. This first revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) ICS number is incorporated in place of udc number.
iii) References to the Indian standard have been updated.

Acetic acid content of acetate or triacetate fibres is an important parameter for controlling the degree of acetylation of regenerated cellulose and is useful in ascertaining chemical damage to acetate or triacetate fibres during processing by cuprammonium fluidity test.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)',

1 **SCOPE**

1.1 This standard prescribes a method for determination of acetic acid content of acetate or triacetate fibre materials.

1.2 The method prescribed in this standard is not applicable to acetate and triacetate fibre materials containing sizing and finishing substances such as polyvinyl acetate, polyacrylic or polymethacrylic acid, cellulose ether, carbonic acid, etc, the presence of which may falsify the results of titration.

1.3 While testing dyed or printed specimens, there is a possibility that the dye may get dissolved and hence make it difficult to recognize the colour change during titration. In such a case, the titration should be carried out electrometrically.

2 REFERENCE

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 1070 : 2023	Reagent grade water — Specification (*Fourth Revision*)
IS 9068 : 2021 ISO 1833-1 : 2020	Textiles — Quantitative Chemical Analysis — General Principles of Testing (*First Revision*)

3 PRINCIPLE

3.1 The acetate fibres are saponified with alcoholic potash lye. The acetic acid content is determined by the amount of alkali used to reach the end point, titrimetrically.

4 SAMPLING

4.1 Lot — The quantity of same type and quality of acetate or triacetate fibre material and of the same form (fibre, yarn or fabric, etc) delivered to a buyer against one despatch note shall constitute a lot.

4.1.1 If the textile material is fibre or yarn and the lot consists of more than 200 kg of fibre or yarn, it shall be divided into sub-lots each weighing 200 kg or less.

4.1.2 Each sub-lot shall be tested separately.

4.2 Sampling for Fibre and Yarn

4.2.1 From a sub-lot, 15 increments, each weighing approximately 10 g, shall be taken from different parts and mixed thoroughly. This shall constitute a test sample.

4.3 Sampling for Fabrics

4.3.1 Unless otherwise specified, the number of pieces to be selected from a lot shall be in accordance with Table 1. The pieces thus selected shall constitute a gross sample.

TABLE 1 SAMPLE SIZE

LOT SIZE (PIECES)	SAMPLE SIZE (PIECES)
(1)	(2)
up to 100	3
101 ,, 300	4
301 ,, 500	5
501 and above	7

4.3.2 From each piece in the gross sample selected as in **4.3.1**, cut out small portions from at least two different parts weighing about 25 g. The parts selected shall be as representative as possible of the gross sample. In the case of fabrics with a definite repetition in weave pattern, the parts selected shall include all yarns in the complete pattern. Dissect small portions of the fabric thus collected into yarns and mix them thoroughly. This shall constitute a test sample.

4.4 If the test sample consists of yarn, woven material or hosiery or knitted fabric, they shall be separated into yarn pieces of 1 to 2 cm length and mixed thoroughly to prepare the test sample,

5 APPARATUS

5.1 Weighing Glass

5.2 Desiccator with Blue Gel Filling

5.3 Analytical Balance with an Accuracy up to 1 mg

5.4 Air Drying Oven Capable of Maintaining at 105 ± 2°C.

5.5 1 000 ml Measuring Flask

5.6 200 ml Erlenmeyer Flask with Ground Stopper

5.7 50 ml PiPette

5.8 Burette

5.9 1000 ml Erlenmeyer Flask

6 REAGENTS

6.1 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS 1070) shall be used.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

6.2 Alcoholic Potash Lye — 1 M, potassium hydroxide (free of carbonate) in tablet form dissolved in ethanol.

6.3 Hydrochloric Acid — 1 M.

6.4 Caustic Soda Lye — 1 M.

6.5 Phenolphathelein Solution - 1 g phenolphathalein dissolved in 95 ml of ethanol and 5 ml distilled water.

7 PREPARATION OF TEST SPECIMEN

7.1 From the test sample (*see* **4.2**, **4.3** and **4.4**) after removing size and finishing as recommended in IS: 9068-1979†, draw a representative specimen weighing 2.0 ± 0.1 g. Cut test specimen into pieces of approximately 25 mm length. Take at least two such test specimens.

8 PROCEDURE

8.1 Dry the test specimen (**6.2**) in the weighing glass at 105 ± 2°C temperature in a drying oven to constant mass. The mass shall be taken as constant when the difference between two successive weighings at an interval of 20 minutes does not exceed 0.1 percent. Cool the dried test specimen in the desiccator and weigh it correct to 1 mg.

8.2 Transfer the weighed test specimen (**8.1**) into a 200 ml Erlenmeyer flask. Add to it 50.0 ml of 1 M alcoholic potash lye, close the flask and leave it for 48 hours at room temperature. Then add to it 50.0 ml of 1 M hydrochloric acid, shake the flask thoroughly for 5 minutes and leave it for one more hour at room temperature.

8.3 Wash the contents of the Erlenmeyer flask with about 500 ml of distilled water in the 1 000 ml Erlenmeyer flask.

8.4 Titrate the contents of the flask (**8.3**), after addition of three drops of phenolphathelein solution with 1 M of caustic soda lye.

8.5 Find out the amount of caustic soda lye used in ml.

8.6 Repeat the procedure from **8.1** to **8.5** with other test specimens and find out the amount of caustic soda lye consumed, in ml, for each test specimen.

9 CALCULATION

9.1 Calculate the acetic acid content of all the test specimens separately with reference to dried fibre material by the formula:

$$\text{Acetic acid content, percent} = \frac{6 \times a}{E} \times 100$$

where

a = the amount of 1 M caustic soda lye in ml (*see* 7.5 and 7.6), and
E - the weighed amount of the dried fibre material in gas obtained in 7.1.

9.2 Find out the average acetic acid content, percent of the fibre material.

10 REPORT

10.1 The test report shall indicate the following:

a) Type and quality of the textile material tested, and
b) Acetic acid content, percent, rounded to three significant figures (individual values and the mean value separate).

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BUREAU OF INDIAN STANDRADS

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XXXX 2024

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भारतीय मानक **मसौदा**

वस्त्रादि — सूखी गर्मी के लिए कपड़ा कपड़ों की आयामी स्थिरता के निर्धारण के लिए विधि

(आईएस 12170 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method For Determination Of –Dimensional Stability Of Textile Fabrics To Dry Heat

(*First Revision* of IS 12170)

ICS: 59.060.01

Textiles Chemical Methods of Test Sectional Committee, TXD 05 last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clauses will be added later)

This standard was first published in 1987. This First revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

i) The Title of the standard has been updated.
ii) ICS number is incorporated in place of udc number.
iii) References to the Indian standard have been updated.

Textile fabrics usually change in dimensions when exposed to dry heat due to various processes which they may undergo during contact with hot metal surfaces under pressure. Preparation of' standard method tie determine their dimensional stability to dry heat, therefore, needs no emphasis.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)',

1 SCOPE

1.1 This standard prescribes a method for determination of dimensional change of all kinds of textile fabrics, when exposed to dry heat. It is intended to predict the behaviour of fabrics in garment-making processes such as fusing and transfer printing or during their contact with hot metal surfaces under-pressure..

2 REFERENCE

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 6359 : 2023	Method for Conditioning of Textiles (*First Revision*)

3 DEFINITIONS

3.1 For the purpose of this standard; the following definitions shall apply.

3.2 Narrow Fabric — A fabric constructed at 450 mm width or less:

3.3 Wide Fabric — A fabric constructed at more than 450 mm width.

3.4 Dimensional Change, Percent — The increase or decrease in dimensions (that is, in length or width) after subjecting the fabric to the prescribed test, expressed as a percentage of the corresponding dimensions before such test.

4 PRINCIPLE

4.1 A specimen of fabric is heated by contact with a plane, hot surface under accurately known conditions and changes in specimen dimensions are measured.

5 SAMPLING

5.1 Lot — The quantity of same kind and quality of fabric delivered to a buyer against one despatch note shall constitute a lot.

5.2 Sample to determine conformity of a lot to a specification shall be selected so as to be representative of the lot.

5.3 Unless otherwise stated in the contract or order or in the appropriate textile specification, the sample drawn according to **5.4** and Table 1 shall be held to be representative of the lot.

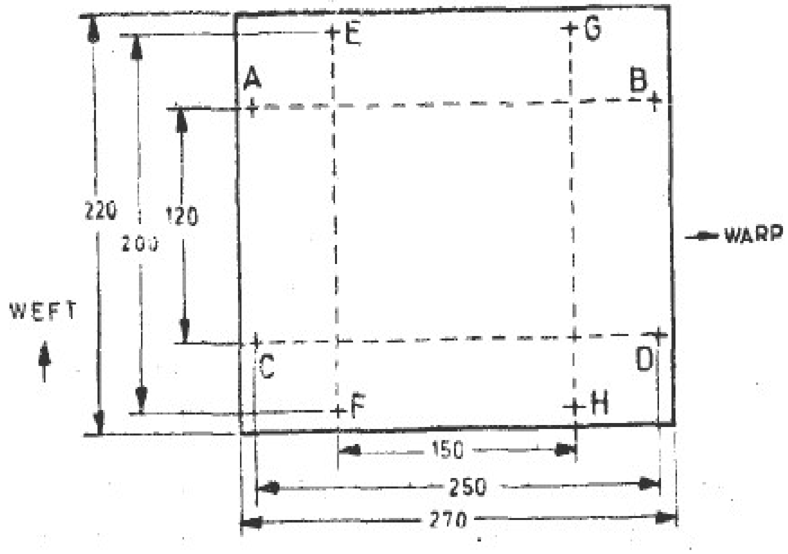
TABLE 1 SAMPLING FREQUENCY

LOT SIZE (No. OF PIECES)	SAMPLE SIZE (No. OF PIECES)
Up to 10	3
11 to 50	4
51 to 100	5
101 to 200	6
201 and above	7 + 1 for each additional 100

5.4 Samples shall not be taken from first few metres of the fabric. For coated fabrics, the samples shall be taken from areas of the fabric well away from the ends. All fabric samples shall Abe of full width.

6 PREPARATION OF TEST SPECIMENS

6.1 Cut two uncreased fabric specimens 270 × 220 mm. After conditioning, from the dry side, mark two pairs of reference points in each, direction as shown in Fig. 1 so that the distances between corresponding reference points are 250 mm in the warp or wale direction, and 200 mm in the weft or course direction.



All dimensions in millimetres.
FIG. 1 MARKING OF TEST SPECIMENS

7 CONDITIONING OF TEST SPECIMENS

7.1 Prior to test, the test specimens shall be conditioned to moisture equilibrium from dry side in a standard atmosphere of 65 ± 2 percent relative humidity and 27 ± 2°C temperature (*see* IS 6369).

7.2 When the test specimens have been left in such an atmosphere for 6 hours in such a way as to expose, as far as possible, all portions of the specimens to the atmosphere, they shall be deemed to have reached moisture equilibrium. However, in the case of fabrics weighing more than 240 g/m$_2$, this period shall be not less than 16 hours.

8 APPARATUS

8.1 A Press — consisting of a plane heated metal plate whose temperature can be adjusted within the range 100 to 210°C with an accuracy of ± 2°C, and a horizontal bed. When closed, the press exerts a uniform pressure of 4 ± 1 kPa between the plate and bed. The bed is covered by flexible and compressible cladding of low thermal conductivity and heat capacity, which is capable of conforming to slight variations in the thickness of specimens or of the gap between plate and bed. The cladding shall be .unaffected by the highest temperature used and shall not absorb moisture.

NOTE — A silicone foam rubber layer, supported on a low density textile wadding has proved suitable for the cladding specified in **8.1**.

8.2 Specimen Holder — consisting of a thin flexible sheet of material with low friction and low heat capacity, larger than the heated plate, and supported at its edges by a light frame which does not impede contact between the plate and bed.

NOTE — A sheet of 0.15 mm thickness, polytetra fluoroethylene with glass fibre reinforcement and a total mass per unit area of 250 g/m^2, has been found suitable.

8.3 Steel Measuring Scale or Other Means of Measuring Length — accurate to 0.5 mm.

8.4 Means of Cutting Out and Marking Fabric Specimens — Marking may be by notches, sewing thread, or other means of equal precision that do not significantly increase the thickness of the specimens.

9 PROCEDURE

9.1 Determine the dimensions *AB, CD, EF* and GH of the conditioned specimen to the nearest 0.5 mm.

9.2 Set the press at one or more of the following temperatures, unless otherwise specified in the appropriate textile specification, and leave the press closed until it reaches a steady state of temperature:

Test	*Temperature*
Mild	150 ± 2°C
Intermediate	180 ± 2°C
Severe	210 ± 2°C

9.3 Place the conditioned fabric specimen on the specimen holder. Open the press, place the holder and specimen in position on the bed and close the press so that a pressure of 4 ± 1 kPa is applied on the specimen. Leave the specimen in this condition for 30 seconds. Then immediately open the press and remove the specimen and holder.

NOTE — It is essential that the working area of the test press shall be larger than the specimen size.

9.4 Condition the specimen in its flat state in the standard atmosphere, until the equilibrium is reached.

9.5 Measure the dimensions ***AB, CD, EF, GH*** of the specimen to the nearest 0.5 mm.

9.6 Repeat the procedure with the second specimen.

10 CALCULATION AND EXPRESSION OF RESULTS

10.1 Calculate, for each specimen, the changes in dimensions for each test length as follows:

$$\text{Change in dimension (percent)} = \frac{\text{new dimension} - \text{original dimension}}{\text{original dimension}} \times 100$$

10.2 For each specimen, calculate the mean dimensional change in each direction.

11 REPORT

11.1 The report shall include the following:

a) Details of the samples tested,
b) The mean dimensional change in both directions for each specimen expressed as in **10**,
c) The temperature used for testing, and
d) Any deviation from the test conditions described in **9.2** and **9.3**.

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भारतीय मानक मसौदा

वस्त्रादि — मर्करीकरण के लिए गीला करने वाले एजेंटों की सापेक्ष दक्षता का मूल्यांकन करने की विधि

(आईएस 5151 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Evaluating the Relative Efficiency of Wetting Agents for Mercerization

(*First Revision* of IS 5151)

ICS: 59.060.10

Chemical Methods of Test Sectional Committee, TXD 05	last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1969. This revision has been made in the light of experience gained since its last publication and to incorporate the following changes:

v) The Title of the standard has been updated.
vi) ICS number is incorporated in place of udc number.
vii) Apparatus and reagents has been updated.
viii) Amendment 1 has been incorporated.

