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भारतीय मानक

वस्त्रादि — वायुयानों तथा ग्लाइडरों को ढकने के लिए
मरसरीकृत सूती कपड़ा — विशिष्ट

(तीसरा पुनरीक्षण)

Indian Standard

TEXTILES — MERCERIZED COTTON FABRICS
FOR COVERING AIRCRAFTS AND GLIDERS —
SPECIFICATION

(*Third Revision*)

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Indian Standard

TEXTILES — MERCERIZED COTTON FABRICS FOR COVERING AIRCRAFTS AND GLIDERS — SPECIFICATION

(*Third Revision*)

1 SCOPE

1.1 This standard prescribes the requirements of four grades of mercerized cotton fabrics for covering aircraft and glider surfaces such as wings, fuselage, ailerons, elevators and other airfoil surfaces:

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
199 : 1989	Textiles — Estimation of moisture, total size or finish, ash, and fatty matter in grey and finished cotton textile materials (<i>third revision</i>)
1390 : 1983	Methods for determination of pH value of aqueous extracts of textile materials (<i>first revision</i>)
1954 : 1990	Method for determination of length and width of fabrics (<i>second revision</i>)
1963 : 1981	Methods for determination of threads per unit length in woven fabrics (<i>second revision</i>)
1964 : 1970	Methods for determination of weight per square metre and weight per linear metre of fabrics (<i>first revision</i>)
1969 : 1985	Methods for determination of breaking load and elongation of woven textile fabrics (<i>second revision</i>)
3919 : 1966	Methods of sampling of cotton fabrics for determination of physical characteristics
5463 : 1969	Methods of sampling of cotton fabrics for chemical characteristics
6359 : 1971	Method of conditioning of textiles
11662 : 1986	Preservative treatments of textiles

3 MANUFACTURE

3.1 Yarn

The cotton yarn used shall be combed, evenly spun and preferably mercerized, and it shall be free from leaf particles, neps, snarls, slubs, etc.

3.2 Fabric

The fabric shall be woven in plain weave with firm and regular selvages. It shall be calendered and mercerized (if yarn used is not mercerized). The calendering shall be sufficient to lay any nap present to provide smooth and even surface. Nap, if present, shall be removed by singeing.

3.2.1 The fabric shall be rot-proofed or finished for doping as required by the buyer.

3.3 Rot-Proofing

The fabric shall be rendered rot-proofed by treating with pentachlorophenyl laurate (PCPL), (normal process) in accordance with IS 11662 : 1986.

4 REQUIREMENT

4.1 The fabric shall conform to the requirements specified in Tables 1 and 2.

4.2 Dimensions

Unless otherwise specified, the length and width of the fabric shall be as given in Table 1.

4.3 If required by the buyer, the fabric, after dope finish shall withstand the tests and corresponding requirements given in Annex A.

4.4 Sealed Sample

If in order to determine characteristics such as appearance, smoothness and other requirements not covered under this standard, a sample has been agreed and sealed, the supply shall also conform to the sealed sample in such respects.

4.4.1 The custody of sealed sample shall be a matter of prior agreement between the buyer and the seller.

5 INSPECTION

5.1 The cloth shall be inspected by the method given in Annex B. The permissible number of

Table 1 Physical Requirements of Aircraft Fabrics
(Clauses 4.1 and 4.2)

Grade	Length	Width	Nominal Count of Yarn*		Ends/ dm	Picks/ dm	Mass, Max g/m ²	Beaking Load on 50 × 20 cm Strips, Min N	Suitable for Aircraft Surface with Wind Loading N/m ²
			Warp	Weft					
(1)	(2)	(3) mm	(4) tex (cotton count)	(5) tex (cotton count)	(6)	(7)	(8)	(9)	(10)
1	50 m unless otherwise specified	900 ± 12 or	10 tex × 2	10 tex × 2	330	330	140	715	431 and above
2		1100 ± 15 or	(60 s/2)	(60 s/2)					
3		1500 ± 25 or as specified	10 tex × 2	10 tex × 2	330	330	140	530	382-430
4		in the contract or order	10 tex (60 s)	8.5 tex (70 s)	390	390	100	440	Up to 382
			10 tex (60 s)	9 tex (65 s)	380	380	85	295	
Tolerance					± 20 - 10	± 20 - 10			
Methods of Test		IS 1954 : 1969			IS 1963 : 1969		IS 1964 : 1970	IS 1969 : 1985	

*For guidance only.

defects shall be 1 major and 3 minor per 20 metres of continuous fabric length.

