IS : 2089 - 1977
( Reaffirmed 2001 )



# *Indian Standard*

# SPECIFICATION FOR COMMON PROOFED CANVAS/DUCK AND PAULINS ( TARPAULINS )

## *( Second Revision )*

Fifth Reprint AUGUST 2006
( Including Amendment Nos. 1 & 2 )

UDC 677.11.064.13



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

Gr 5 *May* 1978

# AMENDMENT NO. 1 MARCH 1989
# TO
# IS : 2089 - 1977 SPECIFICATION FOR COMMON PROOFED CANVAS/DUCK AND PAULINS ( TARPAULINS )

*( Second Revision )*

( *Page* 4, *clause* **3.3.2.1**, *Note* ) — Substitute the following for the existing Note:

'NOTE — Copper or zinc naphthenate are the only known economical and effective rot-proofing agents which do not leach out. The manufacturer shall provide evidence and make a declaration that he has used copper naphthenate conforming to IS : 1078-1987* and best trade quality zinc naphthenate. The purchaser, if he so desires, shall get copper naphthenate to be used, pre-tested conforming to IS : 1078-1987* before the manufacturer is permitted to use it. For this purpose, a proper record of pre-inspection of copper naphthenate shall be maintained by the manufacturer. Copper or zinc content when determined by the method prescribed in A-2, shall be *Min* 0·5 or 0·8 percent respectively when calculated on the mass of the proofing content. Manufacturer shall satisfy the buyer that the right quality and quantity of rot-proofing agent has been used, if necessary, by stage-control checks, proof of purchase and record of consumption of copper or zinc naphthenate. In case of doubt the buyer reserves the right to carry out biological appreciation as per IS : 1389-1984† before and after leaching as prescribed in this clause in addition to copper or zinc content determination as prescribed.'

*Specification for copper napththenate ( *second revision* ).

†Methods for testing cotton fabrics for resistance to attack by micro-organisms ( *first revision* ).

( *Page* 7, *clause* **4.1.1.2**, *line* 1 ) — Substitute 'rot-proofed cotton thread conforming to variety No. 18 or 43 of IS : 1720-1978* shall be used' *for* 'rot-proofed cotton thread conforming to variety No. 19 or 43 of IS : 1720-1969 shall be used'.

*Specification for cotton sewing threads ( *second revision* ).

( *Page* 7, *clause* **4.1.1.4** ) — Insert the following Note in the end:

'NOTE — In case the length of 30 size eyelets conforming to IS : 4084-1978§ is found to be inadequate for proper fixing of the fabric layers, eyelets of size higher than 30 given in IS : 4084-1978§ may be used.'

§Specification for eyelets and washers ( sail ) ( *first revision* ).

( *Page* 10, *clause* **4.2.5** ) — Insert the following after **4.2.5**:

'**4.2.5.1** For hook joints, number of stitches shall be between 16 to 20 per decimetre.'

( PCDC 16 )

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# AMENDMENT NO. 2 FEBRUARY 2005
# TO
# IS 2089 : 1977 SPECIFICATION FOR COMMON PROOFED CANVAS/DUCK AND PAULINS (TARPAULINS)

*( Second Revision )*

( *Page* 5, *clause* **3.3.7.1** ) — Substitute the following for the existing:

'**3.3.7.1** *Pressure head test* — A circular piece of common proofed canvas/duck 200 mm in diameter, when subjected to a constant pressure head of water in Table 2 for one hour according to method given in IS 7016 (Part 7) : 1986§ shall not show any leakage.

NOTE — In case small water drops ( maximum 5 in different places ) are found but these leakages stop during the test period, such defects should not be considered for rejection.'

( *Page* 5, *footnote* marked §) — Substitute the following footnote for the existing:

'§ Method of test for coated and treated fabrics : Part 7 Determination of resistance to penetration by water (*first revision*). '

( PCD 13 )

Printed at Simco Printing Press, Delhi

# *Indian Standard*

# SPECIFICATION FOR COMMON PROOFED CANVAS/DUCK AND PAULINS ( TARPAULINS )

## *( Second Revision )*

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# *Indian Standard*

# SPECIFICATION FOR COMMON PROOFED CANVAS/DUCK AND PAULINS ( TARPAULINS )

## *( Second Revision )*

## 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 29 November 1977, after the draft finalized by the Treated Fabrics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

**0.2** This standard was originally published in 1962 and was revised in 1972. In this revision the constructional requirements as well as the sampling plan were rationalized. The revision also took note of the developments in the production of paulins. This revision is necessitated because of the difficulty faced by the industry in meeting certain provisions of the standard, specially the use of excessive microbial agents and higher content of alumina recommended by the earlier standard. In this revision, based on the experience and data available, the copper and zinc contents as well as alumina content have been modified. Opportunity has also been taken to further improve the sampling scheme.