To facilitate uniform, thorough and speedy impregnation of textile materials which is much desired in mercerizing, wetting agents are extensively used. From among the varieties of commercial wetting agents, the textile processor has to choose the one suitable for his requirements. Formulation of standard method of test for determining the relative efficiency of wetting agents used for mercerization is, therefore, necessary.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’,

1 SCOPE

1.1 This standard prescribes two methods for evaluating the relative efficiency of wetting agents used in the mercerization of cotton textiles.

2 PRINCIPLE

2.1 In the first method the time required for complete wetting of a bundle of yarn or canvas disc in caustic soda solution containing the wetting agent is determined. For the same concentration of different wetting agents, lesser the wetting time, higher is the efficiency of wetting agent. In the second method, a single cotton thread is allowed to contract in caustic soda solution containing the wetting agent for definite time and the contraction is determined. Higher the contraction, more efficient is the corresponding wetting agent.

3 REAGENTS

3.1 Quality of Reagents — Unless specified otherwise pure chemicals shall be employed in tests and distilled water shall be used where the use of water as reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

3.2 Caustic Soda Solution — 300 g/l.

NOTE — The solution should be allowed to stand and supernatant clear solution be used.

4 FIRST METHOD

4.1 Apparatus and Materials

4.1.1 *Beakers or Glass Jars* — of 600 ml capacity.

4.1.2 *Measuring Pipettes* — graduated in 0.05 ml.

4.1.3 *Measuring Flask* — of 500 ml capacity.

4.1.4 *Stop—Watch* — to read correct to one-tenth of a second.

4.1.5 *A Special Holding Device* — made of stiff stainless steel wire with a coil about 50 mm in diameter at one end and a hook in the center of the coil to hold the test specimen (*see* Fig. 1).

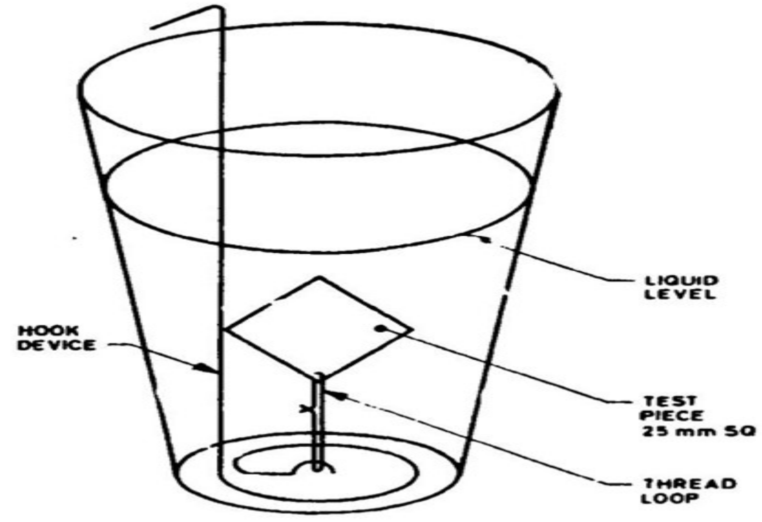

FIG. 1 APPARATUS FOR DETERMINATION OF WETTING TIME

4.1.6 *Cotton Yarn or Cotton Canvas*

Cotton yarn — grey, unboiled, 15 tex × 2 (or $40^{s}/2$) combed, long staple.

Cotton canvas — grey, unboiled, 615 g per m^2.

4.2 Preparation of Test Specimens

4.2.1 From the grey cotton yarn, cut out the required number of bundles, each containing 160 parallel ends, 25 mm in length. In case of canvas, cut out the required number of test specimens of size 25 × 25 mm with the help of a die. Alternatively, prepare test specimens of 25 mm diameter.

NOTES

1 The cotton yarns may be tied by single thread of the same quality (*see* **4.1.6**) to form the bundle.
2 The square pieces may be cut with sharp pair of scissors. Precautions should be taken that there are no frayed ends.

4.3 Procedure

4.3.1 Take a 600-ml beaker or glass jar. Pour 500 ml of caustic soda solution at 27 ± 2°C. Pipette out 3.75 ml of one of the wetting agents (*see* Note 1) under test. Stir the contents until the wetting agent is dissolved completely in caustic soda solution (*see* Note 2). Allow the solution to stand until all air bubbles have risen to the surface.

NOTES

1 It is presumed that the mercerizing wetting agents are mostly liquids.

2 It is often better to mix the wetting agent thoroughly with small volume of the caustic soda solution before adding this to the bulk of the mercerizing solution. It should be particularly noticed whether the vetting agent remains well dispersed or dissolved, because separation of an immiscible layer on the surface would entirely viciate the results and give false values.'

4.4 In case of yarn Drop one bundle carefully on the surface of caustic soda solution. Start the stop-watch and note the time required for complete wetting of all the ends.

And in case of canvas attach a loop of thick sewing thread about 100 mm in perimeter to one corner of the test specimen. Attach the specimen through the loop to the wire holder. Hold the wire holder with one hand and the test specimen with the other. Immerse the test specimen in caustic soda solution gently such that the specimen remains upright in the solution and the thread of the loop is also straight (*see* Fig. 1). Start the stop-watch. Note the time required for the specimen to sink as indicated by limping of the thread.

4.5 Repeat the test (*see* **4.4**) for four times for the same concentration of the wetting agent and calculate the average sinking time.

4.6 Repeat the test (*see* **4.4** and **4.5**) with different concentrations of wetting agents, say, by adding 5.00 ml and 6.25 ml each time instead of 3.75 ml of wetting agent in caustic soda solution, and calculate the average sinking time for each concentration separately.

NOTE — If the mercerizing agent to be tested is too efficient or too inefficient to obtain a comparison within the range of the volumes already employed then either smaller (1.25 ml, 2.50 ml) or larger (10.00 ml, 12.50 ml) volumes of the product should be tested.

4.7 Plot a graph showing the average sinking time against the corresponding concentrations of wetting agents in ml per 500 ml of caustic soda solution. Similarly, plot the graphs for the other wetting agents under test on the same graph paper.

4.8 From the graphs obtained as in **4.7**, determine the wetting time for each wetting agent under test for specific concentration, say, 5.00 ml of wetting agent.

4.9 Compare the results to determine the relative wetting power of the wetting agents under test bearing in mind that lesser the wetting time, the higher is the efficiency of the wetting agent.

5 SECOND METHOD

5.1 Apparatus and Materials

5.1.1 A 50—ml graduated burette in 0.1 ml with a two way stopcock and a side arm — the side arm being connected to a reservoir.

5.1.2 *A Stop-Watch* — to read correct to one—tenth of a second.

5.1.3 *Cotton Yarn — grey,* unboiled 15 tex × 2 (or $40^s/2$) combed, long staple cotton.

5.1.4 *Weighing Balance*

5.2 Procedure

5.2.1 To one end of the cotton yarn tie a one-gram weight. Adjust the yarn in such a way that the knot tied on the weight coincides with the 50—ml mark of the burette. The other end of the yarn is fitted above the burette in such a way that the yarn is in the central position (*see* Fig. 2). Prepare separately solutions containing four different concentrations of the wetting agent under test. Draw into the burette 50 ml of the solution from the reservoir and start the stop-watch when the level of the solution reaches the zero mark. Observe the contraction in one minute (*see* Notes under **4.3.1**).

5.2.2 Repeat the test for nine times for the same concentration of wetting agent in the solution. Calculate the average of the ten determinations.

5.2.3 Calculate percentage contraction as follows:

$$\frac{\text{Difference in burette reading}}{50} \times 100$$

5.3 Similarly, determine the percentage contraction for other concentrations of the wetting agent.

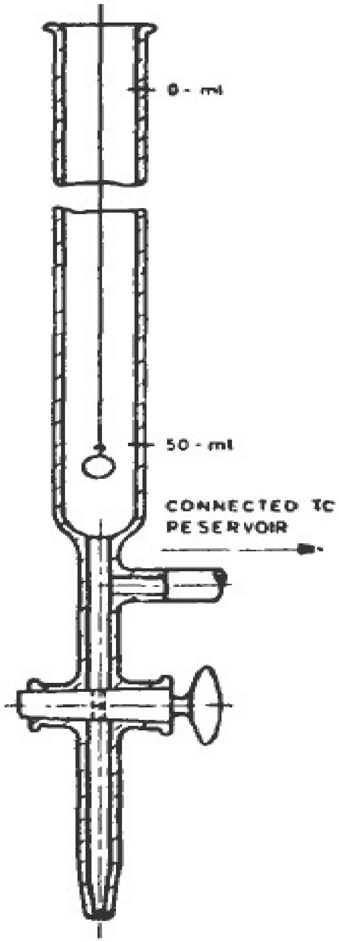

FIG. 2 APPARATUS FOR DETERMINATION OF YARN CONTRACTION

5.4 Similarly, determine the percentage contractions for the other wetting agents at the same four concentrations (*see* Note under **4.6**).

5.5 Plot a graph showing the average percentage contraction against concentration of wetting agent. Similarly, plot the graphs for the other wetting agents under test on the same graph paper.

5.6 From the graphs obtained in **5.5**, determine the percentage contraction for each wetting agent under test for specific concentration.

5.7 Compare the results to determine the relative wetting power of the wetting agents under test bearing in mind that higher the percentage contraction, higher is the efficiency of the wetting agent.

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वस्त्रादि — वस्त्रों में आयरन और क्रोमियम के निर्धारण की विधि

(आईएस 4655 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Determination of Iron and Chromium in Textiles

(*First Revision* of IS 4655)

ICS: 59.060.01

Chemical Methods of Test Sectional Committee, TXD 05 — last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clause will be added later)

This standard was first published in 1968. This revision has been made in the light of experience gained since its last publication and to incorporate the following changes:

- ix) The Title of the standard has been updated.
- x) ICS number is incorporated in place of udc number.
- xi) References to Indian standard have been updated.
- xii) Apparatus and reagents has been updated.

Iron and chromium are present in large quantities in textiles, dyed in mineral khaki. Mineral khaki dyed material is used mainly by Defence and civilians as well for making uniforms. The iron and chromium content of the fabric would give an indication regarding the amount of mineral khaki present in the textile material. This standard would be useful for the purpose of determining iron and chromium present in the textile material.

Considerable assistance has been derived from Joint Services Specification JSS-1250 ‘Methods of tests for textile’ issued by the Ministry of Defence.

This edition 1.1 incorporates Amendment No. 1 (June 2002). Side bar indicates modification of the text as the result of incorporation of the amendment.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).

1 SCOPE

1.1 This standard prescribes method for determination of iron and chromium present in textile materials, especially dyed in mineral khaki and olive green shades.

2 REFERENCES

The standards listed 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 possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 196:1966	Atmospheric Conditions For Testing (*Revised*)
IS 1070 : 2023	Reagent Grade Water — Specification (*Fourth Revision*)

3 PRINCIPLE

A known amount of test sample is ashed and the amount of iron and chromium is determined as their oxides (Fe_2O_3 and Cr_2O_3) and expressed as the percentage of the conditioned weight of the test sample.

4 SAMPLING

4.1 Sampling for Yarn

4.1.1 *Lot* (*Yarn*) — The quantity of yarn from the same source shall constitute the lot. If the lot contains more than 200 kg of yarn, it shall be divided into sub-lots, each weighing 200 kg or less.

4.1.2 *Test Sample* — Unless otherwise agreed to between the buyer and the seller, 15 increments each approximately weighing 10 g shall be taken from different parts of each sub-lot so that a representative test sample is obtained. All the increments thus collected shall be thoroughly mixed.

4.2 Sampling for Fabrics

4.2.1 *Lot* (*Fabric*) — The quantity of fabrics manufactured essentially under uniform conditions shall constitute a lot.

4.2.2 *Gross Sample* — Unless otherwise agreed to between the buyer and the seller, the number of pieces to be selected from a lot to constitute gross sample shall be as given below:

Lot Size	*Sample Size*
Up to 100	*3*
101 ,, 300	*4*
301 ,, 500	*5*
501 and above	*7*

4.2.3 *Test Sample* — From each piece in the gross sample about 25 g of fabric shall be taken out from at least two different parts to constitute test sample. The parts shall then be cut into further smaller pieces and thoroughly mixed.

5 PREPARATION OF TEST SPECIMEN

5.1 Cut the test sample into small pieces. Mix all the pieces thoroughly. Draw at least 3 test specimens from among these pieces such that each specimen weighs 5 g.

6 CONDITIONING OF TEST SPECIMEN

6.1 Prior to test, the test specimen shall be conditioned for 24 hours to moisture equilibrium in a standard atmosphere at 65 ± 2 percent RH and 27°C ± 2°C temp (*see* IS 196).

7 APPARATUS

7.1 Porcelain Crucible

7.2 Beakers

7.3 Weighing Balance

7.4 Stopwatch

7.5 Graduated Cylinder

7.6 Filter Paper

7.7 Conical Flask

7.8 Muffle Furnace

8 REAGENTS

8.1 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS 1070) shall be used where the use of water or distilled water as reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

8.2 Hydrogen Peroxide — 6 percent (*w*/*w*) (or 20 volumes).

8.3 Sodium Hydroxide Solution — 20 percent (*w*/*v*).

8.4 Dilute Hydrochloric Acid — equal volumes of concentrated hydrochloric acid and water.

8.5 Dilute Sulphuric Acid — 10 percent (*w*/*v*).

8.6 Mixed Acid Solution — prepared by mixing 150 ml of concentrated sulphuric acid and 150 ml of phosphoric acid and made up to 1 litre with water.

8.7 Ferrous Ammonium Sulphate Solution—N/10.

8.8 Potassium Dichromate Solution — (a) N/10, and (b) N/20.

8.9 Stannous Chloride Solution — 5 percent (*w*/*v*).

8.10 Mercuric Chloride Solution — saturated.

8.11 Indicator Solution — prepared by dissolving 0.2 g of barium diphenylamine sulphonate in 100 ml of water.

8.12 Potassium Permanganate Solution — (a) saturated, and (b) N/20.

8.13 Potassium Bisulphate — anhydrous.

8.14 Potassium Iodide — crystals.

8.15 Starch Indicator — 1 percent solution.

8.16 Sodium Thiosulphate Solution — N/20.

8.17 Reinhardt Solution — prepared by dissolving 200 g of manganese sulphate in 1000 ml of water to which is added a cooled mixture of 400 ml of concentrated sulphuric acid, 1200 ml of water and 400 ml of syrupy phosphoric acid.