NOTE — When calculating from the observed number of defects in a roll of fabric, the number of defects per 20 m shall be rounded off to the nearest whole number.

6 PACKING

6.1 The fabric shall be packed in roll form in such a manner so as to prevent permanent

Table 2 Chemical Requirements of Aircraft Fabric
(Clause 4.1)

Sl No.	Characteristics	Requirement	Method of Test
(1)	(2)	(3)	(4)
i)	pH value	6.0 to 8.0	IS 1390 : 1983
ii)	Sizing, finishing, other non-fibrous materials, percent, Max	3.5	IS 199 : 1989
iii)	Rot-proofness: Pentachlorophenyl laurate content, percent	1.7 to 2.5	Appendix C of IS 11662 : 1986

distortion and damage from exposure to moisture, weathering, etc, during transportation and storage; or according to requirements of the buyer.

7 MARKING

7.1 Each package of fabric shall be marked with the following informations:

- a) Name of the fabric and grade,
- b) Length (m), width (mm),
- c) Indication of the source of manufacturer, and
- d) Lot number and date of manufacture.

7.1.1 The fabric may also be marked with the Standard Mark.

8 SAMPLING

8.1 Unless otherwise agreed, the procedure for sampling for testing physical and chemical characteristics shall be as given in IS 3919 : 1966 and IS 5463 : 1969 respectively.

ANNEX A

(Clause 4.3)

DOPING SPECIFICATIONS AND TESTS

A-1 TEST FRAME

A-1.1 The test frame should be strong rectangular wooden frame reinforced with metal to prevent warping. It shall measure 25 × 25 cm internally and have 2 holes, 5 cm in diameter, bored through one of the sides. A piece of

13 mm thick 5-ply plywood with a central hole 25 mm in diameter, shall be screwed to one face (see Fig. 1). The frame shall be covered on the plywood face with linen fabric under a tension of approximately 360 gf/cm width in the warp direction and 180 gf/cm width in the weft direction.

A-2 CONDITIONING

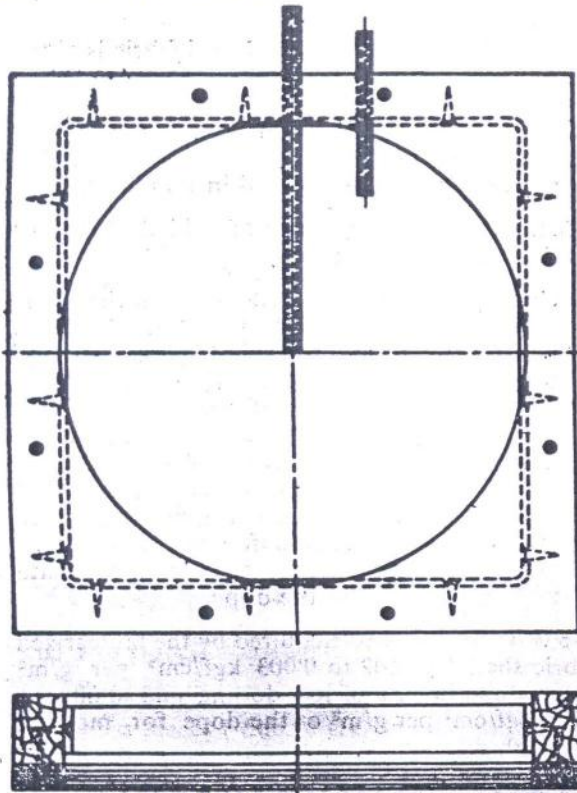


FIG. 1 TEST FRAME FOR DOPED FABRIC

A-2.1 Condition the test specimens for the stipulated time, in the standard atmosphere

(65 ± 2 percent relative humidity and temperature of $27 \pm 2^\circ\text{C}$).

NOTE — Guidance on conditioning is available in IS 6359 : 1971.

