IS 15433 (2003): Textiles - Method for Determination of Colour Fastness to Pleating - Steam Pleating [TXD 5: Chemical Methods of Test]

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भारतीय मानक

वस्त्रादि—प्लीटिंग के प्रति वस्त्रादि के रंग का पक्कापन ज्ञात करने की पद्धति—वाष्पीय प्लीटिंग

Indian Standard

TEXTILES — METHOD FOR DETERMINATION OF COLOUR FASTNESS TO PLEATING — STEAM PLEATING

ICS 59.080.01

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

November 2003

Price Group 5

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

This standard is technically equivalant to International Standard ISO 105-P02 : 2002 'Textiles — Tests for colour fastness — Part P02 : Colour fastness to pleating : Steam pleating', issued by the International Organization for Standardization (ISO).

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

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

Indian Standard

TEXTILES — METHOD FOR DETERMINATION OF COLOUR FASTNESS TO PLEATING — STEAM PLEATING

1 SCOPE

1.1 This standard specifies a method for determining the resistance of the colour of textiles of all kinds and in all forms to the action of steam pleating processes. The materials are not pleated during the test and it is emphasized that the test is not intended for assessing the quality of the pleating process.

1.2 Three tests conditions differing in severity are provided; one or more of them is used depending on the requirements.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of standard indicating below:

IS No.	*Title*
768 : 1982	Method for evaluating change in colour (*first revision*)
769 : 1982	Method for evaluating staining (*first revision*)
1390 : 1983	Method for determination of *p*H value of aqueous extracts of textile materials (*first revision*)
1964 : 1970	Methods for determination of weight per square metre and weight per linear metre of fabrics (*first revision*)
3429 : 1966	Method for determination of solubility of wool in alkali
4390 : 1967	Method for determination of ether soluble matter in textile materials
10251 : 1982	General principles of testing textiles for colour fastness tests.
15098 : 2002	Textiles — Methods for calculation of colour difference
15099 : 2002	Textiles — Multifibre adjacent fabric — Specification

3 PRINCIPLE

A specimen of the textile in contact with either one or two specified adjacent fabrics is steamed under pressure and dried. The change in colour of the specimen and the staining of the adjacent fabric(s) are assessed with the grey scales.

4 APPARATUS AND MATERIALS

4.1 Specimen Holder (*see* Fig.1), consists of a copper tube 80 mm in external diameter. The thickness of the copper is 1.5 mm. The copper tube is wrapped with six layers of bleached cotton fabric of mass per unit area approximately 125 g/m^2, on which the test specimen is wrapped. Wrapped round the test specimen is an outer cover made from bleached cotton fabric of mass per unit area approximately 185 g/m^2. The outer cover is held in place by rods made from 6 mm diameter mild steel, spring-fitted to the tube.

NOTE — The strength of the springs is not critical but it shall be sufficient to hold the cover tightly against the tube. The springs are conveniently fastened to one of the rods and shall hook easily on to the other.

4.2 Jacketed Steamer or Pressure Cooker

One of the following is used:

a) Jacketed steamer designed so that the pressure can be accurately determined and that no water splashes on to the specimen during the test;

b) Domestic pressure cooker sufficiently large to avoid water splashing on to the specimen during the test; the minimum size shall be 230 mm in diameter and 260 mm high, and it shall be fitted with an accurate pressure gauge.

The specimen holder (*see* **4.1**) shall be loosely wrapped in one layer of polyester film which projects 10 mm over each end of the tube and is not closed at the ends.

The specimen holder shall be placed in a rectangular metal container containing ten 1 mm holes equally spaced along the centre of the bottom. The container shall be sufficiently deep to reach to 10 mm from the top of the specimen holder (*see* Fig. 2). The bottom of the container shall be slightly concave to ensure that condensed water drains away rapidly. The container shall be placed on a stand which holds it 50 mm above the surface of the water.

NOTE — The quantity of water in the cooker is not critical, but water to a depth of 30 mm is suggested.

Expel air from the pressure cooker for 2 min before raising the pressure.

