Doc: TXD 01 (26867) WC
November 2024

(*Not to be reproduced without permission of BIS or used as Standard*)

भारतीय मानक मसौदा

वस्त्रादि — कपड़ों के प्रति इकाई क्षेत्रफल द्रव्यमान तथा प्रति इकाई लम्बाई द्रव्यमान — परीक्षण पद्धतियाँ

(*आई एस 1964 का पहला पुनरीक्षण*)

Draft *Indian Standard*

TEXTILES — MASS PER UNIT LENGTH AND MASS PER UNIT AREA OF FABRICS — METHODS OF TEST

(*Third Revision of* IS 1964)

ICS 59.080.30

Physical Methods of Test Sectional Committee TXD 01	Last date for receipt of comments 20 January 2025

FOREWORD

(*Formal clauses will be added later*)

This standard was first published in 1961 and subsequently revised in 1970 and 2001. This standard was revised earlier for removal of selvedge in case the fabric mass is different than that of selvedge.

This revision has been made to incorporate the following major changes:
   a) The Scope of the standard has been modified;
   b) The clause "Terminology" of the standard has been modified;
   c) A new clause "Sampling" has been incorporated;
   d) The clause "Apparatus" for both method A and B has been modified;
   e) The tolerance of relative humidity for atmospheric conditioning of samples has been modified;
   f) The clause "Calculation" for both method A and B has been modified;
   g) The tolerance for temperature in oven-drying has been modified; and
   h) References to standards have been updated.

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*)'.

Draft *Indian Standard*

TEXTILES — MASS PER UNIT LENGTH AND MASS PER UNIT AREA OF FABRICS — METHODS OF TEST

(First Revision of IS 1964 *)*

1 SCOPE

1.1 This standard prescribes two methods for determination of mass per unit length and the mass per unit area of fabrics.

1.2 The methods prescribed in this standard are applicable to all other textile fabrics irrespective of their composition (that is, whether they are made of cotton, wool, silk, jute or man-made fibres or blends of two or more such fibres), manufacturing processes and finishing treatments. The methods are also applicable to narrow fabrics.

1.3 The methods prescribed in this standard are not applicable to tyre cord fabrics.

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 recent editions of the standards indicated below:

IS No.	Title
196 : 2024	Atmospheric conditions for testing (*first revision*)
232 : 1985	Glossary of textile terms — Natural fibres (*second revision*)
1954:2024	Textiles — Fabrics — Determination of Width and Length (*third revision*)
3919 : 1966	Methods for sampling cotton fabrics for determination of physical characteristics
6359 : 2023	Method for conditioning of textiles (*first revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 232 and the following shall apply.

3.1 Commercial Moisture Regain

An arbitrary value formally adopted as a regain to be used with the oven-dry mass for calculating the commercial or legal mass of a shipment or a delivery of any specific textile material.

3.2 Conditioned Mass

The mass of a textile material conditioned in the standard atmosphere for testing.

3.3 Moisture Regain

The amount of moisture present in a textile material expressed as a percentage of its oven-dry mass.

3.4 Oven-Dry Mass

The constant mass of textile material obtained by drying it at a temperature of (110 ± 2) °C.

3.5 Moisture equilibrium — Condition reached by a sample at a closely defined temperature and relative humidity when the net difference between the amount of moisture absorbed and the amount desorbed, as indicated by a change in mass, shows no trend and becomes insignificant.

> NOTE — A textile material is in moisture equilibrium with the ambient atmosphere when it does not exchange water with this atmosphere; its mass then remains constant as long as the experiment is carried out in an unchanged atmosphere. For test purposes, moisture equilibrium is reached by absorption starting from a relatively low moisture content. Moisture equilibrium for testing is considered as having been reached when the rate of increase in mass of a Sample or specimen due to moisture uptake does not exceed that prescribed for the material being tested (see IS 6359).

4 PRINCIPLES

In Method A, the mass is determined by conditioning of material to the moisture equilibrium in standard atmospheric conditions. In Method B, the mass is determined by adding the commercial moisture regain of material with the oven dry mass of the material.

> NOTE — Any method may be used for the determination of mass per unit length and mass per unit area of fabric depending upon the type of the instruments and facilities available subject to agreement between the buyer and the seller. In case of dispute, Oven-dry method is recommended to be used as a reference method.

5. SAMPLING

Follow the method of drawing the test sample from the gross sample with respect to the lot as given in the relevant specification for the material or as agreed to between the buyer and the seller.