8.18 Nitric Acid — concentrated.

8.19 Sodium/Potassium Chlorate — crystals.

8.20 Ammonium Hydroxide

8.21 Ammonium Chloride — crystals.

9 PROCEDURE

9.1 Condition the test specimens to moisture equilibrium in standard atmosphere (*see* **6**) and weigh each test specimen accurately.

9.2 Put a test specimen in porcelain crucible (*see* Note), ash it in a muffle furnace at 800°C for 15 minutes and fuse the ash over a Bunsen flame to clear melt with 10 g of potassium bisulphate. Dissolve the melt in 100 ml of hot water and add 100 ml of hydrogen peroxide. Add enough amount of sodium hydroxide solution till the solution is slightly alkaline. Boil the solution gently for 5 minutes and filter it through Whatman No. 54 or its equivalent filter paper. Wash the precipitate with hot water. Collect the filtrate and the washings.

NOTE — If the amount of iron and chromium compounds which have been fixed properly on the fabric is to be determined the water-soluble compounds of iron and chromium (which have not been properly fixed) should be removed by the following procedure:

'Before ashing, put the test specimen in a 250-ml beaker. Add 100 ml of distilled water and boil it for 15 minutes. Wash the test specimen thoroughly, first with warm water and then with cold water. Dry the test specimen and follow the procedure given in **9.2**.

9.3 Dissolve the precipitate obtained as in **9.2** in 10 ml of hot dilute hydrochloric acid. Wash the filter paper thoroughly with distilled water till the washings are free from iron. Add 5 ml of hydrogen peroxide solution and reprecipitate iron with sodium hydroxide solution as in **9.2**. Boil it for 5 minutes. Filter off the precipitate and wash it till free from chromium.

9.4 Combine the filtrate as obtained in **9.2** and **9.3**.

9.5 Determination of Chromium

9.5.1 *First Method*

9.5.1.1 Concentrate the filtrate obtained as in **9.4** and neutralize it with dilute sulphuric acid. Add 10 ml of dilute sulphuric acid in excess. Add 25 ml of N/10 ferrous ammonium sulphate solution followed by 20 ml of mixed acid solution and 1 ml of indicator solution. Titrate the mixture against N/10 potassium dichromate solution to the first permanent blue colour.

9.5.1.2 Carry out a blank test by following the procedure given in **9.5.1.1** using distilled water instead of the filtrate obtained as in **9.4**.

9.5.1.3 Calculate the percentage of chromium as chromium oxide (Cr_2O_3) by the following formula:

$$A = \frac{(V_2 - V_1) \times 0.253\,4}{W}$$

Where
A = percent by weight of chromium as Cr2O3,
V_2 = volume in ml of N/10 potassium dichromate required for blank (*see* **9.5.1.2**),
V_1 = volume in ml of potassium dichromate required for the test (*see* **9.5.1.1**), and
W = weight in g of the conditioned test specimen (*see* **9.1**).

9.5.2 *Second Method*

9.5.2.1 Take the filtrate obtained as in **9.4** and make up the volume to 250 ml. Take 50 ml of the diluted solution in a flask and neutralize it with dilute sulphuric acid and add 10 ml of dilute sulphuric acid in excess. Cool the solution to room temperature. Add 2 g of potassium iodide crystals and keep the flask stoppered for 5 minutes in dark place. Titrate the liberated iodine against standard sodium thiosulphate solution using starch as an indicator.

9.5.2.2 Calculate the percentage of chromium as its oxide (Cr_2O_3) by the following formula:

$$P = \frac{A \times B \times 25.34}{2\,W}$$

where
P = percent by weight of chromium as Cr_2O_3,
A = volume in ml of sodium thiosulphate solution required for the test,
B = strength of the sodium thiosulphate used, and
W = conditioned weight in g of the specimen (*see* **9.1**).

9.5.3 *Third Method*

Put a test specimen in porcelain crucible (*see* Note), and ash it in a muffle furnace at 800°C for 15 minutes. Dissolve the ash in the beaker in minimum amount of concentrated nitric acid and then add sodium/potassium chlorate (5 g) with small quantity of water. Evaporate the solution to just dryness on a sand bath and then add to it 100 ml of hot water to bring the residue into solution. To the above solution add solutions of ammonium chloride or ammonium sulphate and ammonium hydroxide to precipitate the iron. The precipitate is filtered and washed repeatedly with hot water till it is free from chromium.

NOTE — If the amount of iron and chromium compounds which have been fixed properly on the fabric is to determine the water soluble compounds of iron and chromium (which have not been properly fixed) should be removed by the following procedure:
Before ashing, put the test specimen in a 250-ml beaker. Add 100 ml of distilled water and boil it for 15 minutes. Wash the test specimen thoroughly, first with warm water and then with cold water. Dry the test specimen and follow the procedure given in **9.2**.

9.6 Determination of Iron

9.6.1 Dissolve the precipitate obtained as in **9.3** in hot dilute hydrochloric acid. Boil the solution and add stannous chloride solution drop-wise while boiling until the solution becomes colourless. Cool the solution to room temperature. Add 5 ml of mercuric chloride solution (*see* Note).

NOTE — Excess of stannous chloride should not be added as it would require more of mercuric chloride resulting in the precipitation of mercurous chloride which would interfere in the titration.

9.6.2 *First Method*

9.6.2.1 Add 20 ml of mixed acid solution to the solution obtained as in **9.6.1**. Add 1 ml of indicator and titrate against N/20 potassium dichromate solution to the first permanent blue colour.

9.6.2.2 Calculate the percentage of iron as its oxide (Fe_2O_3) by the following formula:

$$B = \frac{V_3 \times 0.3\ 992}{W}$$

Where
B = percent by weight of iron as Fe_2O_3,
V_3 = volume in ml of N/20 potassium dichromate solution required for the test (**9.6.2.1**), and
W = weight in g of the conditioned test specimen (*see* **9.1**).

9.6.3 *Second Method*

9.6.3.1 Transfer the solution obtained as in **9.6.1** (after 5 to 10 minutes) to a large porcelain dish. Add to this 25 ml of Reinhardt solution and 400 ml of water. Rinse with a moderate amount of water and titrate against N/20 potassium permanganate solution with a constant stirring to a definite pink tint.

9.6.3.2 Carry out a blank titration on the reagents.

9.6.3.3 Calculate the percentage of iron as its oxide (Fe_2O_3) by the following formula:

$$B = \frac{(V_5 - V_4) \times 0.3\ 992}{W}$$

where
B = percent by weight of iron as Fe2O3,
V_5 = volume in ml of N/20 potassium permanganate (required for the test),
V_4 = volume in ml of N/20 potassium permanganate (required for blank), and
W = weight in g of the conditioned test specimen.

9.7 Repeat the procedure with the remaining test specimens.

10 REPORT

10.1 Report individually the values obtained as in **9.5.1.3** or **9.5.2.2** and **9.7**, as the percentage of chromium as its oxide (Cr_2O_3) and the values obtained as in **9.6.2.2** or **9.6.3.3** and **9.7** as percentage of iron as its oxide (Fe_2O_3) in the test specimens.

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (xxxx)

October 2024

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भारतीय मानक मसौदा

वस्त्रादि —विलायक में घुलनशील पदार्थ का वस्त्रादि सामग्री में ज्ञात करने की पध्दती

(IS4390 का पहला पुनरीक्षण)

Draft *Indian Standard*

Textiles — METHOD FOR ESTIMATION OF SOLVENT SOLUBLE MATTER IN TEXTILE MATERIAL

(*First Revision* of IS 4390)

ICS:

Textiles Chemical Methods of Test Sectional Committee, TXD 05

last date for receipt of comments is October 2024

FOREWORD

(Formal clauses will be added later)

This Indian Standard was first published in 1967 and has been revised to accommodate use of benzyl alcohol as solvent for evaluating solvent soluble matter in cotton textiles presently covered in IS 5152: 1969. As a result of above IS 5152: 1969 stands withdrawn.

There is no International standard on the subject,

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

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded Off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*revised*)',

1 SCOPE

This standard prescribes a method for determination of solvent soluble matter in textile materials using benzene-methyl alcohol mixture or ethyl ether as solvent.

2 REFERENCES

The Indian 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 possibility of applying the most recentedition of standard given below:

IS No.	***Title***
196:1966	Atmospheric conditions for testing *(revised)*
336:2021	Ether specification
517:2000	Monosodium phosphate specification (Second Revision)
1070:1992	Reagent Grade Water Specification Fourth Revision
1840:1961	Benzene, reagent grade (withdrawn)

3 PRINCIPLE

A known amount of test sample is extracted with benzene-methyl alcohol mixture or ethyl ether as solvent. The solvent is dried and the residue is expressed as the percentage of the weight of the conditioned textile material.

4 SAMPLING

4.1 Sampling for Fibre and Yarn

4.1.1 *Lot*

The quantity of fibre or yarn from the same sourceshall constitute a lot. If the lot contains more than 200 kg of fibre or yarn, it shall be divided in sub-lots, each weighing 200 kg or less.

4.1.2 From the sub-lot 15, increments each approximately weighing 10 g shall be taken from different parts so that a representative sample is obtained. All the increments, thus, collected shall be thoroughly mixed to get the test sample.

4.2Sampling of Fabrics

4.2.1 *Lot*

The quantity of fabric manufactured under relatively uniform conditions shall constitute a lot.

4.2.2 The number of pieces to be selected from a lot shall be as given below. The pieces selected shall constitute the gross sample:
l

SL NO.	*Lot size*	*Sample Size*
(1)	(up to 100)	(3)
2	101 to 300	4
3	301 to 500	5
4	501 and above	7

4.2.3 From each piece in the gross sample about 25 g of fabric shall be taken out from at least two different parts. The parts shall be then cut into further smaller pieces and thoroughly mixed. The pieces thus collected shall constitute a test sample.

5 PREPARATION OF TEST SPECIMENS

Cut the test sample into small pieces, Mix all the pieces thoroughly. Draw at least three test specimens from among these pieces such that each specimen weighs about 5 g.

6 CONDITIONING OF TEST SPECIMENS

Prior to test, the test specimens shall be conditioned for 24 hours for moisture equilibrium in a standard atmosphere at 65 ±5 percent relative humidity and 27°±20C temperature (*see also* IS196).

7 APPARATUS

7.1 Soxhlet Apparatus

7.2 Reflux Condenser

8 REAGENTS

8.1 Quality of Reagents

Unless specified otherwise, pure chemicals shall be employed for tests and distilled water (*see* IS 1070) shall be used where the use of water or distilled water as reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

8.2 Benzene-Methyl Alcohol Mixture

Prepared by mixing three volumes of benzene (*see* IS 1840) with two volumes of methyl alcohol (*see*IS517).

8.3Ethyl Ether

Redistilled (*see* IS 336).

9 PROCEDURE

9.1 Condition the test specimens to moisture equilibrium in standard atmosphere (*see***6**). Weigh each test specimen accurately.

9.2 Take one test specimen and put it in thimble of Soxhlet apparatus (*see* Note). Extract the specimen with 150 ml of benzene methyl alcohol mixture or ethyl ether in a Soxhlet apparatus for 3 hours siphoning the solvent at a minimum rate of 10 extractions per hour.

NOTE— If the thimble is not available, the test specimen should be wrapped in filter paper.

9.3 Reduce the extract, if necessary, by subsequent distillation to a volume of approximately 25 ml. Filter the extract through a rapid filter paper and collect the extract in a50 ml tared flask. Wash the filter paper and the extraction flask with small portions of solventand add the washings to the extract.

9.4 Evaporate the extract in the tared flask. Dry the residue to constant weight at 105 to 110 °Cand weigh.

9.5 Calculations

Calculate the percentage of solvent-soluble matter present in the textile material by the following formula:

$$p = \frac{b}{a} \times 100$$

where

p = percent, by weight, solvent-soluble matter in the test specimens;

b = Weight, in g, of the residue (*see***9.4**); and
a = conditioned weight, in g, of the test specimen (*see***9.1**).

9.6 Repeat the test with the remaining test specimens and calculate the solvent-soluble matter in each test specimen.

9.7 Calculate the average of the values obtained as in**9.5**and **9.6**.

10 REPORT

Report the value obtained in **9.7** and the solvent used.

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 05 (XXXX)
XXXX 2024

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***भारतीय मानक* मसौदा**

वस्त्रादि — तैयार कपड़ों की मिट्टी प्रतिरोध और मिट्टी रिलीज दक्षता के निर्धारण की पध्दती

(आईएस 11813 का *पहला पुनरीक्षण*)

Draft *Indian Standard*

Textiles — Method for Determination of Soil Resistance and Soil Release Efficiency of Finished Textile Fabrics

(*First Revision* of IS 11813)

ICS: 59.060.01

Textiles Chemical Methods of Test Sectional Committee, TXD 05	last date for receipt of comments is XXXX 2024

FOREWORD

(Formal clauses will be added later)

This standard was originally published in 1986. This first revision has been made in the light of experience gained since its last revision and to incorporate the following changes:

iv) The Title of the standard has been updated.

v) ICS number is incorporated in place of udc number.
vi) References to the Indian standard have been updated.

The soiling of textile fabrics is one of the most difficult problems associated with their use. Cotton and cellulosic fabrics do not pose a severe problem of soiling because of their high moisture regain. Nevertheless, the resin finished cellulosic fabrics and fabrics rich in synthetic fibres pose a severe problem of soiling during their usage. The soiling of fabrics is due to: (a) interfacial attraction or Van der Wall forces, (b) electrostatic attraction, (c) mechanical forces, and (d) hydrophobicity of the fibres.

The soil is mainly of two types, namely, dry or particulate soil and oily or greasy soil. The former which includes particles of dust, sand, earth, soot, metallic oxides and carbon with tarry substances may be hydrophilic (metallic oxides) or hydrophobic (carbon) in nature. The latter includes glycerides, long chain fatty acids and alcohols, lubricating oil, etc, which are mostly hydrophobic.