4.3 Adjacent Fabrics

4.3.1 A multifibre adjacent fabric, complying with IS 15099.

4.3.2 Two single-fibre adjacent fabrics, complying with the requirements given in Annex A, each measuring 40 mm × 50 mm and made of the same kind of fibre as that of the textile to be tested, or as otherwise specified. In the case of blends, two different adjacent fabrics are required, corresponding to the two predominant fibres of the specimen.

NOTE — If wool is used as one of the adjacent fabrics, it may have an adverse effect on the dye in the specimen, particularly under alkaline conditions.

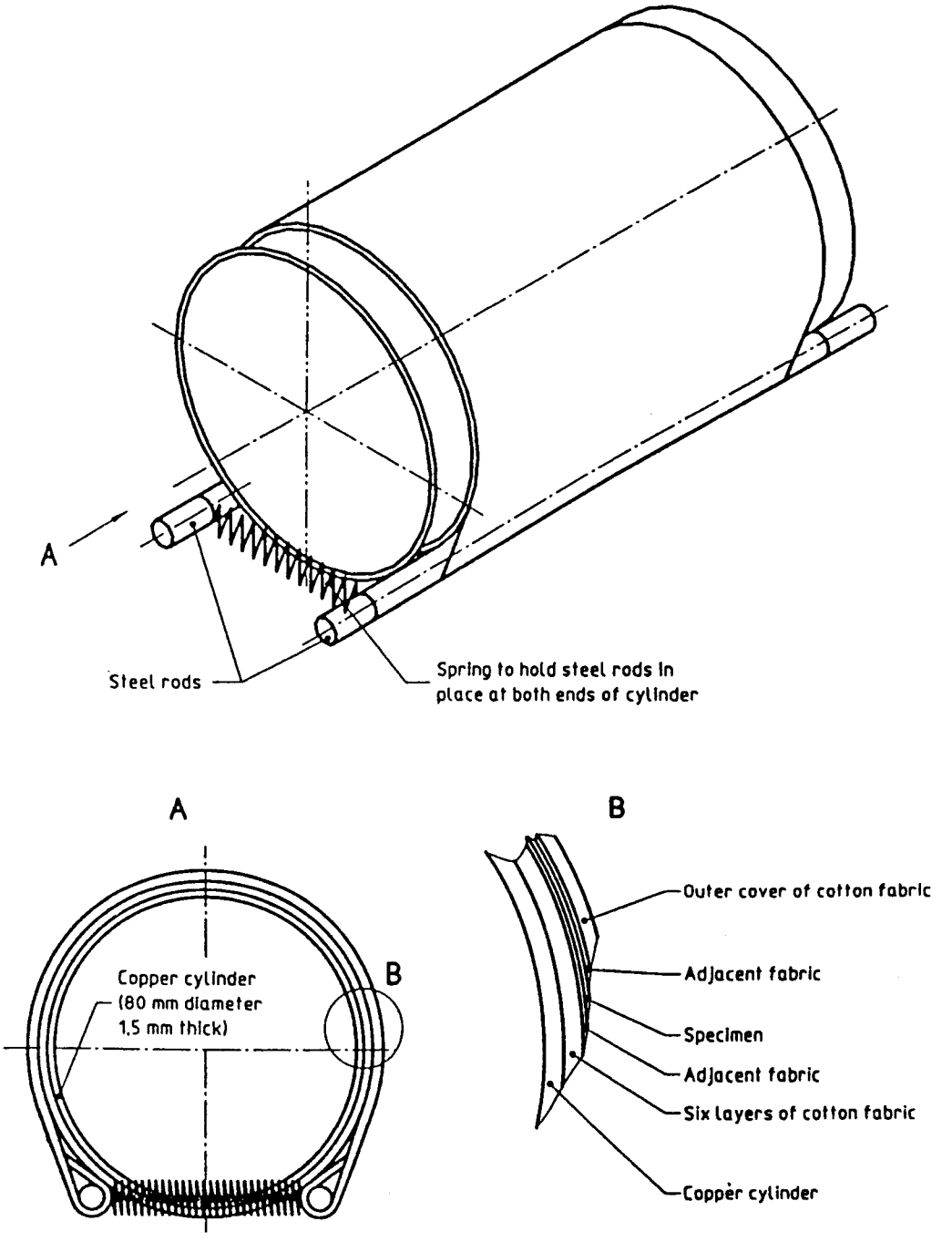

FIG. 1 SPECIMEN HOLDER

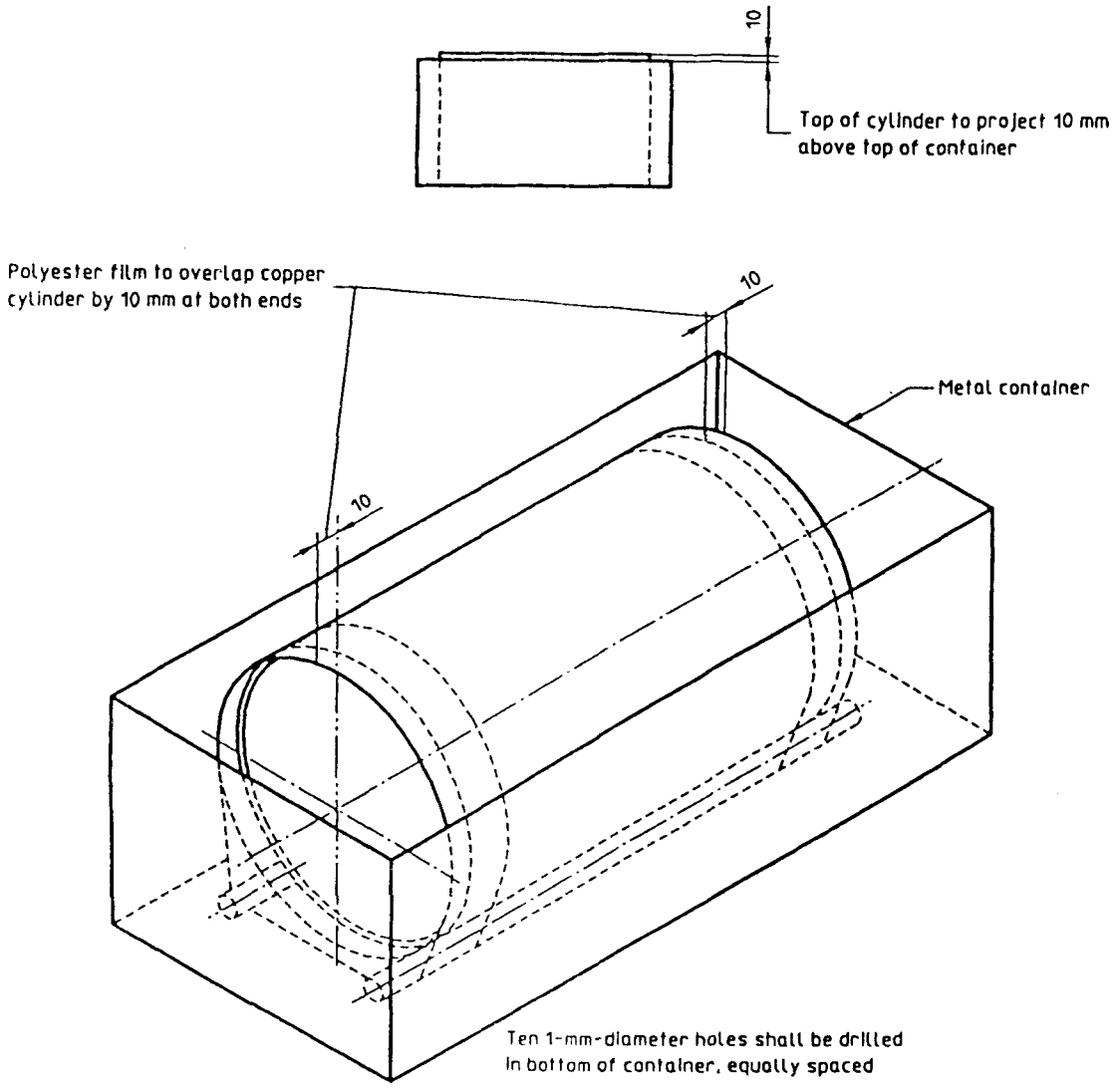

FIG. 2 SPECIMEN HOLDER IN CONTAINER

4.4 If required, a non-dyeable fabric (for example, polypropylene).

4.5 Grey scale for assessing change in colour, complying with IS 768, and grey scale for assessing staining, complying with IS 769.