> NOTE — For cotton fabrics, IS 3919 may be followed.

5.1 Preparation of Test Specimens

5.1.1 From the samples, as selected in **5**, draw or cut the test specimen in the form of full piece, roll, bolt, or cut, or in the form of full width sample or in the form of small swatches of fabrics or from narrow fabrics of the below specified dimensions.

5.1.1.1 *Full Piece, Roll, Bolt or Cut* — The full piece, roll, bolt or cut of fabric drawn from the lot sample shall be considered as the test specimen.

5.1.1.2 *Full Width Sample* — From each sample drawn from the lot, cut (don't tear) the test specimen having width equal to the full width of sample including selvedges and length of 250

mm $\pm$ 2 mm. The cut edge must be a straight line, free of indentations or bulges, unless both edges have been made to trace parallel filling yarns.

> NOTE — If the mass per unit length (or area) of the selvedge differs appreciably from the mass per unit length (or area) of the fabric, the mass per unit area shall be determined on a sample from which the selvedges have been removed along the outermost warp threads of the body and calculation(s) shall be based on the mass of the trimmed sample and its length and width.

5.1.1.3 *Small Swatch of Fabrics* — From each sample drawn from the lot, prepare a test specimen having an area of at least 100 cm^2 either in square (10 cm $\times$ 10 cm) or circular shape.

5.1.1.4 *Narrow Fabrics* — From each sample drawn from the lot, cut the test specimens having a length of 1 m $\pm$ 3 mm perpendicular to the selvedges, distributed as evenly as practicable along the length of the sample.

6 METHOD A — CONDITIONED MASS METHOD

6.1 Apparatus

6.1.1 *Horizontal, Flat Smooth Table*

6.1.2 *Graduated Steel Scale*

6.1.3 *Balance* — Capable of weighing to a sensitivity of 0.005 g.

6.1.4 *Cutting die*, either square or round and capable to cut the test specimen to an area of at least 100 cm^2.

6.2 Atmospheric Conditions for Conditioning and Testing

6.2.1 Prior to test, the test samples shall be conditioned to moisture equilibrium from dry side in the standard atmosphere of (65 $\pm$ 4) percent relative humidity and (27 $\pm$ 2) °C temperature (*see* also IS 6359).

> NOTE — The time required for a fabric to reach moisture equilibrium depends mainly on:
> a) the thickness of the fabric or mass per unit area,
> b) the closeness of the weave,
> c) the hygroscopicity of the textile material comprising the fabric, and
> d) type of finish given to the fabric.

The test samples shall be deemed to have been conditioned satisfactorily for the purpose of this test after these have been exposed to standard atmosphere for at least as much time as given below in such a way as to expose, as far as possible, all portions of the specimens to the atmosphere:

Textile Fabrics having Equilibrium Moisture Regain Values at Standard Atmosphere, Percent	Time h
Less than 4	6
From 4 to 10	12
Above 10	24 to 48

6.2.2 The test shall be carried out in a standard atmosphere as specified in **6.2.1** (*see* also IS 196).

6.3 Procedure

6.3.1 Take the conditioned test specimens (*see* **6.2.1**) and determine its mass to an accuracy of 0.005 g.

6.3.2 Determine the length and width of samples according to IS 1954.

6.4 Calculations

Calculate the mass per unit length and mass per unit area of the test specimens by the following formula:

a) In case of full pieces, roll, bolt or cut:

$$\text{Mass per unit length, g/m} = \frac{M}{L} \times 10^3$$

$$\text{Mass per unit area, g/m}^2 = \frac{M}{L \times W} \times 10^3$$

Where
M = mass of fabric in kg,
L = length of fabric in m, and
W = width of fabric in m.

b) In case of swatches of 250 mm × full width:

$$\text{Mass per unit length, g/m} = \frac{G}{L_s} \times 10^3 = G \times 4$$

$$\text{Mass per unit area, g/m}^2 = \frac{G}{L_s \times W} \times 10^6 = \frac{G \times 4 \times 10^3}{W}$$

Where
G = mass of specimen in g,
L_s = length of specimen in mm, and
W = width of fabric in mm.

c) In case of small swatches of fabric i.e. 100 cm^2 area:

$$\text{Mass per unit length, g/m} = \frac{G \times W}{A} \times 10 = \frac{G \times W}{10}$$

$$\text{Mass per unit area, g/m}^2 = \frac{G}{A} \times 10^4 = G \times 10^2$$

Where
G = mass of specimen in g,
A = Area of specimen in cm^2, and
W = width of fabric in mm.

d) In case of narrow fabric of 1 m × full width:

$$\text{Mass per unit length, g/m} = \frac{G}{L_s} \times 10^3 = G$$

$$\text{Mass per unit area, g/m}^2 = \frac{G}{L_s \times W} \times 10^6 = \frac{G \times 10^3}{W}$$

Where
G = mass of specimen in g,
L_s = length of specimen in mm, and
W = width of fabric in mm.