This Indian Standard prescribes a method for determination of soil resistance and soil release efficiency of finished textile fabrics and garments for both types of soil as mentioned above. In normal use, both types of soils may be present on the fabric. It is, therefore, advisable to test the fabric for both types of soil before use.

For evaluation of soil resistance and soil release efficiency of the fabric, synthetic soils are used for soiling purpose. Ferric oxide and carbon black in fine powder form are employed as particulate soil whereas used lubricating oil SAE 40 is employed as oily soil. In the absence of a standard used lubricating oil, it is recommended to use a standard oil and add to it 10 percent of carbon black particles of standard mesh size of 20 to 25 mm.
The latter is hydrocarbon based and is similar to natural soiling encountered in actual usage as it contains carbon particles dispersed in oil phase. The properties of these soils are given in Table 1 (see **6.1**).

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’,

1 SCOPE

1.1 This standard prescribes a method for determining soil resistance and soil release efficiency of finished textile fabrics and garments.

1.2 The method can also be used to assess the relative washing efficiency of surfactant auxiliaries.

2 REFERENCE

IS No.	*Title*
IS 9458:2020	Synthetic Detergents for Washing Woollen and Silk Fabrics — Specification (*Second Revision*)
IS 1070:2023	Reagent Grade Water Specification (*Fourth Revision*)

3 PRINCIPLE

3.1 A specimen of the fabric under test is soiled with synthetic soil, washed under prescribed conditions and dried. Simultaneously, a control specimen and a control washed specimen are taken from the fabric under test. The soil resistance and soil release efficiency of the fabric is determined as described in **8.3**.

4 SAMPLING

4.1 Lot — The quantity of one definite type and quality of a fabric or garment delivered to a buyer against one dispatch note shall constitute a lot.

4.2 Sample shall be drawn so as to be representative of the lot.

4.3 Sample drawn in compliance with the material specifications or as agreed to between the buyer and the seller to evaluate soil resistance and soil release efficiency of the textile fabric in the lot shall be held to be representative of the lot.

5 APPARATUS

5.1 An accelerator consisting of a rotor capable of rotating at 1 600 rpm. The rotor consists of motor to which a shaft is attached. The shaft carries two arms at the end which are enclosed in a circular chamber having a door. A hole is provided on the upper part of this chamber for pouring particulate soil.

NOTE — Accelerator type AB 7 of Atlas Electric Device Co, Chicago, USA maybe used without the liner. Other similar instruments capable of producing consistent results may also be used. This type of instrument can be fabricated with little efforts.

5.2 A gas tight micrometer syringe to apply oily soil on the fabric with an accuracy of 0.01 ml.

5.3 A launderometer for washing the specimen.

5.4 A drying oven in which temperature can be maintained at 70 ± 5°C.

5.5 A spectrophotometer used in colour matching systems.

5.6 A white plate coated with barium sulphate.

6 QUALITY OF REAGENTS

Unless otherwise specified, pure reagents shall be employed in the tests. Distilled water (*see* IS: 1070), where the use of water as a reagent is intended, shall be used.

NOTE — 'Pure chemicals' shall mean the chemicals which do not contain impurities that affect the experimental results.

6.1 Soil — Ferric oxide or carbon black in fine powder form is used as particulate soil, whereas lubricating oil SAE 40 conforming to IS 13656 after it turns black during usage, or any other equivalent oil is employed as oily soil. The details of dry particulate and oily soils are given in Table 1.

TABLE 1 PROPERTIES OF SOILS TO BE USED

(Clauses **Foreword, 6.1** *and* **8.1.2.2***)*

Sl. No.	Property	Used Lubricating Oil	Ferric Oxide	Carbon Black
i)	Physical nature	Liquid	Powder	Powder
ii)	Chemical nature	Hydrophobic	Hydrophilic	Hydrophobic
iii)	Colour	Black	Red	Black
iv)	Density (g/cm^3)	0.91 ± 0.01	—	—
v)	Viscosity (cps)	275	—	—
vi)	Particle size (microns)	—	0.3 to 1.6	2 to 4

6.2 A non-ionic detergent based on ethylene oxide condensate for washing, conforming to Type 2 of IS 9458.

Note —The detergent selected should be capable of working at 50 ± 5°C satisfactorily.

6.3 Carboxymethyl Cellulose (CMC) — Sodium salt to prevent redeposition of soil during washing.

6.3.1 CMC normally used in sizing and printing of textiles is suitable.

7 PREPARATION OF SPECIMEN

7.1 From the sample as selected in **4.2**, cut twelve specimens of 10 x 10 cm size.

7.2 Take four of the twelve specimens as obtained in **7.1** and mark them as control specimens. Mark the other eight specimens as test specimens.

8 PROCEDURE

8.1 Soiling of the Specimens

8.1.1 *Method for Particulate Soil*

8.1.1.1 Take four test specimens (*see* **7.2**) and weigh each of them nearest to one mg.

8.1.1.2 Weigh the particulate soil exactly 5 percent on the bone dry mass of the two test specimens.

8.1.1.6 Repeat the procedure from **8.1.1.2** to **8.1.1.5** for remaining two test specimens as obtained in **8.1.1.1** (*see* Note 1 under **8.1.2.6**).

8.1.2 *Method for Oily Soil*

8.1.2.1 Take the other two test specimens (*see* **7.2**) and weigh each of them nearest to one mg.

8.1.2.2 Calculate the amount of 'used lubricating oil' (*see* **6.1**) 45 percent on the mass of the test specimens and convert it into ml taking into account the density of the oil (*see* **Table 1**).

8.1.2.3 Pour exactly half of the calculated amount on each test specimen with the help of a gas micrometer syringe and place them on each arm of the rotor of the accelerator.

8.1.2.4 Secure tightly the door of the chamber, switch on the motor and maintain its speed at 1 600 rpm for three minutes. Take out the uniformly soiled test specimens and keep them aside for spectrophotometric measurement and washing.

8.1.2.5 The uniformly soiled test specimens shall not have maximum reflectance variation of more than ±5 percent. In case, the test specimens as soiled in **8.1.2.4** do not meet this requirement, two fresh test specimens shall be cut from the sample and treated as given in **8.1.2.**1 to **7.1.2.4** till they meet the requirement given in **8.1.2.5**.

8.1.2.6 Repeat the procedure given in **8.1.2.1** to **8.1.2.5** for the remaining two test specimens (*see* **6.2**).

NOTES

1 The chamber should be cleaned in between two successive soiling operations.

2 Alternatively the sample is fixed on an embroidery ring and secured tight. The exact amount of soil is poured in the middle of the sample and allowed to wick for 16 to 20 hours. Each sample is processed similarly.

8.2 Washing

8.2.1 Wash two of the control specimens (*see* **7.2**) and four soiled test specimens, two each as obtained in **8.1.1.5** and **8.1.2.5** in a launderometer in separate baths each containing 3.5 g/l of a non-ionic detergent (*see* **6.2**) and lg/l carboxymethyl cellulose (*see* **6.3**) at 50°C for 30 minutes at a liquor ratio of 1 : 50.

NOTE— The specimens should be fully exposed to the wash liquor from both the sides.

8.2.2 Rinse the washed specimens with tap water for 10 minutes and again rinse them with distilled water.

8.2.3 Dry the washed specimens in an electric oven at 70 °C ± 5°C for 20 minutes.

8.3 Assessment of Soil on Fabrics

8.3.1 Calibrate the spectrophotometer against a standard white plate of barium sulphate as per the method given in ANNEX A.

8.3.2 Find out the minimum percent reflectance on the spectrophometer and note down the corresponding wave length for two specimens soiled with particulate soil—ferric oxide as obtained in **8.1.1.6** and that of two particulate soiled and washed specimens at the same wavelength as above, as obtained in **8.2.3** at four different places on each side for each specimen and calculate the average value from these sixteen readings eight for each specimen for both the sets, soiled and soiled-washed separately. Repeat the exercise for one control and one control-washed specimen at the same wavelength as above and calculate the average of eight readings for each separately.

8.3.3 Find out percent reflectance on a spectrophotometer at 450 and 650 mm for the two specimens soiled with oily soil as obtained in **8.1.2.6** at four different places on each side for each specimen and calculate the average of 32 readings. Perform similar exercise on two oily soiled and washed specimens as obtained in **8.2.3**, and one control and one control-washed specimen and calculate the average reflectance separately for oily soiled, soiled-washed, control; and control-washed specimens.

8.3.4 Calculate the Kubelka-Munk ratio $(\frac{K}{S})$ for soiled, soiled washed, control and control—washed specimens separately as obtained in **8.3.2** and **8.3.3** for both types of soil using the following formula:

$$\frac{K}{S} = \frac{(1-R)^2}{2R}$$

where

K = Absorption coefficient,
S = Scattering coefficient, and
R = Average percent reflectance as measured in **8.3.2** or **8.3.3**.

8.3.5 *Determination of Soil Resistance*

8.3.5.1 This can be done correctly only in case of particulate soil.

8.3.5.2 Find out $\frac{K}{S}$ value for the soiled and control sample and determine the soil resistance as follows:

Soil Resistances = $(\frac{K}{S})p - \left(\frac{K}{S}\right)c$

Where

$(\frac{K}{S})p$= Kubelka-Munk ratio for particulate soiled sample, and

$\left(\frac{K}{S}\right)c$Kubelka-Munk ratio for control sample.

8.3.6 *Determination of Soil Release Efficiency*

8.3.6.1 Calculate the degree of soil retained on the fabric specimen separately for particulate soil and oily soil using the formula:

$$DSR = \frac{\left(\frac{K}{S}\right)W-\left(\frac{K}{S}\right)U}{\left(\frac{K}{S}\right)S-\left(\frac{K}{S}\right)C}$$

where

D_{SR} = Degree of soil retained on the fabric specimen,

$\left(\frac{K}{S}\right)W$ =Kubelka-Munk ratio for soiled-washed specimen,

$\left(\frac{K}{S}\right)U$ =Kubelka-Munk ratio for control-washed specimen,

$\left(\frac{K}{S}\right)S$ = Kubelka-Munk ratio for soiled unwashed specimen, and

$\left(\frac{K}{S}\right)C$ = Kubelka-Munk ratio for control unwashed specimen.

8.3.6.2 Calculate the percent soil retained on the fabric separately for both types of soil by multiplying DSR by 100, that is, percent soil retained = D_{SR} × 100.

8.3.6.3 Calculate the percent soil removed during washing for both types of soil by the formula.

Percent soil removed during washing or soil release efficiency =
100 (1- D_{SR}) where D_{SR} is the value obtained in **8.3.6.1.**

9 REPORT

9.1 The report shall include the following information:

a) Nature, type and constructional details of fabric being tested;
b) Nature and type of finish given to the fabric;
c) Percent soil retained on the fabric after washing separately for the particulate and the oily soil;
d) Soil release efficiency separately for the particulate and the oily soil; and
e) Soil resistance of the fabric or garment for particulate soil only.

ANNEX A

(*Clause* **8.3.1**)

METHOD FOR CALIBRATION OF SPECTROPHOTOMETER

A-l Keep the spectrophotometer in an air-conditioned chamber at 27 5 2°C.

A-2 Switch on the instrument about 90 minutes before use.

A-3 Set the arbitrary value, given with the instrument, on the panel.

A-4 Keep the white plate coated with barium sulphate below the sensor and calibrate the instrument at an interval of 10 nm. Set the reading to 100 ± 0.5 on the digital panel, each time.

A-5 Calibrate the instrument for the full range of wavelength from 380nm to 760 nm. The instrument is now ready for recording the measurements.

Indian Standard

METHOD FOR DETERMINATION OF DIMENSIONAL CHANGES ON WASHING OF FABRICS FROM RAYON AND SYNTHETIC FIBRES

(*Second Revision*)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 23 March 1984, after the draft finalized by the Chemical Methods of Test Sectional Committee had been app .oved by the Textile Division Council.

0.2 This standard was first published in 1958. It was revised in 1963 to express all the values in metric system. It has now been revised again in the light of the experience gained during its use. In this revision, the Cubex International Shrinkage Testing Apparatus has been included.

0.3 Merely on soaking in water, fabrics woven from rayon and synthetic fibres are liable to change in dimensions; when washed with soap, their dimensional instability ty is liable to be higher. As the goods made out of these materials are usually washed with soap, their dimensional change behaviour is of obvious interest to the consumer.

0.4 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS: 2-1960*.

1. SCOPE

1.1 This standard prescribes a method for determination of dimensional changes on washing of fabrics woven from rayon and synthetic fibres or their mixtures.

1.2 The method is intended only for the assessment of dimensional changes undergone by woven fabrics subjected to single mechanical washing. When it is desired to determine the amount of progressive dimensional changes, the test specimens should be washed repeatedly and the amount of dimensional changes in the washed specimens and the number of testing cycles to which the specimens have been subjected indicated clearly.

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

2. TERMINOLOGY

2.0 For the purpose oi this standard, the following definition shall apply.

2.1 Dimensional Change, Percent - The increase or decrease in dimensions (length or width or area) after subjecting the fabric to the prescribed test, expressed as a percentage of the corresponding dimension before such test.

3. SAMPLING

3.1 Lot - The quantity of the fabric purporting to be of one definite type and quality, delivered to a buyer against one despatch note shall constitute a lot.

3.2 Samples for test shall be selected so as to be representative of the lot. Samples drawn in compliance with the material specification or as agreed to between the buyer and the seller shall be held to be representative of the lot.

4. TEST SPECIMENS

4.1 From the samples under test draw 3 test specimens, each, of length 650 mm and of full width, taking care that:

a) the specimens are not drawn from within 1 m of either end of the piece,

b) no two specimens are drawn from the same piece, and

c) the specimens are cut and not torn from the piece.

4.2 The free edges of the specimens shall be sewn with a dimensionally stable thread, for example, polyester thread, using a chain stitch and stitch length of 2 to 3 mm.

5. CONDITIONING OF TEST SPECIMENS

5.1 Prior to test, the test specimens shall be conditioned to moisture equilibrium from dry side in the standard atmosphere at 65± 2 percent relative humidity and 27±2°C temperature (*see* IS: 6359-1971*).

5.2 When the test specimens have been left in such an atmosphere for 24 hours in such a way as to expose, ***as*** far as possible***,*** all positions of the specimens to the atmosphere, they shall be deemed to have reached moisture equilibrium. However, in the case of fabrics which weigh more than 270 g/m^2, this period shall be 48 hours.