5 TEST SPECIMEN

5.1 If the textile to be tested is fabric:

a) attach a specimen measuring 40 mm × 50 mm to a piece of the multifibre adjacent fabric (*see* **4.3.1**), also measuring 40 mm × 50 mm, by sewing along one of the shorter sides, with the multifibre fabric next to the face of the specimen; or

b) attach a specimen measuring 40 mm × 50 mm between the two single-fibre adjacent fabrics (*see* **4.3.2**), also measuring 40 mm × 50 mm, by sewing along one of the shorter sides.

5.2 Where yarn or loose fibre is to be tested, take a mass of the yarn or loose fibre approximately equal to one-half of the combined mass of the adjacent fabrics and take either of two actions mentioned below:

a) place it between a 40 mm × 50 mm piece of the multifibre adjacent fabric and a 40 mm × 50 mm piece of the non-dyeable fabric (*see* **4.4**) and sew them along all four sides (*see* IS 10251); or

b) place it between a 40 mm × 50 mm piece of each of the two specified single-fibre fabrics and sew along all four sides.

6 PROCEDURE

6.1 Mount the composite specimen in the holder (*see* **4.1**) as shown in Fig. 1.

6.2 Place the holder containing the composite specimen in a jacketed steamer or pressure cooker (*see* **4.2**).

6.3 Steam under one of the conditions given in Table 1.

Table 1 Steaming Conditions

(*Clauses* 6.3 *and* 7)

Test	Maximum Duration of Heating-up Period	Duration Time Specified Temperature	Pressure	Temperature
	Min	*Min*	kPa	°C
(1)	(2)	(3)	(4)	(5)
Mild	5	5	135	108
Intermediate	8	10	170	115
Severe	15	20	270	130

NOTE — The severe test is intended primarily for wholly synthetic textiles such as those made from polyamide and polyester fibres; it shall not be used for textiles containing wool.

6.4 When steaming is complete, release the pressure over a period not exceeding 2 min.

6.5 Open out the composite specimen and dry it by hanging it in air at a temperature not exceeding 60°C with the three parts in contact only at one line of stitching. Condition for 4 h in air in the standard atmosphere for testing textiles, that is a temperature of 27 ± 2°C and relative humidity of 65 ± 2 percent.

6.6 Assess the change in colour of the specimen and the staining of the adjacent fabric with the grey scales (*see* **4.5**).

6.7 Specimens which liberate formaldehyde under steam pleating conditions shall be tested separately.

NOTE — It should be noted that the papers used in commercial pleating occasionally contain reducing agents which with certain types of colouring matter, can produce a much greater change in colour than that occurs under the test conditions.

7 TEST REPORT

The test report shall include the following:

a) Details necessary for the identification of the sample tested;

b) Numerical ratings for change in colour of the specimen;

c) If single-fibre adjacent fabrics were used, the numerical rating for the staining of each kind of adjacent fabric used (if the fabrics were identical and showed different amounts of staining, report only the heavier staining);

d) If a multifibre adjacent fabric was used, the type of multifibre adjacent fabric and the staining of each type of fibre in the multifibre adjacent fabric; and

e) Steaming conditions (*see* Table 1).

ANNEX A

(*Clause* 4.3.2)

SPECIFICATION FOR SINGLE FIBRE ADJACENT FABRICS

A-1 SPECIFICATION FOR WOOL ADJACENT FABRIC

The fabric shall have the following properties:

a) *Mass per unit area* — 125 ± 5 g/m² when determined in accordance with IS 1964.

b) *Colour specification* — CIE chromaticity coordinates for CIE standard illuminant D_{65} and CIE 1964 supplementary standard colorimetric observer (10° observer) are determined in accordance with IS 15098.