**0.3** The tarpaulins that are commercially available are generally made from fabric whose width is 90 to 120 cm.

**0.4** This standard contains clauses **3.1**, **3.2** ( Note 1 ), **4.1.1.2**, **4.2.1**, **4.2.2**, **4.2.3**, **4.2.4**, **4.2.6** and **7.2** which call for agreement between the purchaser and the supplier.

**0.5** 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values ( *revised* ).

## 1. SCOPE

**1.1** This standard prescribes the requirements and methods of sampling and test for common proofed canvas/duck, and paulins (tarpaulins) fabricated from it.

## 2. TERMINOLOGY

**2.1** For the purpose of this standard, the definitions given in IS : 2244-1972* shall apply.

## 3. REQUIREMENTS FOR COMMON PROOFED CANVAS/DUCK

**3.1 Basic Fabric** — Common proofed canvas/duck shall be made from cotton duck or cotton canvas conforming to any one of the varieties of IS : 1422-1970† or IS : 1424-1970‡ respectively, as agreed between the purchaser and the supplier.

**3.2 Common Proofing** — Common proofing mixture shall be prepared with the ingredients consisting essentially of paraffin wax, a suitable pigment and aluminium stearate.

NOTE 1 — If required by the purchaser the base material may be dyed.

NOTE 2 — The proofing mixture shall not contain any ingredient which is liable to damage the proofed canvas/duck.

### 3.3 Common Proofed Canvas/Duck

**3.3.1** The common proofed canvas/duck shall be such that common proofing shall be between 40 to 75 percent of the mass of base fabric when tested as prescribed in **A-1**.

**3.3.2** *Resistance to Microbial Attack* — The material shall be rendered resistant to microbial attack by treating with suitable rot-proofing agent.

**3.3.2.1** The proofed material when tested by the pure culture, mixed culture, aspergillus niger and soil burial methods prescribed in IS : 1389-1969§ shall conform to requirements stipulated against each method.

NOTE — If it is known that copper or zinc naphthenate has been used as a rot-proofing agent, biological appreciation by the method prescribed in this clause need not be made. The purpose of this clause will be adequately served if copper or zinc content is determined by the method prescribed in **A-2** and the copper or zinc content is found to be *Min* 0·5 or 0·8 percent respectively when calculated on the mass of the proofing content.

**3.3.3** *Chemical Requirements* — Common proofed canvas/duck shall comply with the chemical requirements as given in Table 1.

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*Glossary of terms relating to treated fabrics ( *first revision* ).
†Specification for cotton duck ( *first revision* ).
‡Specification for cotton canvas ( *first revision* ).
§Methods for testing cotton for resistance to attack by micro-organisms.

**TABLE 1 CHEMICAL REQUIREMENTS OF COMMON PROOFED CANVAS/DUCK**

( *Clause* 3.3.3 )

| Sl No. | Characteristic | Requirement | Method of Test ( Ref to Cl No. in Appendix A ) |
|---|---|---|---|
| (1) | (2) | (3) | (4) |
| i) | Free acidity | To pass test | A-3 |
| ii) | Ash, percent by mass, *Max* | 18·0 | A-4 |
| iii) | Aluminium oxide content, ( as $Al_2O_3$ ) percent by mass, *Min* ( on the basis of proofing content ) | 0·6 | A-5 |

**3.3.4** *Pliability* — Common proofed canvas/duck shall be pliable when the sample is kept for 2 hours at 0°C and examined immediately thereafter. The proofing shall show no tendency to crack when folded double and pressed by hand on a flat surface.

**3.3.5** *Sweating Test* — The common proofed canvas/duck shall not stain the blotting paper when tested as prescribed in **6.2.**

**3.3.6** *Breaking Strength* — The common proofed canvas/duck shall have an average breaking strength not less than 90 percent of the specified value prescribed for the basic fabric ( *see* IS : 1422-1970* or IS : 1424-1970† ) when tested according to IS : 1969-1968‡.