* Method for conditioning of textiles.

NOTE -It is preferable to store the newly finished fabrics for about a week before conditioning.

5.3 Atmospheric Conditions for Testing - The test shall be carried out in the standard atmosphere (*see* 5.1).

6. APPARATUS

6.1 Cubex International Shrinkage Testing Apparatus or Wash Wheel or an Equivalent Machine - *see* Appendix A.

6.2 Extractor - A laundry-type centrifugal extractor with perforated basket, capable of adjusting the moisture retention of the fabric to a range between 50 and 100 percent (*m/m*) based on the air-dry mass of the fabric.

NOTE 1 - Any other apparatus that will give equivalent results without fabric distortion for example, rubber roll wringer which could pass the specimen through the rolls along a diagonal line without altering its dimensions may also be used.

NOTES- Heavier fabrics of tight construction require a high moisture retention to ensure removal of wrinkles during pressing.

6.3 .Pressing Equipment - A flat bed press capable of pressing a specimen of size 600 × 600 mm and of providing a minimum pressure of 3 kPa. The temperature of the press shall be 150± 1 5°C.

6.4 Marking Equipment - As specified in 4.3 of IS: 10099-1982*.

6.5 Make-Weights - The make-weights shall consist of fabric similar to that of the test specimens. Each make-weight shall be adjusted to a *p*H of 7 prior to use.

7. REAGENT

7.1 Soap Solution - Prepare a stock solution by dissolving 0’5 kg of soap in 4 litres of hot water. When cooled, this solution forms a thick jelly which may be used as required. From this stock solution, prepare a soap solution for the test containing 5 g/l of soap on dry mass basis.

Soap meeting the following composition (based upon dry mass) is satisfactory:

Free alkali calculated as Na_2CO_3, Max	0.3 percent
Free alkali calculated as NaOH, Max	0.1 percent
Combined fatty acids calculated as Na salt, Min	85 percent
Titre of mixed fatty acids prepared from the soap, *Max*	39°C
Iodine value of fatty acids, *Max*	50

NOTE - Information regarding availability of the soap of above composition may be had from ISI.

8. PREPARATION, MARKING AND MEASURING OF TEST SPECIMENS

8.1 The test specimens shall be prepared, marked and measured as specified in IS: 10099-1982*.

9. PROCEDURE

9.1 Initial Measurement - Expose the specimens to the standard atmosphere as specified in 5.1 until they reach moisture equilibrium (*see* 5.2). Measure the distance between the centres of each of the pairs of marks to the nearest millimetre using the procedure described in IS: 10099-1982*.

9.2 Washing and Rinsing

* Methods for preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change.

9.2.1 Run water into the machine (*see* 6.1) at the temperature such that the machine will heat the liquor to 50°C within 10 minutes, maximum, and fill to the proper level for washing (*see* A-l.5 or A-2.6) within 4 minutes.

9.2.2 Add a load of mass 1 kg, made up of the test specimens plus make-weights not more than half the load of the specimens.

9.2.3 Add sufficient soap (7.1) to give good running suds. If moee than 5 g/l of soap is used, the amount and reasons for this shall be reported [*see* 11.1 (c)]. The temperature shall be maintained at not less than 45°C.

9.2.4 When the machine has run for 45 minutes, timed from the start of the test, drain off the soap solution quickly and fill the machine with water to the proper level for rinsing. Raise the temperature to 50°C within 10 minutes maximum.

* Methods for preparation, marking and measuring of fabric specimens and garments in tests for determination **of** dimensional change.

9.2.5 When the machine has run for another 5 minutes, drain off the water, fill again and heat to 50°C as before.

9.2.6 At the end of the next 5 minute:, drain off the water quickly. Allow the machine to run without further additions for 5 minutes more. Stop the machine.

9.3 Extraction - Remove the specimens from the machine by folding the corners of each to the centre in such a way that the whole specimen can be supported in hand. Lay each specimen flat against the side of the perforated basket of the extractor to avoid streching during rotation and extract the excess water (6.2).

9.4 Pressing - Press each specimen taking care to ensure that it is smoothened. Without stretching, remove wrinkles before pressing. Continue this operation until sufficient moisture has been extracted from the fabric to ensure conditioning from the dry side.

9.5 Final Measurement - Allow the pressed specimen to cool, condition in the standard atmosphere and measure the distance between the centres of the markings to the nearest millimetre (*see* IS: 10099-1982*).

10. CALCULATION AND EXPRESSION OF RESULTS

10.1 Calculate the dimensional changes in the length and width directions separately by the following formula:

$$\text{Dimensional change, percent} = \frac{F-I}{I} \times 100$$

where

F = final measurement (*see* 9.5); and
I = initial measurement (*see* 9.1).

Express as percentages of the original, value to the nearest 0.5 percent, using a minus sign (-) to indicate shrinkage and a plus sign (+) to indicate elongation. Calculate the mean value and the range of the dimensional change for each set of replicates.

10.2 Determine the area dimensional change as follows:

Area dimensional change, percent

$$= D_W + D_L - \frac{D_W \times D_L}{100}$$

Where

D_W=mean dimensional change, percent in width; and
D_L=mean dimensional change, percent in length.

* Methods for preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change.

11. REPORT

11.1 The test report shall include the following particulars:

a) A statement that the test was conducted in accordance with this Indian Standard;

b) Type of apparatus used (*see* **6.1);**

c) Concentration of the soap solution used (state the reasons for using more than 5 g/l of soap when this amount is exceeded);

d) Number of testing cycles to which the specimens were subjected;

e) Dimensional changes in each specimen in the length and width directions and in area;

f) Mean dimensional changes in the replicates, in the length and width directions and in area; and

g) Range of individual dimensional change values.

APPENDIX A

(*Clause* 6.1)

DETAILS OF WASHING APPARATUS

A-l. CUBEX INTERNATIONAL SHRINKAGE TESTING

A-l.1 The apparatus consists of a stainless steel hollow cube (368 × 368 × 368 mm inside measurement) having a capacity of 50 litres. The cube is insulated on five sides and the insulation is covered by a metal outer casing in one face there is an opening fitted with a watertight hinged lid, through which the cube is loaded and discharged. The cube rotates on spindles fixed at diagonally opposite corners, the apparatus being fitted with a reversible drive.

A-l.2 Mounted on the frame is a motor incorporating reduction gearing and an electrically controlled timing device which periodically reverses the motion of the cube. The apparatus is revolved at 60 rev/min for given time, the direction of rotation being automatically reversed every 5 minutes with a 5-second pause between the reversing cycles. The timing device covers the range of 0 to 60 minutes and automatically cuts off at the end of the pre-set period.

A-l.3 At one corner of the cube is mounted a manually operable drain valve, through which liquid may escape when it is opened by the operator.

A-l.4 An expanded steel guard is provided and is so arranged that when it is lifted to allow the cube to be loaded or discharged, the driving power to the cube is cut off. The whole assembly may be mounted on a rigid steel framework.

A-l.5 The load shall be made up of the test specimens plus makeweights not more than half the load of the specimens. The quantity of liquor used shall be sufficient to cover the load. Normally a load of 1 kg shall be used in 25 litres of the liquor.

A-2. WASH WHEEL

A-2.1 The wash wheel comprises horizontal cylindrical machine with rotating cage and reversing mechanism. The cage should have a diameter between 400 and 600 mm and peripheral speed of 50 to 55 m/min. Other diameters may also be used provided that the rotational frequency is adjusted **to** give an equivalent peripheral speed.

A-2.2 Preferably 3 or 4 fins or lifters, about 8 cm wide, equally spaced around the interior of the cage and extending its full length, should be used. A single fin or 2 fins may also be used provided that equivalent results are obtained.

A-2.3 The cage shall turn at such a speed that the load is lifted by the fins and falls back into it. (A peripheral speed of 54 m/min has been found satisfactory.) The cage shall make 5 to 10 revolutions before its direction of rotation is reversed.

A-2.4 The machine shall be equipped with a heating facility, using live steam, gas or electricity, and an outlet large enough to permit discharge of all liquid from the machine in less than 2 minutes.

A-2.5 A thermometer in a suitable well, or an equivalent equipment, shall be provided to indicate the temperature of water within 1 °C during washing and rinsing, and there shall be an outside water gauge to indicate the level of water in the wash wheel.

A-2.6 The mass of the load to be run in the machine shall be between 8 and 50 kg of air-dry fabric per cubic metre of cage space, including the volume of the fins. The load shall be made up of the test specimens plus make-weights not more than half the load of the specimens. The quantity of liquor used shall be sufficient to cover the load, the level being situated at a height from one-seventh to one third of the inside diameter of the cage.

REVIEW ANALYSIS OF INDIAN STANDARD

(To be submitted to the Sectional Committee)

1. **Sectional Committee No. &Title:** TXD 05 (Chemical Methods of Test Sectional Committee)

2. **IS No:** 4419 : 1967
3. **Title:** Method For Determination Of Dimensional Stability Of Knitted Fabrics Made Of Synthetic Fibres

4. **Date of review:** 06 Sept. 2024

5. **Review Analysis**

i) Status of standard(s), if any from which assistance had been drawn in the formulation of this IS.

Standard (No. & Title)	Whether the standard has since been revised	Major changes	Action proposed
B.S. 2959 : 1958 Method Of Test For Dimensional Stability Of Warp-Knitted Nylon Fabrics (Boiling Water Test	Same version	NA	NA

ii) Status of standards referred in the IS

Referred standards (No. & Title)	IS No. of these standards since revised	Changes that are of affecting the standard under review	Action proposed
IS : 196:1950 Atmospheric Conditions For Testing (Revised).	**IS : 196:1966** Atmospheric Conditions For Testing (Revised)	—	Latest version of the standard i.e. IS : 196-1966 shall be referred in the revision and accordingly other changes will be made wherever required
IS : 394:1963 Specification For Ink, Cloth Marking (Revised).	**IS : 394 : 1985** Specification For Ink, Cloth Marking (*Second Revision*)	—	Latest version of the standard i.e. IS : 394 – 1985 shall be referred in the revision and accordingly other changes will be made wherever required

IS : 687:1967 Method For Determination Of Colour Fastness Of Textile Materials To Washing: Test 1 (First Revision)	**IS/ISO 105:C10: 2006** Textiles - Tests For Colour Fastness Part C10 Colour Fastness To Washing With Soap Or Soap And Soda	—	Latest version of the standard i.e. IS/ISO 105-C10: 2006 shall be referred in the revision and accordingly other changes will be made wherever required

iii) **Any other standards available related to the subject& scope of the standard being reviewed(International/regional/other national/association/consortia, etc. or of new or revision of existing Indian Standard)**

Standard (No. & Title)	Provisions that could be relevant while reviewing the IS	Action proposed
NA	NA	NA

iv) **Technical comments on the standard received, if any**

Source	Clause of IS	Comment	Action proposed
NA	NA	NA	NA

v) **Information available on technical developments that have taken place (on product/processes/practices/use or application/testing/input materials, etc.)**

Source	Development	Relevant clause of the IS under review that is likely to be impacted (Clause & IS No.)	Action proposed
NA	NA	NA	NA

vi) Issues arising out of changes in any related IS or due to formulation of new Indian Standard

Related IS and its Title (revised or new)	**Provision in the IS under review that would be impacted & the clause no. or addition of new clause/provision**	**Changes that may be necessary in the Standards under review**	**Action proposed**
NA	NA	NA	NA

vii) Any consequential changes to be considered in other IS

Related IS to get impacted	**Requirements to be impacted**
NA	NA

6. **Any other observation:**

i) IS 2:1960 should be updated in the latest version of the standard.

7. **Recommendations:**
    i) ICS number should be incorporated in place of udc number in the latest version of the standard.
    ii) References to Indian standards may be updated
    iii) Format of the standard is to be updated to A-4.

Indian Standard

METHOD FOR DETERMINATION OF DIMENSIONAL STABILITY OF KNITTED FABRICS MADE OF SYNTHETIC FIBRES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 14 December 1967, after the draft finalized by the Textile Chemistry Sectional Committee had been approved by the Textile Division Council.

0.2 The knitted fabrics, especially made from synthetic fibres and their blends, are stabilized with the combined effects of heat and moisture. It is desirable to determine the extent to which a fabric has been set in order to assess its suitability for particular purposes.

0.3 Considerable assistance has been derived from B.S. 2959: 1958 'Method of test for dimensional stability of warp-knitted nylon fabrics (boiling water test)' issued by the British Standards Institution.

0.4 In reporting the result of a test or analysis made in accordance with standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS: 2-1960*.

1. SCOPE

1.1 This standard prescribes a method for determination of dimensional stability of knitted fabrics made of synthetic fibres and their blends.

2. PRINCIPLE

2.1 A specimen is immersed in boiling water for 30 minutes and any change in dimensions is determined.

3. TERMINOLOGY

3.0 For the purpose of this standard, the following definition shall apply.

3.1 Dimensional Change Percent - The decrease or increase in dimensions (that is, in length or width or both) after subjecting the fabric to the prescribed test, expressed as a percentage of the corresponding dimensions before such test.

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

4. SAMPLING

4.1 Lot - The quantity of textile material purporting to be of one definite type and quality, delivered to one buyer against one despatch note.

4.2 Unless otherwise agreed to between the buyer and the seller, the number of pieces of cloth to be selected at random from a lot shall be as given below. The pieces thus selected shall constitute the test *sample.*

Lot Size (*Number of Pieces in the Lot*)	*5Sample Size* (*Number of6 Pieces to be Selected*)
N	*n*
up to 100	5
101 „ 300	6
301 „ 500	7
501 „ 800	8
801 and above	9

4.2.1 To ensure randomness of selection, a random number table shall be used. In case such a table is not available, the following procedure shall be adopted:

Starting from any piece count the pieces in the lot as 1, 2, 3, etc, up to *r* in a systematic manner. Every *r*th piece thus counted shall be included in the test sample, where *r* is the integral part of *N/n* (*see* 4.2).

5. TEST SPECIMENS

5.1 Draw one test specimen of full width or circumference and measuring not less than 1 m in length from each piece constituting the test sample, taking care (a) that the specimens are not drawn from within 1 m of either end of the piece, and (b) that they are cut and not torn from the piece.