$x_{10} = 0.337 \pm 0.002$

$y_{10} = 0.356 \pm 0.002$

With the illuminance factor:

$Y_{10} = 72 \pm 2$

The yellowness (G) of the fabric shall be $G = 25 \pm 2$ when determined by the formula:

$$G = \frac{1.301\,X_{10} - 1.149\,Z_{10}}{Y_{10}} \times 100$$

*p*H of the aqueous extract shall be 7.5 ± 0.5 when determined by the method described in IS 1390.

The mass fraction of residual dichloromethane soluble matter shall be 0.5 ± 0.1 percent when determined by the method prescribed in Annex B.

The solubility in alkali shall not exceed a mass fraction of 18 percent determined by the method described in IS 3429.

A-2 SPECIFICATION FOR COTTON AND VISCOSE ADJACENT FABRIC COTTON

The fabric shall have the following properties:

a) *Mass per unit area* — 115 ± 5g/m² when determined in accordance with IS 1964.

b) *Whiteness value* — $y_{10} = 80 \pm 2$

$w_{10} = 73 \pm 2$

$T_{10} = -1 \pm 1$ (that is –2 to 0)

Measurements shall be made with specular included in accordance with IS 5098, excluding 0/45 (45/0). Luminance (Y_{10}), Whiteness (W_{10}) and Tint (T_{10}) values shall be calculated using CIE standard illuminant D_{65} and CIE 1964 supplementary standard colorimetric observer (10° observer) in accordance with Annex C.

*p*H of the aqueous extract shall be 7.0 ± 0.5 when determined by the method described in IS 1390.

A-2.1 Viscose

The fabric shall have the following properties:

a) *Mass per unit area* — 140 ± 5 g/m² when determined in accordance with IS 1964.

b) *Whiteness value* — $y_{10} = 85 \pm 3$

$w_{10} = 58 \pm 4$

$T_{10} = -1 \pm 1$ (that is –2 to 0)

Measurements shall be made with specular included in accordance with IS 15098, excluding 0/45 (45/0). Luminance (Y_{10}), Whiteness (W_{10}) and Tint (T_{10}) values shall be calculated using CIE standard illuminant D_{65} and CIE 1964 supplementary standard colorimetric observer (10° observer) in accordance with Annex C.

*p*H of the aqueous extract shall be 7.0 ± 0.5 when determined by the method described in IS 1390.

A-3 SPECIFICATION FOR POLYAMIDE ADJACENT FABRIC

The fabric shall have the following properties:

a) *Mass per unit area* — 130 ± 5 g/m² when determined in accordance with IS 1964.

b) *Whiteness value* — $y_{10} = 86 \pm 2$

$w_{10} = 65 \pm 2$

$T_{10} = -1 \pm 1$ (that is –2 to 0)

Measurements shall be made with specular included in accordance with IS 15098, excluding 0/45 (45/0). Luminance (Y_{10}), Whiteness (W_{10}) and Tint (T_{10}) values shall be calculated using CIE standard illuminant D_{65} and CIE 1964 supplementary standard colorimetric observer (10° observer) in accordance with Annex C.

*p*H of the aqueous extract shall be 7.5 ± 0.5 when determined by the method described in IS 1390.

A-4 SPECIFICATION FOR POLYESTER ADJACENT FABRIC

The fabric shall have the following properties:

a) *Mass per unit area* — 130 ± 5 g/m² when determined in accordance with IS 1964.

b) *Whiteness value* — $y_{10} = 86 \pm 2$

$w_{10} = 70 \pm 2$

$T_{10} = 0 \pm 1$ (that is –1 to 1)

Measurements shall be made with specular included in accordance with IS 15098, excluding 0/45 (45/0). Luminance (Y_{10}), Whiteness (W_{10}) and Tint (T_{10}) values shall be calculated using CIE standard illuminant D_{65} and CIE 1964 supplementary standard colorimetric observer (10° observer) in accordance with Annex C.

*p*H of the aqueous extract shall be 7.0 ± 0.5 when determined by the method described in IS 1390.