A-3 RESISTANCE TO HIGH TEMPERATURE

A-3.1 The number of test specimens shall be one for each tautening dope included in the doping scheme in addition to the one for complete doping scheme.

A-3.2 Procedure

Apply tautening dope uniformly on each of the test specimens held on individual test frames (see B-1.1) to impart the coating mass of $120 \pm 15 \text{ g/m}^2$ when measured after drying to constant tautening with both the fabric surfaces freely exposed to air.

A-3.2.1 Apply the complete doping scheme (see Table 3) to the test specimen meant for it.

A-3.2.2 Cut a strip $15 \times 2.5 \text{ cm}$ Min in the warp direction from each of the doped test specimens and heat it for 4 days (96 hours, Min) at a temperature of 95°C Min, cool to room temperature and bend it along weft around a mandrel moving the strip through minimum of 15 cm over it during bending operation. The diameter of the mandrel shall be 3.2 mm in the case of black finish and 1.6 mm in other cases.

A-3.3 There shall be no sign of cracking of the dope film(s).

Table 3 Doping Specifications
(Clause A-3.2.1)

Description of Components	Tautness					
	Low		Medium		High	
	Dry mass	Normal number of coats	Dry mass	Normal number of coats	Dry mass	Normal number of coats
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>For all finishes other than aluminium</i>	g/m^2	—	g/m^2	—	g/m^2	—
Red oxide tautening dope	—	—	68.0 ± 13.5	3	25.5 ± 5.0	1
Transparent tautening dope	68.0 ± 13.5	3 or 4	—	—	161.0 ± 32.0	6 or 7
Aluminium non-tautening finish	34.0 ± 7.0	2	—	—	—	—
Aluminium tautening dope	—	—	34.0 ± 7.0	2	34.0 ± 7.0	2
Pigmented non-tautening finish	34.0 ± 7.0	1 or 2	34.0 ± 7.0	1 or 2	34.0 ± 7.0	1 or 2
(Note 1)						
Transparent non-tautening finish	34.0 ± 7.0	1 or 2	34.0 ± 7.0	1 or 2	34.0 ± 7.0	1 or 2
(Note 2)						
<i>For an aluminium finish</i>						
Red oxide tautening dope	—	—	102.0 ± 20.5	4	25.5 ± 5.0	1
Transparent tautening dope	68.0 ± 13.5	3 or 4	—	—	195.0 ± 39.0	8
Aluminium non-tautening finish	34.0 ± 7.0	2	34.0 ± 7.0	2	34.0 ± 7.0	2
Transparent non-tautening finish	34.0 ± 7.0	1 or 2	34.0 ± 7.0	1 or 2	34.0 ± 7.0	1 or 2

NOTES

1 For colour and finish matching purposes only, a mass addition of not more than 68 g/m^2 shall be permitted for yellow, white and sky blue finishes.

2 Only when a glossy finish is required.

A-4 RESISTANCE TO NATURAL WEATHERING

A-4.1 There shall be only one specimen for this test, protected at the back of the frame with a covering of waterproof material.

A-4.2 Procedure

A-4.2.1 Freely expose the frame to maximum sunlight in the open for 6 months including at least 2 months from the period of May to August.

A-4.2.2 During exposure period, examine the frame at least once a day for adhesion of dope, cracks, etc, and its behaviour in dry and wet weather. Also examine tautness once a week.

A-4.2.3 After exposure for 6 months, cut from the fabric in the warp direction, 6 test specimen 2.5 cm wide and sufficient long to allow 20 cm between the jaws of a suitable tensile testing machine, condition them for 24 hours in standard atmosphere and then determine the tensile strength. Also determine, by the same method and under the same atmospheric conditions, the tensile strength of a piece of untreated fabric cut from the same length of fabric which was held on frame.

A-4.3 There shall be no cracking, clipping, flaking or blistering of the film, slight chalking be disregarded. The change in colour shall not be too apparent and the underlying coats shall not be visible through final finishing colour. The breaking strength and tautness shall not be impaired.

A-5 TAUTNESS PROPERTIES

A-5.1 The number of test specimens shall be one each for the tautening dopes included in the doping scheme.