6. CONDITIONING OF TEST SPECIMENS

6.1 Prior to test, the test specimen shall be conditioned to moisture equilibrium in a standard atmosphere at 65 ± 2 percent RH and 27° ± 2°C temp (*see also* IS: 196-1950*).

6.2 When the test specimens have been left in such an atmosphere for 24 hours, in such a way as to expose, as far as possible, all portions of the specimens to the atmosphere, they shall be deemed to have reached moisture equilibrium.

---

* Atmospheric conditions for testing **(***revised***).**

7. APPARATUS

7.0 For the purpose of this test, the following apparatus shall be used.

7.1 A stainless steel or similar smooth-surfaced vessel of suitable size to hold the specimen(s) and water during boiling.

7.2 Glass Scale -A plate glass of 6 mm thickness with dimensions not less than 75 × 15 cm, on the under-surface of which is marked a scale graduated in centimetres and millimetres, the scale running parallel to and approximately equidistant from the long sides of the glass plate.

NOTE -The scale may be engraved on the glass or it may be printed on a thin transparent film which is fastened to the glass plate in such a way as to cover its entire undersurface uniformly. For convenience in use, handles may be fitted at the ends of the plate but they should be attached in such a way that they do not project below the lower surface of the plate.

7.3 Measuring Table - having a horizontal smooth flat surface, both length and width of the table being at least 10 cm greater than the length of the glass plate referred to in 7.2.

7.4 Marking Ink - conforming to IS: 394-1963*

NOTE - If this is not readily available, cotton sewing thread of contrasting colour and having a colour fastness rating of 5 to washing: Test 1 (*see* IS: 687-1967†) may be used.

8. QUALITY OF REAGENTS

8.1 Pure chemicals and soft water having a hardness of not more than 50 ppm expressed as calcium carbonate shall be used for the purpose of this test.

NOTE - 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

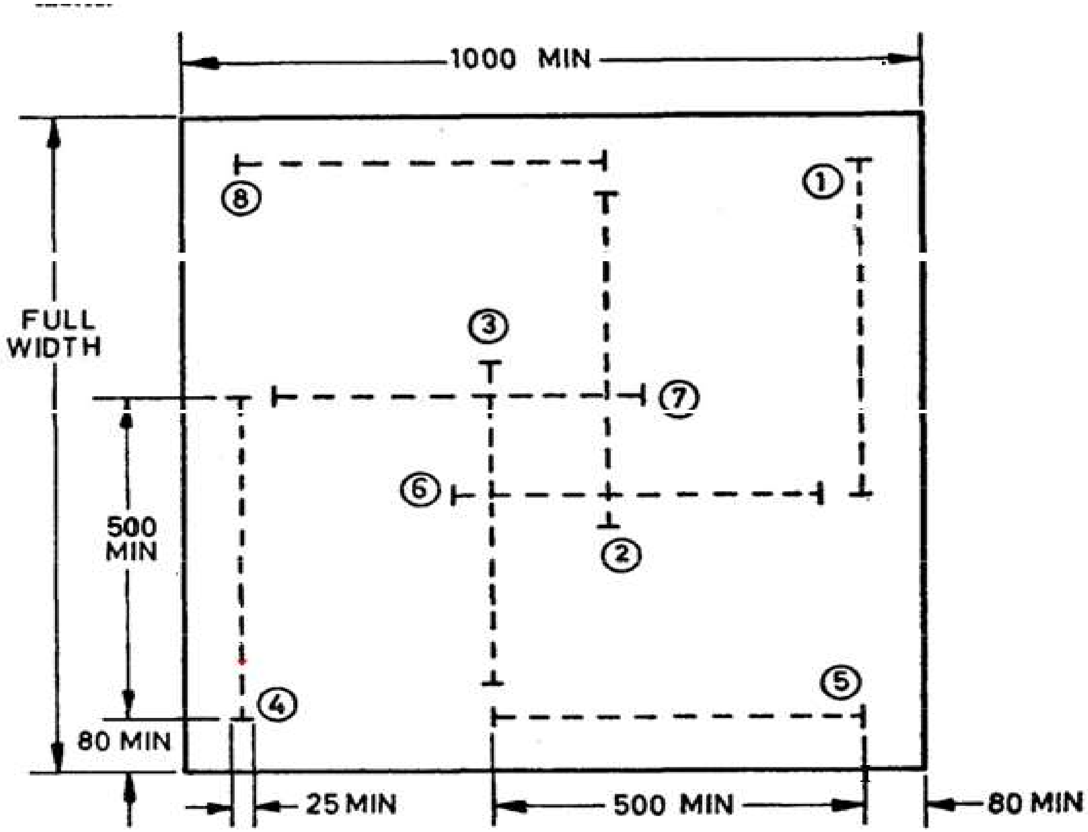
9. PROCEDURE

9.1 Preparation and Marking of Specimens - Condition the test specimen to moisture equilibrium in the standard atmosphere (*see* 6). Weigh and spread it (*see* Note) on the measuring table, removing by hand all creases and wrinkles taking care not to extend or distort the specimen, and with a fine pointed nib and marking ink (or with cotton sewing thread) mark on it by dotted lines the first, second, third and fourth pairs of marks in the wale direction, and the fifth, sixth, seventh and eighth pairs of marks in the course direction, each mark being at least 25 mm long and at least 80 mm away from the edges of the test specimen. Keep the distance between the two marks in every pair the same but not less than 500 mm (or as much greater as the size of the specimen permits) and distribute the pairs of marks across the test specimen, staggering them as illustrated in Fig. 1. Mark one datum point on each of the two marks in the pairs so that the lines joining the datum points on the first, second, third and fourth pairs of marks run parallel to the courses, and the lines joining the datum points on the fifth, sixth, seventh

* Specification for ink, cloth marking (*revised*).
† Method for determination of colour fastness of textile materials to washing: Test 1 (*first revision*).

and eighth pairs of marks run parallel to the wales. Join as illustrated in Fig. 1, the datum points on the first, second, third and fourth pairs of marks and the datum points on the fifth, sixth, seventh and eighth pairs of marks by dotted lines, taking care not to distort or extend the specimen. Measure to nearest millimetre the distance between the datum points on all pairs of marks by means of the scale.

NOTE - If the fabric is tubular-knitted, cut the fabric lengthwise and open it before spreading on table. Thereby the circumference of the fabric would be the width of the fabric.



All dimensions in millimetres.
FIG. 1 METHOD OF MARKING OF TEST SPECIMENS

9.1.1 Similarly mark the remaining test specimens and measure the distance between the pairs of marks in each of the remaining specimens. Mark the specimens so that each can be identified from the other.

9.2 Immerse the specimen in sufficient boiling water to prevent undue creasing of the fabric (normally a water to cloth ratio of not less than 50: 1 will be convenient) and continue boiling for 30 minutes. Remove the fabric gently from the water and then place it flat between two layers of absorbent material, pressing gently with the hand, so as to absorb excess moisture. Allow the fabric to dry by exposing it freely to air while flat and without tension. Condition it to moisture equilibrium in a standard atmosphere (*see* 6). Place it on the measuring table; carefully remove by hand all wrinkles and creases and measure correct to the nearest millimetre the distance between datum points on every pair of marks by means of the glass scale, taking care not to stretch or distort the specimen while measuring.

9.3 Repeat the procedure given as in 9.2 with the remaining test specimens.

10. EVALUATION

10.1 Calculate separately on one test specimen the percentage of dimensional change between datum points on every pair of marks by the following formula:

$$S = \frac{100\ (a-b)}{a}$$

where

S = percentage dimensional change,

a = distance between datum points on a pair of marks before treatment (*see* 9.1), and

b = distance between the same datum points after treatment (*see* 9.2).

10.2 Take the mean of the values so determined for the first, second, third and fourth pairs of marks as the courseway dimensional change of the test specimen and the mean of the values determined for the fifth, sixth, seventh and eighth pairs of marks as the waleway dimensional change of the test specimen.

10.3 Determine similarly (*see* 10.1 and 10.2) the courseway and waleway dimensional changes of all the treated test specimens.

11. REPORT

11.1 Report individually the courseway and waleway dimensional changes of each test specimen in the sample.

11.2 Report also whether the change in dimension is shrinkage or extension.

REVIEW ANALYSIS OF INDIAN STANDARD

(To be submitted to the Sectional Committee)

8. **Sectional Committee No. &Title:** TXD 05 (Chemical Methods of Test Sectional Committee)

9. **IS No:** : 1299 : 1984

10. Title: Method For Determination Of Dimensional Changes On Washing Of Fabrics Woven From Rayon And Synthetic Fibres (*Second Revision*)

11. Date of review: 11 Sept. 2024

12. Review Analysis

viii) Status of standard(s), if any from which assistance had been drawn in the formulation of this IS.

Standard (No. & Title)	Whether the standard has since been revised	Major changes	Action proposed
NA	NA	NA	NA

ix) Status of standards referred in the IS

Referred standards (No. & Title)	IS No. of these standards since revised	Changes that are of affecting the standard under review	Action proposed
IS 6359 : 1971 Method For Conditioning Of Textiles	**IS 6359 : 2023** Method for Conditioning of Textiles (*First Revision*)	—	Latest version of the standard i.e. IS 6359 : 2023 shall be referred in the revision and accordingly other changes will be made wherever required
IS 10099 : 1982 Methods for preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional Change.	**IS 10099 : 2020** **ISO 3759 : 2011** Textiles— Preparation, Marking and Measuring of Fabric Specimens and Garments in Tests for Determination	—	Latest version of the standard i.e. IS 10099 : 2020 ISO 3759 : 2011 shall be referred in the revision and accordingly other changes will be made wherever required

	of Dimensional Change (*First Revision*)		

x) **Any other standards available related to the subject& scope of the standard being reviewed(International/regional/other national/association/consortia, etc. or of new or revision of existing Indian Standard)**

Standard (No. & Title)	Provisions that could be relevant while reviewing the IS	Action proposed
NA	NA	NA

xi) **Technical comments on the standard received, if any**

Source	Clause of IS	Comment	Action proposed
NA	NA	NA	NA

xii) **Information available on technical developments that have taken place (on product/processes/practices/use or application/testing/input materials, etc.)**

Source	Development	Relevant clause of the IS under review that is likely to be impacted (Clause & IS No.)	Action proposed
NA	NA	NA	NA

xiii) **Issues arising out of changes in any related IS or due to formulation of new Indian Standard**

Related IS and its Title (revised or new)	Provision in the IS under review that would be impacted & the clause no. or addition of new clause/provision	Changes that may be necessary in the Standards under review	Action proposed
NA	NA	NA	NA

xiv) Any consequential changes to be considered in other IS

Related IS to get impacted	Requirements to be impacted
NA	NA

13. Any other observation:

ii) IS 2:1960 should be updated in the latest version of the standard.

14. **Recommendations:**

iv) ICS number should be incorporated in place of udc number in the latest version of the standard.
v) References to Indian standards may be updated
vi) Format of the standard is to be updated to A-4.

REVIEW ANALYSIS OF INDIAN STANDARD

(To be submitted to the Sectional Committee)

15. **Sectional Committee No. &Title:** TXD 05 (Chemical Methods of Test Sectional Committee)

16. **IS No:** 1389:1984
17. **Title:** Methods For Testing Cotton Fabrics For Resistance To Attack By Micro-Organisms (*First Revision*)

18. Date of review: 06 sept. 2024

19. Review Analysis

xv) Status of standard(s), if any from which assistance had been drawn in the formulation of this IS.

Standard (No. & Title)	Whether the standard has since been revised	Major changes	Action proposed
NA	NA	NA	NA

xvi) Status of standards referred in the IS

Referred standards (No. & Title)	IS No. of these standards since revised	Changes that are of affecting the standard under review	Action proposed
IS : 392:1975 Method for determining water absorption and penetration of fabrics using Bundesmann type apparatus (*second revision*)	**IS : 392:1989** Textiles—Determination of water Absorption and penetration of fabrics Using bundesmann type apparatus (*Third Revision*)	—	Latest version of the standard i.e. IS : 392:1989 shall be referred in the revision and accordingly other changes will be made wherever required
IS: 7940:1976 Method for determining resistance to penetration by water	Same version	NA	NA

of fabrics by static pressure head test.			
IS : 6359-1971 Method for conditioning of textiles.	**IS 6359 : 2023** Method for Conditioning of Textiles (*First Revision*)	—	Latest version of the standard i.e. IS 6359 : 2023 shall be referred in the revision and accordingly other changes will be made wherever required
IS : 1969:1968 Method for determination of breaking load and elongation at break of woven textile fabrics (first revision)	**IS 1969 (Part 1) : 2018** **ISO 13934-1 : 2013** Textiles — Tensile Properties of Fabrics Part 1 Determination of Maximum force and Elongation at Maximum Force Using the Strip Method (*Fourth Revision*)	—	Latest version of the standard i.e. IS 1969 (Part 1) : 2018 ISO 13934-1 : 2013 shall be referred in the revision and accordingly other changes will be made wherever required
IS : 460 (Part 1):1978 Specification for test sieves: Part 1 Wire cloth test sieves (second revision)	**IS 460 (Part 1) : 2020** Test Sieves — Specification Part 1 Wire Cloth Test Sieves (*Fourth Revision*)	—	Latest version of the standard i.e. IS 460 (Part 1) : 2020 shall be referred in the revision and accordingly other changes will be made wherever required

xvii) Any other standards available related to the subject& scope of the standard being reviewed(International/regional/other national/association/consortia, etc. or of new or revision of existing Indian Standard)

Standard (No. & Title)	Provisions that could be relevant while reviewing the IS	Action proposed

NA	NA	NA

xviii) Technical comments on the standard received, if any

Source	Clause of IS	Comment	Action proposed
NA	NA	NA	NA

xix) Information available on technical developments that have taken place (on product/processes/practices/use or application/testing/input materials, etc.)

Source	Development	Relevant clause of the IS under review that is likely to be impacted (Clause & IS No.)	Action proposed
NA	NA	NA	NA

xx) Issues arising out of changes in any related IS or due to formulation of new Indian Standard

Related IS and its Title (revised or new)	Provision in the IS under review that would be impacted & the clause no. or addition of new clause/provision	Changes that may be necessary in the Standards under review	Action proposed
NA	NA	NA	NA

xxi) Any consequential changes to be considered in other IS

Related IS to get impacted	Requirements to be impacted

NA	NA

20. Any other observation:

iii) IS 2:1960 should be updated in the latest version of the standard.