**3.3.7** *Waterproofness*

**3.3.7.1** *Pressure head test* — A circular piece of common proofed canvas/duck 200 mm in diameter, when subjected to a constant pressure head of water prescribed in Table 2 for one hour according to method given in Appendix E of IS : 1389-1959§ shall not show any leakage.

NOTE — In case small water drops ( maximum 5 in different places ) are found but these leakages stop during the test period, such defects should not be considered for rejection.

*Specification for cotton duck ( *first revision* ).
†Specification for cotton canvas ( *first revision* ).
‡Method for determination of breaking load and elongation at break of woven textile fabrics ( *first revision* ).
§Methods for testing cotton fabrics for resistance to attack by micro-organisms.

TABLE 2 HEIGHT OF WATER COLUMN FOR PRESSURE HEAD TEST

( *Clause* 3.3.7.1 )

| Material for Basic Fabric Conforming to | Water Column Height |
|---|---|
| (1) | (2) |
| | mm |
| IS : 1422-1970* Variety No. 1 | 300 |
| ,, No. 2 | 300 |
| ,, No. 3 | 250 |
| ,, No. 4 | 150 |
| IS : 1424-1970† Variety No. 1 | 300 |
| ,, No. 2 | 300 |
| ,, No. 3 | 250 |
| ,, No. 4 | 200 |

*Specification for cotton duck ( *first revision* ).
†Specification for cotton canvas ( *first revision* ).

**3.3.7.2** *Cone test* — There shall be no leakage of water either through the apex of the cone or through the outer surface of the common proofed canvas/duck which is exposed to air in a conditioned room at 27 ± 2°C and 65 ± 2 percent relative humidity when tested as given in **6.3.** The outer exposed surface shall not wet also.

NOTE — Water drops due to condensation inside the fold of the cone or along the contact line with the metal ring should not be considered for rejection.

## 4. REQUIREMENTS FOR COMMON PROOFED PAULINS ( TARPAULINS )

### 4.1 Materials

**4.1.1** Common proofed paulins shall be made from common proofed fabric specified in **3** and employing materials specified in **4.1.1.1** to **4.1.1.4.**

**4.1.1.1** *Rope lashing* — Indian sisal ( aloe fibre ) conforming to IS : 1321-1970* or hemp rope conforming to IS : 5176-1969† lashings of 12 mm diameter and made from 3 strands shall be used.

**4.1.1.2** *Sewing thread* — Subject to agreement between the purchaser and the supplier, 165 tex × 3 linen thread having a minimum breaking load of 8 kgf ( single thread breaking load on 50 cm test length using

*Specification for sisal rope ( *first revision* ).
†Specification for hawser-laid hemp line and ropes.

constant rate of traverse machine ) or rot-proofed cotton thread conforming to variety No. 19 or 43 of IS : 1720-1969* shall be used. The sewing thread shall be rot-proofed by copper naphthenate or zinc naphthenate or any other suitable agent subject to agreement between the purchaser and the supplier. In case copper or zinc naphthenate has been used, the amount of copper shall be 0·5 to 0·8 percent and of zinc 0·8 to 1·0 percent as determined by the method prescribed in **A-2**.

**4.1.1.3** *Twine whipping* — Cotton thread conforming to variety No. 8, 19 or 36 of IS : 1720-1969* shall be used. Warp thread of proofed fabric of variety No. 2 of IS : 1422-1970† may also be used with method of whipping and sewing as stipulated in this standard.

**4.1.1.4** *Eyelets* — Aluminium alloy $NS_3$ or $NS_4$ or brass eyelets conforming to size 30 of IS : 4084-1967‡ shall be used.

### 4.2 Manufacture

**4.2.1** Common proofed paulins ( tarpaulins ) shall be made to the shade and dimensions as agreed to between the purchaser and the supplier. Each paulins ( tarpaulins ) should be made with panels of even tone as far as possible. The shade or colour of the paulin ( tarpaulins ) shall be made by adding the desired colour pigments in the waterproofing mixture that is, base canvas/duck need not be dyed unless specifically mentioned by the purchaser.

**4.2.2** *Construction* — The panels shall be flat ( lap ) joined; if specifically required by the purchaser it may also be hook joined ( *see* Fig. 1 and 2 ).