A-5.2 Procedure

A-5.2.1 Apply each tautening dope uniformly to the individual test specimen held on the frame to impart it a coating mass of 120 ± 15 g/m² measured after drying to constant tautness, both the surfaces of the fabric freely exposed to air.

A-5.2.2 Measure tautness by any approved method, however, in case of dispute the following reference method shall be used:

After conditioning the test specimen in the standard atmosphere for 2 hours, minimum, fit the frame with an air-tight back in a conditioned room. Connect it, through the holes at its side, to a suitable manometer and a water pump, adjusted to reduce the air pressure inside the frame by 5 cm H₂O, including a large air reservoir to smooth out variations in the pressure. Measure the resulting depression (*d*) at the centre of the circle of unsupported fabric, using any instrument accurate to read in 0.025 mm units and that

does not impose a load exceeding 5 g on the area of unsupported fabric.

The tautness (*T*) in the doped fabric is given by the equation:

$$T = \frac{2}{d} \text{ kgf/cm}^2$$

where *d* is depression read in millimetres.

A-5.2.3 Determine the mass of added dope by the following method:

Cut minimum area of 250 cm² from the circle of unsupported doped fabric. Weigh and remove the dope by suitable solvents and weigh it again. Record the difference in mass (*A*). Cut a piece of undoped fabric of the same area from the same length as used to cover the test frame. Weigh it, apply the same solvent treatment as before under the same atmospheric conditions and weigh it again. Record the difference in mass (*B*) as a correction to (*A*) and calculate the mass in g/m² of the dope.

A-5.3 The tautness acquired by the mercerized fabric shall be 0.002 to 0.003 kgf/cm² per g of the dope in case of low doping and 0.003 to 0.004 kgf/cm² per g/m² of the dope for medium and high doping.

A-6 FREEDOM FROM FILM DEFECTS

A-6.1 Testing Atmosphere

The test shall be conducted at

- a) Relative humidity of 65-70 percent,
- b) Temperature of 25-29°C, and
- c) Air speed of a 1 m/s.

A-6.2 Procedure

A-6.2.1 Condition the test frames, samples of dopes and finishes to be tested, and to be used for application in the testing atmosphere in **A-6.1** for 2 hours, Min.

A-6.2.2 Dope the fabric with the material follows:

- a) Apply by brush application, one full coat of each tautening dope included in the doping scheme to an individual piece.
- b) When testing non-tautening finishes, apply one full coat of the finish, wherever appropriate, to a test piece previously tautened with the doping in accordance with Table 3.

A-6.2.3 Allow to dry under the test conditions and then examine visually.

A-6.3 The dopes shall be free from wrinkling, gubbling, etc.

A-7 KEEPING QUALITIES

A-7.1 The doped mercerized fabric stored in the original sealed condition shall retain its

original properties for a minimum of 6 months in tropical climate and minimum of 12 months in temperate climate.

ANNEX B
(Clause 5.1)

INSPECTION AND TAGGING OF DEFECTS

B-1 INSPECTION

B-1.1 Each cut shall be inspected under transmitted light for defects by passing the fabric, metre by metre, over 'light rails' or an artificial light table.

B-2 CATEGORIES OF DEFECTS**B-2.1 Major Defects**

The following shall constitute major defects:

- a) Bad floats of more than one end or more than one picks,
- b) Bad slubs (warp or weft),
- c) Weft snarls,
- d) Thin places (due to starting or stopping the loom or rip cuts),
- e) Broken ends or picks,
- f) Torn or wavy selvages,
- g) Holes,
- h) Spots of oil, and
- j) Such other defects as are obviously detrimental to strength, durability or use of the fabric.

NOTE — Such of the above defects as are obviously not detrimental to strength, durability or use of the fabric, shall be considered as minor defects.

B-2.2 Minor Defects

The following shall constitute as minor defects:

- a) Neps,
- b) Small slubs,
- c) Small snarls,
- d) Loose ends,
- e) Single end cut, and
- f) Such other defects as are obviously not detrimental to strength, durability or use of the fabric.

B-3 TAGGING

B-3.1 All major defects shall be tagged by sewing red thread in the selvedge opposite the defects.

B-3.2 All minor defects shall be tagged by sewing blue thread in the selvedge opposite the defects.

B-3.3 All tags shall be affixed only on one side of the roll.