21. **Recommendations:**

vii) ICS number should be incorporated in place of udc number in the latest version of the standard.
viii) References to Indian standards may be updated
ix) Format of the standard is to be updated to A-4.

Indian Standard

METHODS FOR TESTING COTTON FABRICS FOR RESISTANCE TO ATTACK BY MICRO-ORGANISMS

(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 23 March 1381, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 This standard was first published in 1959. It has now been revised to make it up-to-date on the basis of the experience gained during its use. In this revision, requirements for conditioning of specimens before breaking load tests and pre-drying of specimens at 50 to 60°C before conditioning for the breaking load test in the soil burial method, and a criterion to distinguish light weight and heavy weight fabrics for the purpose of deciding incubation time have been added. Besides, references given in the old standard have been made up-to-date.

0.3 Cotton fabrics are liable to deterioration by the action of microorganisms. Since they are often stored, transported and used under conditions favourable for the growth of micro-organisms, various protective treatments have been developed and their number is constantly increasing.

0.4 Four different accelerated mildew infection methods and a soil burial method for testing cotton fabrics for resistance to attack by micro-organisms have been prescribed in this standard. The accelerated mildew infection methods are the humidity chamber method, pure culture method, mixed culture method and *Aspergillus niger* method. The humidity chamber method is intended for determining qualitatively the susceptibility of the fabric to the growth of micro-organisms associated with attack on cellulose. The pure culture and mixed culture methods are intended for testing quantitatively the resistance of the fabric to fungal attack by infecting the fabric with micro-organisms capable of destroying cellulose. The *Aspergillus niger* method is intended for assessing the resistance of waterproofed fabrics to the fungus ***Aspergillus niger,*** typical of those capable of destroying waterproofness. The soil burial method is intended for assessing the behaviour of the fabric under conditions of contact with damp soil for a long period.

0.5 Two alternative methods for determining the waterproofness of fabric have been provided, namely, the method for measuring water absorption and penetration in water-resistant fabrics (permeable to air) by Bundesmann type apparatus, as laid down in IS: 392-1975*, and the static pressure head test as laid down in IS: 7940-1976†. In the method prescribed in IS: 392-1975*, the specimen under test is subjected to falling water drops simulating tropical rain of controlled intensity and to a rubbing action on the under surface; the assessment is made by determining: (a) the resistance to actual wetting as measured by the increase in mass of the specimen, and (b) the extent to which the specimen resists passage of water under the prescribed conditions of test. In the static pressure head test laid down in IS: 7940- 1976†, the test specimen is subjected to a constant hydrostatic pressure and the leakage of water through the specimen is measured.

0.6 Cultures of the organisms prescribed in this standard for the test can be obtained from the Defence Materials & Stores Research and Development Establishment, Post Box No. 320, Kanpur 208013. To facilitate supply, the culture numbers as set out below may also be mentioned:

Micro-organism	*Kanpur Culture No.*
Aspergillus niger	51
Chaetomium globosum	6
Rhizopus stolonifer	39
Memnoniella echinata	119
Helminthosporium sp	27
Pullularia pullulans	45
Myrothecium verrucaria	159
Aspergillus japonicus	185

Curvularia lunata	362
Penicillium pinophilum	364

0.7 The methods prescribed in this standard can also be used for evaluating preservatives or treatments designed to protect cotton fabrics from damage by micro-organisms. In such cases, the preservative or the treatment has to be applied to a uniformly good quality cotton fabric by the procedure recommended by the supplier or the originator, and the treated fabric then tested.

* Method for determining water absorption and penetration of fabrics using Bundesmann type apparatus (*second revision*).
† Method for determining resistance to penetration by water of fabrics by static pressure head test.

NOTE 4 - If it is known that the fabric under test has not been treated with a preservative, a sufficiently long piece from a well-scoured cotton fabric shall be taken as the basic fabric. The mass/m2 of this fabric shall not vary by more than 20 percent of the mass of the fabric under test.

NOTE 5 - If information as to whether the fabric was treated with a preservative containing copper or mercury or both is not available, the fabric should be tested for the presence of copper and mercury by the usual chemical tests.

4. ACCELERATED MILDEW INFECTION METHODS

4.1 Humidity Chamber Method

4.1.1 *Apparatus*

4.1.1.1 ***Humidip chamber -*** with inside measurements 70 × 80 × 70 cm, lined on the inside with a non-corrosive material, and provided with shelves, arrangements to maintain relative humidity of 98 ± 2 percent at 30 ± 2°C and, preferably, a fan for air circulation.

4.1.1.2 ***Petri dishes -*** 12, each 15 cm in diameter, without cover.

4.1.2 ***Test Organisms -*** Cultures of the following organisms:

a) ***Aspergillus niger,***
b) ***Chaetomium globosum,***
c) ***Rhizopus stolonifer,***
d) ***Memnoniella echinata,***
e) ***Helminthosporium*** sp, ***and***

f) ***Pullularia pullulans.***

4.1.3 ***Procedure***

4.1.3.1 From the test samples, cut at random 6 test specimens, each of size 10 × 5 cm, with their longer sides parallel to warp threads.

4.1.3.2 Prepare, in the manner prescribed in Appendix A, a mixed suspension of the spores of the test organisms prescribed in 4.1.2.

4.1.3.3 Take 6 petri dishes and place 1 test specimen in each dish. Inoculate each specimen (*see* 4.1.3.4) with 2 ml of the mixed spore suspension. Lay the petri dishes on the shelves and leave them for 14 days inside the humidity chamber maintained at 98 ± 2 percent relative humidity and 30 ± 2°C temperature. At the end of the period, remove the specimens and evaluate the degree of fungal growth on each specimen in terms of ratings as given in Table 1.

4.1.3.4 From the control sample, cut at random 6 control specimens, each of size 10 × 5 cm with their longer sides parallel to warp threads. Side by side with the test on test specimens, test the control specimens according to the procedure set out in 4.1.3.3 for test specimens.

TABLE 1 DEGREE OF FUNGAL GROWTH

(*Clauses* 4.1.3.3 *and 4.4.3.3*)

SYMBOLIC RATING	STATE OF GROWTH OF MICRO-OROANISM	RATING IN TERMS OF RESISTANCE
(1)	(2)	(3)
-	No growth	Good
+	Slight growth (area of growth less than one fourth of total)	Fair
++	Moderate growth (area of growth more than one fourth but less than one half)	Poor
+++	Heavy growth (area of growth more than one half)	Very poor

4.1.3.5 The rating for the control specimens shall be ‘very poor’, that is, the control specimens should show heavy mould growth; if not, the test shall be considered inconclusive and shall be repeated.

4.1.3.6 Report the rating in terms of resistance of the fabric under test to attack by micro-organisms.

4.2 Pure Culture Method

4.2.1 *Apparatus*

4.2.1.1 ***Petri dishes*** - 15, each 15 cm in diameter.

4.2.1.2 ***Atomizer*** - 10-ml capacity.

4.2.2 ***Test Organism*** - Culture of *Chaetomhm globosum.*

NOTE - If the material under test has been treated with a preservative containing mercury or copper or both (*see* Note 5 *under 3.3*), culture of Myrotlucium oerrucarra should be used instead of *Chastomium globosum.*

4.2.3 ***Test Medi****um* - Mix together the following in 1 000 ml of distilled water and sterilize with steam at a pressure of 108 kPa (1.1 kg/cm^2) for 20 minutes:

Ammonium nitrate	3.00 g
Potassium dihydrogen phosphate	0.25 g
Magnesium sulphate	0.25 g
Potassium chloride	0.25 g
Agar-agar	5.00 g

NOTE 1 - Only pure chemicals shall be used for preparing the medium. 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of test.

NOTE 2 - The *p*H of the medium should be 6.4.

4.2.4 *Procedure*

4.2.4.1 From the test samples, cut at random 15 test specimens, each of size 27 ×6.5 cm, with their longer sides parallel to warp threads. Take 5 test specimens, condition them to moisture equilibrium in the standard atmosphere (*see* 2) and determine the breaking load of each specimen by the method prescribed in IS: 1969-1968*. Find the average of all the values.

4.2.4.2 From the control sample, cut at random 10 control specimens, each of size 27 × 6.5 cm, with their longer sides parallel to warp threads. Take 5 control specimens, condition them to moisture equilibrium in the standard atmosphere (*see* 2) and determine the breaking load of each specimen by the method prescribed in IS: 1969- 1968*. Find the average of all the values.

4.2.4.3 Prepare, in the manner prescribed in Appendix A, a suspension of the spores of the test organism prescribed in 4.2.2.

4.2.4.4 Out of the remaining 10 test specimens, take 5 specimens.

4.2.4.5 Sterilize the specimens in the manner prescribed in Appendix B and with sterile instruments. Transfer them to 5 sterile petri dishes, each containing 50 ml of the test medium. Roll up the two ends of each specimen so that about 13 cm of its central portion is left exposed. Inoculate the exposed portion of each specimen under sterile conditions by spraying with 2 ml of the suspension prepared as in 4.2.4.3 by means of the atomizer. Incubate the specimens for 14 days at 98 ± 2 percent relative humidity and 30 ± 2°C temperature. At the end of the period, remove the specimens and wash them with cold water until they are free from agar. Dry the specimens in air, condition them to moisture equilibrium in the standard atmosphere (*see* 2) and determine the breaking load of each by the method prescribed in IS: 1969-1968*. Find the average of all the values.

4.2.4.6 Leach the remaining 5 test specimens in the manner prescribed in Appendix C and test them in the manner prescribed in 4.2.4.5.

4.2.4.7 Test the remaining 5 control specimens in the manner prescribed in 4.2.4.5.

4.2.4.8 Calculate the loss in breaking load, percent, of the basic fabric on incubation (*L)* by the following formula:

$$L = \frac{100\,(a-b)}{a}$$

where

a = average breaking load value obtained as in 4.2.4.2, and

b = average breaking load value obtained as in 4.2.4.7.

If the value of *L* is less than 90 percent, the test shall be repeated.

4.2.4.9 Calculate in the manner prescribed in 4.2.4.8 the loss in breaking load, percent, of the fabric under test on incubation prior to leaching, equating to:

‘*a*’ the value obtained as in 4.2.4.1, and

‘b’ the value obtained as in 4.2.4.5.

NOTE - The fabric should be considered satisfactorily resistant to attack by microorganisms if the value of *L* does not exceed 10 percent.

4.2.4.10 Calculate in the manner prescribed in 4.2.4.8 the loss in breaking load, percent, of the fabric under test on incubation after leaching, equating to:

‘*a*’ the value obtained as in 4.2.4.1, and

‘b’ the value obtained as in 4.2.4.6.

NOTE - The fabric should be considered satisfactorily resistant to attack by *micro*organisms if the value of *L* does not exceed 10 percent.

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

4.2.4.11 Report the following:

a) Loss in breaking load, percent, of the basic fabric on incubation (*see* 4.2.4.8);
b) Loss in breaking load, percent, of the fabric under test on incubation prior to leaching (*see* 4.2.4.9); and
c) Loss in breaking load, percent, of the fabric under test on incubation after leaching (*see* 4.2.4.10).

4.3 Mixed Culture Method

4.3.1 ***Apparatus -*** Same as in **4.2.1.**

4.3.2 ***Test Organisms -*** Cultures of the following organisms:

a) ***Aspergillus japonicus***
b) ***Curvularia lunata, and***
c) Penicillium pinopnilum.

4.3.3 ***Test Medium*** - Same as in *4.2.3.*

4.3.4 ***Procedure*** - Follow the procedure prescribed in 4.2.4, except that:

a) for the purpose of 4.2.4.3, prepare (instead of a suspension of the spores of *Chaetomium globosum*) a mixed suspension of the spores of the test organisms prescribed in 4.3.2; and
b) for the purpose of 4.2.4.5, use (instead of a suspension of the spores of *Chaetomium globosum*) a mixed suspension as prescribed in (a) above.

4.4 *Aspergillus Niger* Method

4.4.1 ***Apparatus***

4.4.1.1 ***Petri dishes*** - 6*,* each 15 cm in diameter.

4.4.1.2 ***Atomizer*** - lo-ml capacity.

4.4.2 ***Test Organism*** - Culture of *Aspergillus niger.*

4.43 ***Procedure***

4.4.3.1 From the test samples, cut at random 9 test specimens in the form of 13 cm diameter discs.

4.4.3.2 Take 3 test specimens and determine their waterproofness in accordance with IS: 392-1975* or IS: 7940-1976†.

If the waterproofness test is made as prescribed in IS: 392-1975*, determine for each specimen:

a) the percentage of absorption of water; and
b) the penetration, in millilitres, of water.

Find the average values.

If the waterproofness test is made as prescribed in IS: 7940-1976†, determine the leakage of water, in litres per square metre per hour. Find the average value.

4.4.3.3 Take 3 test specimens from the remaining and sterilize them in the manner prescribed in Appendix B. Take 3 sterile petri dishes and put in each dish 10 ml of sterile water and filter paper of 10 cm diameter. With sterile instruments, transfer the specimens to the petri dishes.

* Method for determining water absorption and penetration of fabrics Bundesmann type apparatus (*second* revision).
† Method for determining resistance to penetration by water of fabrics by pressure head test.

Inoculate each specimen by spraying with 2 ml of the suspension of the spores of *Aspergillus niger* prepared according to Appendix A by means of the atomizer. Incubate the specimens for 9 days at 98 ± 2 percent relative humidity and 30 ± 2°C temperature. At the end of the period, evaluate the degree of fungal growth on each specimen in terms of ratings as given in Table 1 (*see* 4.1.3.3).

4.4.3.4 Dry the specimens in air and determine their waterproofness by the method chosen for the purpose (*see* 4.4.3.2).

4.4.3.5 Leach the remaining 3 test specimens in the manner prescribed in Appendix C and test them in the manner prescribed in 4.4.3.3 and 4.4.3.4.