**4.2.2.1** The ends and sides of the paulins shall be hemmed with a single row of stitching. The hem shall be about 50 mm wide and the turn-in shall be in full width of the hem. The seams of the paulins shall be not less than 40 mm in width and shall be stitched by two rows of stitching 25 mm apart and approximately equidistant from the edges. In case of hook joints the turn-in at the seams shall be in full width of the joint. The panels shall be joined on either side of the centre panel such that the centre panel is laid on the top and others lapped on the two sides so as to facilitate correct drainage of water in the finished paulin as shown in Fig. 1. The 9 thicknesses of the fabric at each corner shall be reduced to five by cutting off a piece of fabric, 100 × 100 mm, permitting thereby the shank of the eyelets to be securely set over the washers.

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*Specification for cotton sewing threads.
†Specification for cotton duck ( *first revision* ).
‡Specification for eyelets and washers.

**4.2.2.2** Cross seams may be used at the rate of one on alternate panels excluding the two side panels and no piece less than 900 mm in length shall be used for making the panel. The cross-seam shall be made by 'fall-and-seam' method allowing for a 15-mm turn-in of the edges ( *see* Fig. 3 ). Narrow width panels of 250 to 900 mm in width after fabrication may be used at the rate of one per paulin to obtain the required width of paulin. In all cases, however, the end panels shall be of full width except where the width of the paulin is less than 2 m, in which case one of the end panels may be less than the full width. The alternate short panels for cross joint shall be in the opposite ends.

**4.2.2.3** In case of hook joints of the panels on the hem, the 12 thicknesses of the base fabric at each joint shall be reduced to six by cutting a piece of fabric 150 × 40 mm from two adjoining panels as shown in Fig. 4. In case the reinforced triangular pieces fall on the hem of the hook joints, only one layer of the reinforced triangular piece may be introduced to have only seven thicknesses of cloth to be stitched.

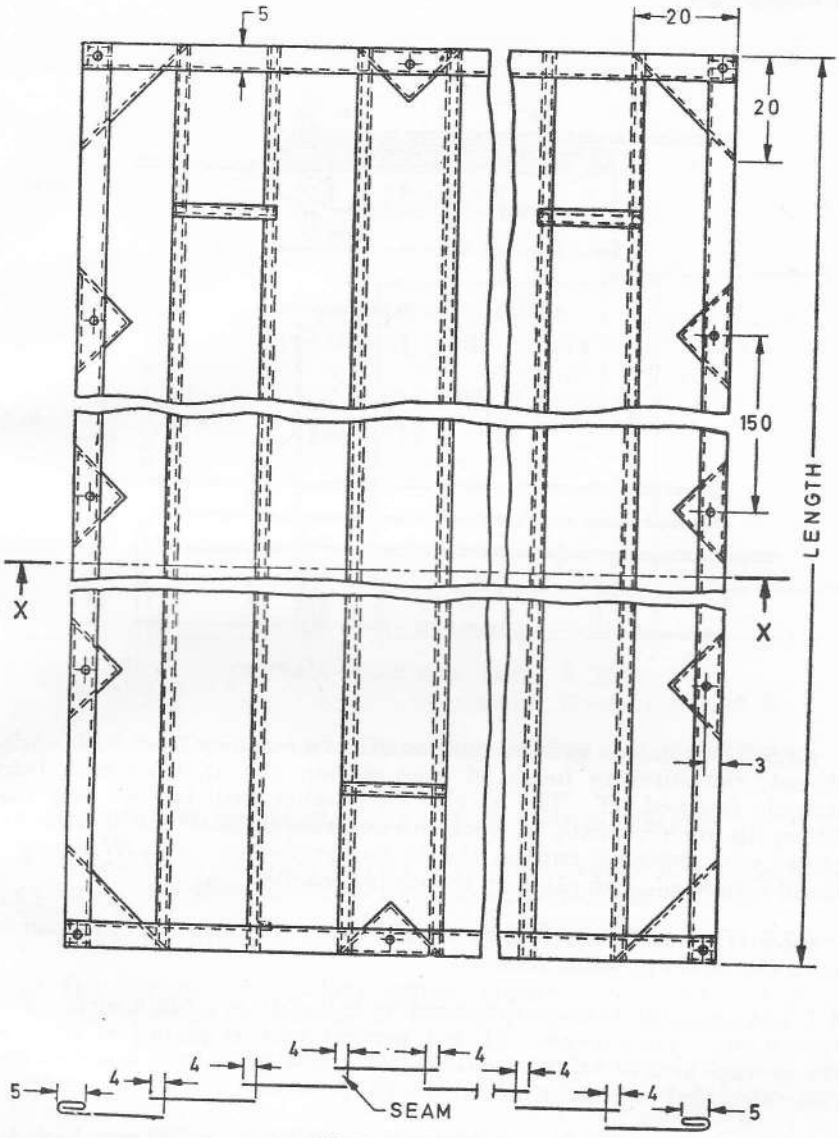
**4.2.3** *Fixing of Eyelets* — Unless otherwise agreed between the purchaser and the supplier, the eyelets shall be fixed at an interval of about 150 cm on all sides. Only one eyelet shall be used at corners. Other particulars with regard to fixing of eyelets shall be as given in **4.2.3.1** to **4.2.3.3**.