A-5 SPECIFICATION FOR ACRYLIC ADJACENT FABRIC

The fabric shall have the following properties:

a) *Mass per unit area* — 135 ± 5 g/m² when determined in accordance with IS 1964.

b) *Whiteness value* — $y_{10} = 86 \pm 2$

$w_{10} = 67 \pm 2$

$T_{10} = 1 \pm 1$ (that is 0 to 2)

Measurements shall be made with specular included in accordance with IS 15098, excluding 0/45 (45/0). Luminance (Y_{10}), Whiteness (W_{10}) and Tint (T_{10}) values shall be calculated using CIE standard illuminant D_{65} and CIE 1964 supplementary standard colorimetric observer (10° observer) in accordance with Annex C.

*p*H of the aqueous extract shall be 7.0 ± 0.5 when determined by the method described in IS 1390.

A-6 SPECIFICATION FOR SILK ADJACENT FABRIC

The fabric shall have the following properties:

a) *Mass per unit area* — 60 ± 3 g/m² when determined in accordance with IS 1964.

b) *Whiteness value* — $y_{10} = 91 \pm 2$

$w_{10} = 79 \pm 3$

$T_{10} = -1 \pm 1$ (that is –2 to 10)

Measurements shall be made with specular included in accordance with IS 15098, excluding 0/45 (45/0). Luminance (Y_{10}), Whiteness (W_{10}) and Tint (T_{10}) values shall be calculated using CIE standard illuminant D_{65} and CIE 1964 supplementary standard colorimetric observer (10° observer) in accordance with Annex C.

*p*H of the aqueous extract shall be 7.8 ± 0.5 when determined by the method described in IS 1390.

The residual matter, after extraction with diethyl ether, shall not exceed 0.5 percent when tested in accordance with IS 4390. The alkali solubility shall not exceed 19 percent (*m/m*) when determined by the method described in IS 3429.

A-7 SPECIFICATION FOR SECONDARY ACETATE ADJACENT FABRIC

The fabric shall have the following properties:

a) *Mass per unit area* — 160 ± 5 g/m² when determined in accordance with IS 1964.

b) *Whiteness value* — $y_{10} = 86 \pm 2$

$w_{10} = 69 \pm 2$

$T_{10} = -1 \pm 1$ (that is –2 to 0)

Measurements shall be made with specular included in accordance with IS 15098, excluding 0/45 (45/0). Illuminance (Y_{10}), Whiteness (W_{10}) and Tint (T_{10}) values shall be calculated using CIE standard illuminant D_{65} and CIE 1964 supplementary standard colorimetric observer (10° observer) in accordance with Annex C.

*p*H of the aqueous extract shall be 7.5 ± 0.5 when determined by the method described in IS 1390.

ANNEX B

(*Clause* A-1)

DETERMINATION OF DICHLOROMETHANE–SOLUBLE MATTER IN WOOL

B-1 PRINCIPLE

A known amount of wool is extracted in a Soxhlet apparatus with dichloromethane and then the soluble matter is calculated, based on the difference in mass of original specimen and the untreated specimen.

B-2 REAGENTS

B-2.1 Dichloromethane (Methylene Chloride), boiling range 39 to 41°C. When 100 ml of the solvent is evaporated, the residue shall not exceed 1 mg.

NOTE — Dichloromethane is toxic, therefore, the room in which extractions are made shall be adequately ventilated.

B-2.2 Acetone, analytical reagent quality.

B-3 APPARATUS

B-3.1 Soxhlet Extraction Apparatus, assembled with ground glass joints and protected against the entry of moisture. The extractor (Barrel) of the Soxhlet shall conveniently have a capacity of about 200 to 300 ml and the flask 250 ml.

B-3.2 Water-bath, or other suitable means of low temperature heating.

B-3.3 Balance, with an accuracy of 0.05 g, preferably with large scale-pan.

B-3.4 Analytical Balance, accurate to 0.000 1 g.

B-3.5 Desiccator

B-3.6 Drying Oven, capable of being controlled at a temperature of 105 ± 3°C.

B-3.7 Conical Flask, 100 ml capacity.

B-3.8 Funnel

B-3.9 Distillation Unit

B-3.10 Fat-Free Filter Papers

NOTE — Whatman filter paper No. 2 is suitable.

B-4 CONDITIONING AND TESTING ATMOSPHERE

All tests shall be carried out in standard atmosphere for testing textiles that is 27 ± 2°C temperature and 65 ± 2 percent relative humidity.