4.4.3.6 Report the results of the test in the form prescribed below:

Unleached Fabric		*Leached Fabric, after biological test (see 4.4.3.5)*
Before biological test (see 4.4.3.2)	*After Biological test (see 4.4.3.3 and 4.4.3.4)*	

a) Rating in terms of resistance to growth of *Aspergillus niger*

b) Waterproofness:

1) Absorption, percent

of water and

2) Penetration, in
ml, of water
OR
Leakage of water
in litres per square
metre per hour

NOTE - If the waterproofness test has been made by the method prescribed in IS: 392-1975*, the fabric should be considered satisfactorily resistant to attack by micro-organisms provided that:

a) the ratings obtained as in 4.4.3.3 and 4.4.3.5 are ‘good’;
b) the values for absorption, percent, obtained as in 4.4.3.4 and 4.4.3.5 do not exceed the corresponding value obtained as in 4.4.3.2 by more than 20 percent; and

* Method for determining water absorption and penetration of fabrics using Bundesmann type apparatus (*second revision*).
c) the values for penetration obtained as in 4.4.3.4 and 4.4.3.5 do not exceed the corresponding value obtained as in 4.4.3.2 by more than 10 ml.

If the waterproofness test has been made in accordance with the method prescribed in IS: 7940-1976*, the fabric should be considered satisfactorily resistant to attack by micro-organisms provided that:

a) the ratings obtained as in 4.4.3.3 and 4.4.3.5 are ‘ good ‘, and
b) the values for leakage obtained as in 4.4.3.4 and 4.4.3.5 do not exceed the corresponding value obtained as in 4.4.3.2 by more than 0.6 litres per square metre per hour.

5. SOIL BURIAL METHOD

5.1 Test Soil - Prepare as prescribed in Appendix D.

5.2 Procedure

5.2.1 From the test samples, cut at random 15 test specimens, each of size 27 ×6.5 cm, with their longer sides parallel to warp threads. Take 5 test specimens and test them as given in 4.2.4.1.

5.2.2 Take 5 out of the remaining 10 test specimens.

5.2.3 Put the test soil in five 500-ml beakers and bury 1 specimen in each beaker in such a way that the ends of the specimen are free. (Except for the free ends, the rest of the specimen should be surrounded by 2.5 cm thick soil.) Incubate the specimens at 98 ± 2 percent relative humidity and 30 ± 2°C temperature for 7 days, if the fabric under test is light in weight, and for 28 days, if the fabric under test is heavy in weight (*see* Note). At the end of the period, remove the specimens, wash them free from soil, dry them for 30 minutes at 50 to 60°C, condition them to moisture equilibrium in the standard atmosphere and determine the breaking load of each by the method prescribed in IS: 1969-1968†. Find the average of all the values.

NOTE - Fabrics weighing up to 300 g/ m^2 should be considered as light fabrics and more than this limit be considered as heavier fabrics to decide about the time of incubation.

5.2.4 Leach the remaining 5 test specimens in the manner prescribed in Appendix C and test them in the manner prescribed in 5.2.3.

5.2.5 From the control sample, cut at random 10 control specimens, each of size 27 × 6.5 cm, with their longer sides parallel to warp threads. Take 5 specimens and test them as given in 4.2.4.2.

* Method for determining resistance to penetration by water of fabrics by static pressure head test.
† Method for determination of breaking textile fabrics (*first revision*).

5.2.6 Test the remaining 5 control specimens in the manner prescribed in 5.2.3.

5.2.7 Calculate the loss in breaking load, percent, of the basic fabric on soil burial (L) by the following formula:

$$L = \frac{100\,(a-b)}{a}$$

where

a = average breaking load value obtained as in 5.2.5, and
b = average breaking load value obtained as in 5.2.6.

If the value of L is less than 90 percent, the test shall be repeated.

5.2.8 Calculate in the manner prescribed in 5.2.7 the loss in breaking load, percent, of the fabric under test on soil burial prior to leaching, equating to:

'a' the value obtained as in 5.2.1, and
'b' the value obtained as in 5.2.3.

NOTE - The fabric should be considered satisfactorily resistant to attack by microorganisms if the value of L does not exceed 10 percent.

5.2.9 Calculate in the manner prescribed in 5.2.7 the loss in breaking load, percent, of the fabric under test on soil burial after leaching, equating to:

'a' the value obtained as in 5.2.1, and
'b' the value obtained as in 5.2.4.

NOTE - The fabric should be considered satisfactorily resistant to attack by microorganisms if the value of *L* does not exceed 10 percent.

5.2.10 Report the following:

a) Loss *in* breaking load, percent, of the basic fabric on soil burial (*see* 5.2.7);
b) Loss in breaking load, percent, of the fabric under test on soil burial prior to leaching (*see* 5.2.8); and
c) Loss in breaking load, percent, of the fabric under test on soil burial after leaching (*see* 5.2.9).

APPENDIX A
(*Clauses* 4.1.3.2, 4.2.4.3 *and* 4.4.3.3)
PREPARATION OF SPORE SUSPENSION*

A-l. CULTURE MEDIUM

A-l.1 Take about 250 g of potatoes, peel them off and cut them into slices. Weigh 200 g of the sliced potatoes, wash them in running tap water and place them in a beaker. Add 500 ml of distilled water and keep the contents at boil for 30 minutes thin layer of absorbent cotton Filter the hot extract through a previously wetted with distilled water. Preserve the filtrate.

A-1.2 Take 25 g of agar, cut it into small pieces and boil, in the minimum quantity of distilled water necessary, till no solid agar is visible. Add 20 g of dextrose and mix it with the filtrate (*see* A-l.1). Make up the volume to 1 000 ml with hot distilled water. Adjust the *p*H of the culture medium to 6.4.

NOTE - To avoid solidification, the temperature of the culture medium should be kept above 45°C.

A-l.3 Put 5 ml of the culture medium into each of a number of 15 × 2 cm test tubes and plug them with non-absorbent cotton-wool. In an autoclave, sterilize the culture medium with steam at a pressure of 108 kPa (1.1 kg/cm^2) for 20 minutes. At the end of the period, remove the test tubes from the autoclave, place them in a slanting position and allow them to cool to harden the culture medium into slants.

A-2. SUB-CULTURE

A-2.1 Inoculate the slants in the test tubes with a well-sporulated culture of the test organism (*see* 4.1.2, 4.2.2, 4.3.2 and 4.4.2) by means of a sterile needle. Incubate the slants for 7 days at 30 ± 2°C.

NOTE - At the end of this period, a heavy growth of the freshly sporulating test organism should be visible within the tubes.

A-3. PREPARATION

A-3.1 Add about 10 ml of sterile distilled water to freshly sporulating sub-culture of the test organism (*see* A-2) within the tubes. Bring the spores of the sub-culture into suspension by shaking or disturbing them gently with a sterile glass rod. Filter the suspension through a sterile muslin or similar fabric to remove particles of agar or fungal mycelium. Examine a drop of the spore suspension under a low-power microscope, and see whether 50 or more spores appear in the field.

*If a mixed suspension of the spores of more than one test organism is to be prepared, the suspension of the spores of each test organism shall be prepared separately and the suspensions then mixed in equal volumes.

APPENDIX B

(*Clauses* 4.2.4.5 *and* 4.4.3.3)

STERILIZATION IN METHYL ALCOHOL VAPOUR

B-l. Pack the specimens loosely in a desiccator of suitable size containing methyl alcohol and keep them for 24 hours (or longer) at room temperature (about 27°C). In the meantime, make another desiccator ready by sterilizing it with methyl alcohol vapour for a period of 12 hours at room temperature. Transfer the specimens from the first desiccator to the second with a pair of sterile tongs. Connect the second desiccator to a water pump through a cotton-wool filter and exhaust the desiccator at room temperature for 6 hours to remove traces of methyl alcohol. Bring the pressure in the desiccator to the atmospheric pressure by slowly letting in air through the cotton-wool filter.

APPENDIX C

(*Clauses* 4.2.4.6, 4.4.3.5 *and* 5.2.4)

METHOD OF LEACHING

C-l. Place the specimen inside a glass jar with internal diameter of 9 cm. Through a capillary extending to within 0.6 cm of the bottom of the jar, allow water (with *p*H of no less than 6.0 and not more than 8.0 and at a temperature of 30 ± 2°C) to flow into it at the rate of 10 litres per hour. In this stream of water leach the specimen for 24 hours.

APPENDIX D

(*Clause* 5.1)

PREPARATION OF TEST SOIL

D-l. Mix thoroughly:

a) a layer of good, sandy loam soil, 13 cm thick;

b) a layer of fresh cow-dung manure, 7.5 cm thick; and

c) a layer of finely chopped straw, 15 cm thick.

Allow the mixture to ferment for 2 months, turning it once a week and maintaining the moisture content at 22 to 25 percent on the total mass of the mixture. At the end of the period, put the resulting compost through 300 μm IS Sieve [*see* IS: 460 (Part I)-1978*] and test it in the manner prescribed in D-l.1 to D-1.5.

D-1.1 Take a light-weight cotton fabric weighing 240 to 255 g/m^2 and draw from it 6 pieces, each of size 20 × 5 cm.

D-l.2 Take three pieces of the fabric and determine the breaking load of each by the method prescribed in IS**:** 1969-1968†. Find the average of all the values.

D-l.3 Bury the remaining 3 pieces of the fabric in the compost for 5 days. At the end of this period, remove the pieces from the compost and determine the breaking load of each by the method prescribed in IS: 1969-1968†. Find the average of all the values.

D-l.4 Calculate the loss in breaking load, percent, of the fabric after soil burial.

D-1.5 The soil shall be deemed to be suitable for the test if the loss in breaking load of the fabric, so determined, is 80 percent or more.

* Specification for test sieves: Part 1 Wire cloth test sieves (*second revision*).

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

REVIEW ANALYSIS OF INDIAN STANDARD

(To be submitted to the Sectional Committee)

22. **Sectional Committee No. &Title:** TXD 05 (Chemical Methods of Test Sectional Committee)

23. **IS No:** 665:1989
24. **Title:** Textiles - Determination Of Dimensional Changes Of Fabrics Containing Wool On Soaking In Water (*First Revision*)

25. **Date of review:** 06 sept. 2023

26. **Review Analysis**

xxii) Status of standard(s), if any from which assistance had been drawn in the formulation of this IS.

Standard (No. & Title)	Whether the standard has since been revised	Major changes	Action proposed
NA	NA	NA	NA

xxiii) Status of standards referred in the IS

Referred standards (No. & Title)	IS No. of these standards since revised	Changes that are of affecting the standard under review	Action proposed
IS 1070 : 1977 Specification for water for general laboratory use (*Second Revision*)	**IS 1070 : 2023** Reagent Grade Water — Specification (*Fourth Revision*)	—	Latest version of the standard i.e. IS 1070 : 2023 shall be referred in the revision and accordingly other changes will be made wherever required
IS 6359 : 1971 Method For Conditioning Of Textiles	**IS 6359 : 2023** Method for Conditioning of Textiles (*First Revision*)	—	Latest version of the standard i.e. IS 6359 : 2023 shall be referred in the revision and accordingly other changes will be made wherever required
IS 10099 : 1982 Methods for preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional Change.	**IS 10099 : 2020** **ISO 3759 : 2011** Textiles— Preparation, Marking and Measuring of Fabric Specimens and Garments in Tests for Determination of Dimensional Change (*First Revision*)	—	Latest version of the standard i.e. IS 10099 : 2020 ISO 3759 : 2011 shall be referred in the revision and accordingly other changes will be made wherever required

xxiv) Any other standards available related to the subject& scope of the standard being reviewed(International/regional/other national/association/consortia, etc. or of new or revision of existing Indian Standard)

Standard (No. & Title)	Provisions that could be relevant while reviewing the IS	Action proposed

NA	NA	NA

xxv) Technical comments on the standard received, if any

Source	**Clause of IS**	**Comment**	**Action proposed**
NA	NA	NA	NA

xxvi) Information available on technical developments that have taken place (on product/processes/practices/use or application/testing/input materials, etc.)

Source	**Development**	**Relevant clause of the IS under review that is likely to be impacted (Clause & IS No.)**	**Action proposed**
NA	NA	NA	NA

xxvii) Issues arising out of changes in any related IS or due to formulation of new Indian Standard

Related IS and its Title (revised or new)	**Provision in the IS under review that would be impacted & the clause no. or addition of new clause/provision**	**Changes that may be necessary in the Standards under review**	**Action proposed**
NA	NA	NA	NA

xxviii) Any consequential changes to be considered in other IS

Related IS to get impacted	**Requirements to be impacted**

NA	NA

27. Any other observation:

iv) IS 2:1960 should be updated in the latest version of the standard.

28. **Recommendations:**

x) ICS number should be incorporated in place of udc number in the latest version of the standard.
xi) References to Indian standards may be updated
xii) Format of the standard is to be updated to A-4.

ANNEX 11

(Item 8.2)

REVIEW OF PRE-2000 STANDARDS

List of Pre 2000 Standards

Sl No.	IS No.	Title
1)	IS 1316 : 1984	Methods for detection and estimation of damage in cotton fabrics due to micro-organisms first revision
2)	IS 1389 : 1984	Methods for testing cotton fabrics for resistance to attack by micro-organisms first revision
3)	IS 2010 : 1984	Methods for detection and estimation of damage in jute fabrics due to micro-organisms first revision
4)	IS 2011 : 1984	Methods for detection and estimation of damage in jute yarn and cordage due to micro-organisms first revision
5)	IS 2969 : 1974	Method for determination of oil content of jute yarn and fabrics first revision
6)	IS 2977 : 1989	Fabrics other than wool Method for determination of dimensional changes on soaking in water first revision
7)	IS 5151 : 1969	Method for evaluating the relative efficiency of wetting agents for mercerization
8)	IS 8476 : 1977	Metohd for determination of wool content in woollen textile materials
9)	IS 8477 : 1985	Methods for determination of bitumen content in laminated jute bags first revision
10)	IS 9022 : 1979	Methods for preparation of laboratory test samples and test specimens of textile materials for chemical testing
11)	IS 9603 : 1980	Glossary of terms pertaining to textile processing
12)	IS 9603 (Part 2) : 1985	Glossary of terms pertaining to textile processing Part 2
13)	IS 9603 (Part 3) : 1986	Glossary of terms pertaining to textile processing Part 3
14)	IS 11210 : 1984	Code of practice for stains removal from textiles and clothing

15)	IS 11219 : 1984	Method for determination of scouring loss of rayon filament yarn
16)	IS 11870 : 1986	Method for quantitative chemical analysis of binary mixtures of polypropylene and polyethylene
17)	IS 12135 : 1987	Method for determination of acetic acid content of acetate or triacetate fibre materials
18)	IS 12170 : 1987	Method for determination of dimensional stability of textile fabric to dry heat