**4.2.3.1** The eyelets shall be fitted in a row. The holes for the eyelets shall be first punched with a small size punch. These small holes may then be enlarged to the required size by using a marlinespike.

**4.2.3.2** For all common proofed paulins above 15·0 $m^2$ in size, reinforcement triangular pieces shall be provided for the eyelets. The triangular pieces shall be made of 20 × 20 cm piece folded along one diagonal. Each of these triangles shall be inserted under each eyelets under the double turning, the folded edge of the strengthening piece being in line with the outer edge of the hem when finished. The triangular strengthening pieces shall be well stitched along all the three sides, to the common proofed paulin. Raw edges of triangular pieces on sides shall be turned in by about 5 mm before stitching.

**4.2.3.3** One eyelet shall be inserted at each eyelet portion on the hem of the common proofed paulins. The centres of these eyelets shall be at a distance of 3 cm from the outer edge of the hem.

**4.2.4** The lashing ropes shall be supplied if required by the purchaser and in that case they shall be fixed to the eyelets by splicing. The number and length of the lashing ropes shall be as agreed between the purchaser and the supplier. The free ends of the lashings shall be securely whipped with twine whipping and waxed for a distance of at least 2·5 cm, the end being sewn at least in 3 places to prevent the whipping from pulling off.

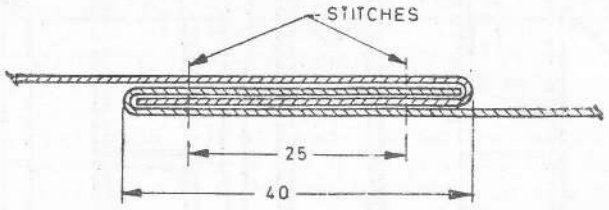



SECTION XX
(SHOWING SEAMS AND HEMS)

NOTE — For stitching *see* Fig. 3.

All dimensions in centimetres.

FIG. 1 CONSTRUCTION OF COMMON PROOFED PAULINS ( TARPAULINS )




All dimensions in millimetres.

FIG. 2 HOOK JOINED SEAM

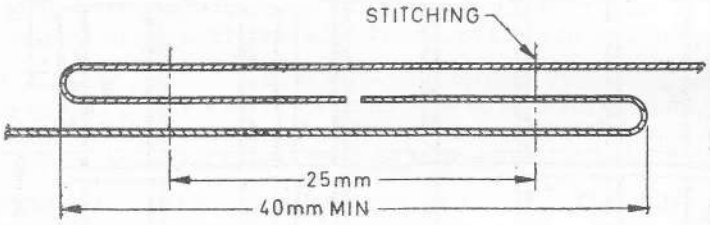



FIG. 3 FALL AND SEAM METHOD

**4.2.5** The common proofed paulins shall be machine sewn with sewing thread, the stitching being of even tension and all loose ends being securely fastened off. The number of stitches shall be not less than 20 per decimetre; sewing by hook and awl method shall not be done, but places with defective stitches should be mended by '*MOCHI* sewing' if found inconvenient to place on the sewing machine.

**4.2.6** If specially required by the purchaser, the seams may be painted with the liquid proofing mixture.

**4.3** The tarpaulin shall be measured by laying it on a plain surface fully spread out. The tolerance of $\pm$ 1 percent will be permitted provided the average area of all the tarpaulins in a consignment is not less than that calculated on sizes stipulated by the purchaser.

**4.4 Bag Test** — When water is slowly poured into a 200-mm high bag formed in a frame with common proofed paulins, up to half of the height, there shall be no leakage of water within one hour.