B-5 SAMPLING

The laboratory sample shall be representative of the bulk of the material and shall be sufficient to provide two test specimens each of mass approximately 20 g.

B-6 PROCEDURE

B-6.1 Condition the laboratory sample and bring it to constant mass by exposing it for not less than 24 h in the standard atmosphere for testing (*see* **B-4**).

B-6.2 In the standard atmosphere for testing, prepare two test specimens each of mass 20 ± 0.05 g. For each duplicate test, introduce the specimen into the Soxhlet barrel in such a way that the extract will not carry wool fibres into the siphon tube and that the level of the top of the test specimen is below that of the end of the siphon tube. A particle-free extract may be secured by one of the following methods:

a) Insert a glass wool plug at a bottom of the Soxhlet barrel, effectively covering the exit tube.

b) Pack the test specimen into a Soxhlet thimble covering with a loose plug of dichloromethane-extracted cotton wool.

c) Enclose the test specimen in a lightweight woven of knitted dichloromethane-extracted fabric.

Check that the extraction flask and filter are free from fatty. If a water-bath is used, heat it to approximately 45°C. Assemble the flask and Soxhlet barrel. Pour into the barrel sufficient dichloromethane (*see* **B-2.1**) to cause first siphoning, together with a small excess. Complete the assembly of condenser, Soxhlet barrel, flask and heating device. Check that all joints are tight. Adjust the heating so that satisfactory siphoning occurs at the rate of not less than 6 cycles per hour. After 20 to 24 siphoning, add additional solvent, if desired. Reject any test in which the siphoning does not function correctly.

B-6.3 Filter the contents of the extraction flask, previously concentrated (if necessary) to approximately 25 ml, through filter paper (*see* **B-3.10**) into a tared 100 ml conical flask (*see* **B-3.7**) which is heated on a boiling water-bath, but not in direct contact with the water. A sintered glass Bucher filter may be used *in lieu* of filter paper. Wash the extraction flask and filter with three separate 10 ml portions of dichloromethane. Before the last washing, cut off the edge of the paper and place it at the bottom of the cone to facilitate washing. Check that the extraction flask and filter are free from fatty matter by washing with a further 10 ml portion of dichloromethane, which is collected separately and then evaporated on a watch glass. If any fatty residue appears, continue washing until the extraction flask and filter are free from fatty matter.

B-6.4 When the distillation of the dichloromethane is completed, detach the conical flask and heat on the

water-bath for a further 5 min. If droplets of water are present in the flask, add 2 to 5 ml of acetone (*see* **B-2.2**) and heat on the water-bath, repeating the process if necessary until no water is visible.

B-6.5 Heat the conical flask for 30 min in the drying over (*see* **B-3.6**) at 105 ± 3°C or in a vacuum over and then introduce, for a few seconds, a tube connected to a pump so as to suck out vapour from the flask.

B-6.6 Finally, heat for a further 5 min in the oven and place in the dessicator (*see* **B-3.5**). Determine the mass of the flask and contents and hence the mass of the dichloromethane-soluble extract.

B-6.7 If the result is to be expressed on the dry mass of the test specimen, determine the dry mass of the extracted test specimen by heating to constant mass at a temperature of 105 ± 3°C, preferably in ventilated enclosure.

B-7 EXPRESSION OF RESULTS

B-7.1 The dichloromethane-soluble extract is given, as a percentage of the conditioned mass of the de-greased specimen, by the formula :

$$\frac{100\, m_1}{20 - m_1}$$

where

m_1 = mass, in g, of the dichloromethane-soluble extract.

B-7.2 The dichloromethane-soluble extract is given, as a percentage of the dry mass of the de-greased specimen, by the following formula :

$$\frac{100\, m_1}{m_2}$$

where

m_1 = mass, in g, of the dichloromethane-soluble extract; and

m_2 = dry mass, in g, of the extracted test specimen.

ANNEX C

(*Clauses* A-2 to A-7)

METHOD OF INSTRUMENTAL ASSESSMENT OF WHITENESS

C-1 PRINCIPLE

The chromaticity coordinates x_{10}, y_{10}, and the Y_{10} tristimulus values are calculated from the spectral radiance factors of the specimen and converted into a whiteness value. If these cannot be calculated, the x, y, Y values may be used instead. The redness/greenness tint factor may also be determined.