6.5 Similarly, determine the mass per unit length and mass per unit area of at least four more test specimens and determine the average of all the values.

7 METHOD B — OVEN-DRY METHOD

7.1 Apparatus

7.1.1 *Horizontal, Smooth Flat Table*

7.1.2 *Graduated Steel Scale*

7.1.3 *Dying Oven* — Suitable for drying sample to constant mass at (110 ± 2) °C.

7.1.4 *Balance* — Capable of weighing to an accuracy of 0.005 g.

7.1.5 *T- Square*

7.1.6 *Cutting die*, either square or round and capable to cut the test specimen to an area of at least 100 cm².

7.2 Procedure

7.2.1 Lay the test specimens smoothly on a flat table. Mark at least five test specimens with the help of the scale and T-square of the dimensions given in **5.1**.

7.2.2 Determine the Length and width of the fabric according to IS 1954.

7.2.3 Dry the test specimen to constant mass in an oven maintained at (110 ± 2) °C temperature and weigh to an accuracy of 0.5 g without removing the specimen from the oven, the draught being stopped during weighing.

7.3 Calculations

Calculate the mass per unit length or mass per unit area of specimen, at the applicable commercial moisture regain value (*see* Note) by the following formula:

   a) In case of full pieces, roll, bolt or cut:

Mass per unit length, g/m $= \dfrac{M_o \times (100 + R)}{L} \times 10$

Mass per unit area, g/m^2 $= \dfrac{M_o \times (100 + R)}{L \times W} \times 10$

Where
M_o = oven-dry mass of fabric in kg,
L = length of fabric in m,
W = width of fabric in m,
R = applicable commercial moisture regain in percentage.

b) In case of swatches of 250 mm × full width:

Mass per unit length, g/m $= \dfrac{G_o \times (100 + R)}{L_s} \times 10 = \dfrac{G_o \times (100 + R)}{25}$

Mass per unit area, g/m^2 $= \dfrac{G_o \times (100 + R)}{L_s \times W} \times 10^4 = \dfrac{G_o \times (100 + R) \times 40}{W}$

Where
G_o = oven-dry mass of specimen in g,
L_s = length of specimen in mm,
W = width of fabric in mm,
R = applicable commercial moisture regain in percentage.

c) In case of small swatches of fabric i.e. 100 cm^2 area:

Mass per unit length, g/m $= \dfrac{G_o \times (100 + R) \times W}{A \times 10} = \dfrac{G_o \times (100 + R) \times W}{1000}$

Mass per unit area, g/m^2 $= \dfrac{G_o \times (100 + R)}{A} \times 10^2 = G_o \times (100 + R)$

where
G_o = oven-dry mass of specimen in g,
A = area of specimen in cm^2,
W = width of fabric in mm,
R = applicable commercial moisture regain in percentage.

d) In case of narrow fabric of 1 m × full width:

Mass per unit length, g/m $= \dfrac{G_o \times (100 + R)}{L_s} \times 10 = \dfrac{G_o \times (100 + R)}{100}$

Mass per unit area, g/m^2 $= \dfrac{G_o \times (100 + R)}{L_s \times W} \times 10^4 = \dfrac{G_o \times (100 + R) \times 10}{W}$

where
G_o = oven-dry mass of specimen in g,
L_s = length of specimen in cm^2,
W = width of fabric in mm,
R = applicable commercial moisture regain in percentage.

NOTES — Commercial moisture regain value of fabrics shall be as stipulated in the relevant Indian Standard specifications for the material or in the absence of such specifications, it shall be as agreed to between the buyer and the seller.

7.4 Similarly, determine the mass per unit length and mass per unit area of at least four more test specimens and calculate the average of all the values obtained.

8 REPORT

Report shall include the following:
a) Type of fabric tested;
b) Method followed;
c) Number of specimens tested;
d) Mass per unit length;
e) Mass per unit area; and
f) Commercial moisture regain value used (in case of Method B).