NOTE — This test shall not be carried out on seams of the paulins unless otherwise specified.

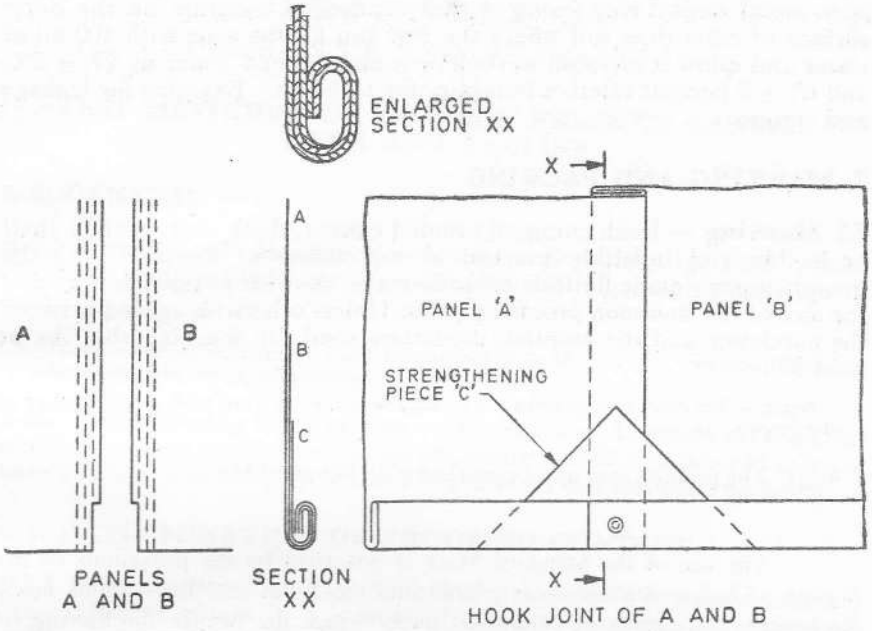



FIG. 4 REDUCTION OF THICKNESS AT HEM FOR HOOK JOINTS

## 5. SAMPLING AND CRITERIA FOR CONFORMITY

**5.1** The scale of sampling and criteria for conformity of common proofed canvas/duck and paulins shall be as prescribed in Appendix B.

## 6. TEST METHODS

**6.1** Determination of proofing content, copper or zinc content and other chemical determinations shall be done as prescribed in Appendix A.

**6.2 Sweat Test** — Cut a piece of common proofed canvas/duck or paulin 200 × 150 mm and place between two blotting papers (*see* IS : 1396-1960*) of about the same size under a pressure of 3·5 kg on this piece in an oven maintained at 40 ± 1°C for 4 hours. At the end of this period, remove the material and the blotting papers from the oven and examine the blotting papers.

*Specification for blotting papers.

**6.3 Cone Test** — Form a cone by folding, pressing and creasing a 300 × 300 mm piece of common proofed canvas/duck. Suspend it on an open metal conical ring frame so that condensed moisture on the outer surface of cone does not affect the test and fill the cone with 400 ml of water and allow it to stand as such in a conditioned room at 27 ± 2°C and 65 ± 2 percent relative humidity for 18 hours. Examine for leakage and wetness.

## 7. MARKING AND PACKING

**7.1 Marking** — Each common proofed canvas, duck and paulins shall be legibly and indelibly marked at one corner of one side with the manufacturer's name, initials or trade-mark, the year of manufacture and the size of the common proofed paulin. Unless otherwise agreed between the purchaser and the supplier, the letters used for marking shall be at least 80 mm.

NOTE — For each consignment the paulins should be marked with serial number of the supply.

**7.1.1** The product may also be marked with Standard Mark.

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

**7.2 Packing** — The packing of the material shall be done with an inner layer of hessian of approximately 225 g/m² followed by an intermediate layer of polyethylene film of 0·038 mm thickness followed by an outer layer of hessian of approximately 340 g/m² conforming to type 1 of IS : 2818-1964*. The four covers of the packing shall be tied to keep atleast 15 cm ears for easy handling. Any other mode of packing may also be followed as agreed between the purchaser and the supplier.

*Specification for Indian hessian.

# APPENDIX A

( *Clauses* 3.3.1, 3.3.2, 3.3.3 *and* 6.1 )

## TEST METHODS FOR COMMON PROOFED CANVAS/ DUCK AND PAULINS

### A-0. GENERAL

**A-0.1 Quality of Reagents** — Unless otherwise specified, pure chemicals and distilled water ( *see* IS : 1070-1977* ) shall be employed in tests.