C-2 APPARATUS

Spectrophotometer, that irradiates the specimen with light resembling standard Illuminant D_{65}.

C-3 TEST SPECIMEN

The specimen shall consist of number of layers sufficient to ensure that the addition of another layer does not alter the spectral radiance factors.

C-4 PROCEDURE

C-4.1 Measure the spectral radiance factors of the test specimen with a spectrophotometer.

C-4.2 Calculate the x_{10}, y_{10} and y_{10} values under Illuminant D_{65} using the colour matching functions.

C-4.3 Calculate the whiteness value W_{10} from the equation

$$W_{10} = Y_{10} + 800\,(0.313\,8 - x_{10}) + 1\,700\,(0.331\,0 - y_{10})$$

If required, calculate the tint factor $T_{w,\,10}$ from the equation

$$T_{w,\,10} = 900\,(0.313\,8 - x_{10}) - 650\,(0.331\,0 - y_{10})$$

If x, y, Y values have been obtained the corresponding equations are

$$W = Y + 800\,(0.312\,7 - x) + 1\,700(0.329\,0 - y)$$

$$T_w = 1\,000\,(0.312\,7 - x) + 650\,(0.329\,0 - y)$$

NOTES

1 The perfect diffuser has whiteness values, W_{10} and W of 10 000. The higher the whiteness value, the greater the indicated whiteness.

2 The tint formulae are based on the empirical result that lines of equal tint run approximately parallel to the lines of dominant wavelength 466 nm in the x_{10}, y_{10} and xy chromaticity diagram. The perfect diffuser has tint factors, $T_{w.10}$ or T_w of zero, This corresponds to a dominant wavelength in the blue region of the spectrum at 466 nm. Positive values of $T_{w.10}$ or T_w indicate greenness; negative value, redness.

3 The test method provides relative, but not absolute, evaluations of whiteness and is restricted to specimens which are measured on the same instrument or instruments known to give values which are acceptably close. The application of the formulae is restricted to samples whose values of W_{10} or W and $T_{w.10}$ or T_w lie within the following limits:

W_{10} or W greater than 40 and less than $5Y_{10}$–280 or 5Y–280;

$T_{w.10}$ or T_w greater than –3 and less than +3.

ANNEX D

(Foreword)

COMMITTEE COMPOSITION

Chemical Methods of Test Sectional Committee, TX 05

Organization	*Representative(s)*
Textile Committee, Mumbai	DR G. S. NADIGAR (***Chairman***)
Ahmedabad Textile Industry's Research Association, Ahmedabad	SHRI A. B. SHAH
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	SHRI S. C. JAIN (*Alternate*)
National Textile Corporation Limited, New Delhi	SHRI B. R. VERMA
	SHRI P. K. HOME (*Alternate*)
Office of the Textile Commissioner, Mumbai	SHRI S. K. PATRA
	SHRI R. A. LAL (*Alternate*)
Sunil Industries Ltd, Mumbai	REPRESENTATIVE
Tex-n-Lab, Thane, Mumbai	SHRI ULHAS NIMKAR
	SHRI S. VARDARAJAN (*Alternate*)
The Synthetics & Art Silk Mills Association Ltd, Mumbai	SHRI V. S. CHALKE
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	SHRI RAJENDRA GAIKWAD (*Alternate*)
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Wool Research Association, Mumbai	SHRIMATI G. P. RANE
	SHRI V. C. PANSE (*Alternate*)
In personal capacity (*2, Shri Siddhi Vinayak Co-op Housing Society Veer Savarkar Marg Prabhadevi, Dadar, Mumbai*)	SHRI M. D. DIXIT
BIS Directorate General	SHRI P. BHATNAGAR, Director and Head (TXD) [Representing Director General (*Ex-officio*)]

Member Secretary
SHRI ARUN SINGH
Joint Director (TXD), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc: No. TX 05 (0491).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:		Telephone
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	2323 7617, 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi, KOLKATA 700054	2337 8499, 2337 8561, 2337 8626, 2337 9120
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