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

**A-0.2 Conditioning for Testing** — All tests shall be made on material which has been conditioned in an atmosphere of 65 ± 2 percent relative humidity and at a temperature of 27 ± 2°C for not less than 48 hours.

### A-1. DETERMINATION OF PROOFING CONTENT

**A-1.1 Procedure** — Cut four pieces of the material 8 × 8 cm accurately from d fferent places in a sample of common proofed canvas/duck or paulin and condition them for 24 hours under standard atmospheric conditions. Weigh the conditioned pieces accurately and subject them to successive extraction in a Soxhlet apparatus with : ( a ) carbon tetrachloride for 3 hours, ( b ) rectified spirit ( conforming to IS : 323-1959† ) for 2 hours, and ( c ) water for 2 hours. After the above treatment, the material may contain pigments in the interstices of the fabric. To remove these, separate individual threads from the pieces, collect together and give light treatment with soap. Wash the threads thoroughly with water to remove last traces of soap. Dry and condition the sample in an atmosphere of 65 ± 2 percent relative humidity and at a temperature of 27 ± 2°C and weigh.

**A-1.2 Calculation** — Calculate the mass of the proofing from the difference between the initial mass of the test pieces and the mass of the threads after deproofing, and express as a percentage of the deproofed fabric.

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*Specification for water for general laboratory use ( *second revision* ).
†Specification for rectified spirit ( *revised* ).

## A-2. DETERMINATION OF COPPER AND ZINC CONTENT

### A-2.1 Copper

**A-2.1.1** *Procedure* — Approximately 5 g of the averaged sample shall be accurately weighed and thoroughly extracted with benzene in a Soxhlet extraction apparatus. A suitable Soxhlet thimble should be used so that any solid matter detached from the sample does not enter the extraction flask.

**A-2.1.1.1** The extract shall be carefully transferred to a silica dish. The solvent shall be evaporated off by heating the dish on a water-bath. The residue shall then be gently heated to burn off the carbonaceous tarry matter. After cooling, the residue shall be moistened with a few ml of concentrated sulphuric acid and a few drops of concentrated nitric acid. The dish shall then be gently heated to free the residue from nitrous fumes.

**A-2.1.1.2** The residue shall then be digested on a water-bath with a few ml of concentrated nitric acid and a few ml of concentrated hydrochloric acid. After most of the acid is evaporated, the solution shall be diluted and an excess of ammonia added. The resulting solution shall be filtered, the filter paper thoroughly washed with dilute ammonia and the filtrate collected in an iodine value flask.

**A-2.1.1.3** The filtrate shall be neutralized with dilute sulphuric or acetic acid and 10 ml of the acid added in excess, 2 to 3 g of potassium iodide crystals shall then be added. After five minutes, the liberated iodine is titrated against 0·1 N sodium thiosulphate solution using starch as indicator.

**A-2.1.2** *Calculation* — Calculate the amount of copper on the basis that 1 ml of 0·1 N sodium thiosulphate equivalent to 0·006 36 g of copper. Report the amount of copper on the basis of mass of proofing compound.

### A-2.2 Zinc

**A-2.2.1** *Procedure*

**A-2.2.1.1** Approximately 10 g of the averaged sample shall be accurately weighed and thoroughly extracted with benzene in a Soxhlet extraction apparatus. A suitable Soxhlet thimble should be used so that any solid matter from the sample does not enter the extraction flask.

**A-2.2.1.2** The extracts shall then be carefully transferred to a tared silica dish. The solvent shall be evaporated off by heating the dish gently on a water-bath. The residue shall then be gently heated to burn off the carbonaceous and tarry matter. After cooling, the residue shall be moistened with a few ml of concentrated sulphuric acid and a few drops of concentrated nitric acid. The dish shall then be gently heated to free the residue from nitrous fumes.

**A-2.2.1.3** The residue shall be diluted with water and the whole thing transferred to 250-ml beaker. Ten ml of 2 N ammonium chloride followed with 20 ml of dilute ammonium hydroxide ( or more till the solution smells of ammonia ) shall be added to the beaker and the solution heated for a few minutes. The solution shall then be filtered and the filter paper washed thoroughly. The solution shall then be made just acidic to methyl orange with dilute hydrochloric acid. To this solution diammonium hydrogen phosphate solution shall be added to precipitate out zinc ammonium phosphate. The contents shall then be heated slowly to coagulate the precipitate.

**A-2.2.1.4** The solution shall then be filtered through a tared sintered glass crucible No. 4 with the help of a suction pump, the residue shall be washed thoroughly with distilled water. The precipitate in the crucible shall be dried in an air oven at 100 to 105°C to constant mass.

**A-2.2.2** *Calculation* — The percentage of zinc content as Zn is calculated as follows:

$$\text{Zinc, percent by mass} = \frac{(A - B)}{M} \times 100 \times 0{\cdot}366\ 5$$

where

$A$ = mass of the sintered glass crucible along with the precipitate,

$B$ = mass of the sintered glass crucible, and

$M$ = mass of the sample taken.

Report the amount of zinc on the basis of the mass of proofing compound.

## A-3. DETERMINATION OF FREE ACIDITY AND ALKALINITY

**A-3.1 Procedure** — Take a sample of the common proofed canvas/duck or paulin weighing about 10 g. Cut this into square pieces about 6·5 × 6·5 cm and boil in 200 ml of water for half an hour. Cool and filter.

**A-3.2** The aqueous extract shall not be acidic to methyl orange nor alkaline to phenolphthalein.

## A-4. DETERMINATION OF ASH

**A-4.1 Procedure** — Incinerate about 5 g of the composite sample of the material to ash in a muffle furnace.

**A-4.2** Express the ash as a percentage of the mass of the common proofed canvas/duck or paulin taken for test.

## A-5. ESTIMATION OF ALUMINIUM CONTENT

### A-5.1 Reagents

**A-5.1.1** *Hydrochloric Acid* — Approximately 4 N.

**A-5.1.2** *Ammonium Chloride* — Solid (conforming to pure grade of IS : 1113-1965*).

**A-5.1.3** *Ammonium Nitrate Solution* — 1 percent (*m/v*).

**A-5.1.4** *Carbon Tetrachloride* — conforming to IS : 718-1970†.

**A-5.2 Procedure** — Cut four pieces from different places in a sample of common proofed duck/canvas paulin and condition them for 24 hours under standard atmospheric conditions. Weigh the conditioned pieces accurately and subject them to extraction with carbon tetrachloride for 3 hours in a Soxhlet extractor. Distil the extracted solution and determine aluminium in the residue after complete removal of solvent. Hydrolyse the residue obtained above by boiling with 50 ml of hydrochloric acid. Any iron present shall be removed by adding hot solution to strong sodium hydroxide solution, filter and wash the residue with hot acidulated water. Add 2 g of solid ammonium chloride to the above filtrate and make slightly alkaline with ammonia solution. Slightly heat the solution to coagulate the precipitate. Filter the precipitate and wash with hot ammonium nitrate solution until it is free from chloride ions. Dry the precipitate, ignite and weigh as aluminium oxide.

**A-5.3 Calculation** — Express the mass of the aluminium oxide as the percentage by mass of the proofing material, as follows:

$$\text{Aluminium oxide, percent by mass} = \frac{100\,a}{(b - c)}$$

where

$a$ = mass in g of the aluminium oxide,

$b$ = mass in g of the proofed duck/canvas, and

$c$ = mass in g of the basic fabric.

*Specification for ammonium chloride, technical and pure (*revised*).

†Specification for carbon tetrachloride (*first revision*).

# APPENDIX B

( *Clause* 5.1 )

## SAMPLING OF COMMON PROOFED CANVAS/DUCK AND PAULINS ( TARPAULINS )

### B-1. SCALE OF SAMPLING

**B-1.1 Lot** — In a single consignment all common proofed canvas/duck and paulins belonging to the same batch of manufacture shall constitute a lot. If the consignment is declared or known to consist of different batches of manufacture, batches shall be marked separately and the group of common proofed duck/canvas or paulins in each batch shall constitute a separate lot.

**B-1.2** For ascertaining conformity of material in the lot to the requirements of the specification, samples shall be tested for each lot separately.

**B-1.3** The number of pieces of canvas/duck and paulins to be selected for this purpose shall depend on the size of the lot and shall be according to col 1 and 2 of Table 3.

**TABLE 3 SCALE OF SAMPLING**

| No. of Pieces of Canvas/Duck and Paulins in the Lot | For Non-Critical Requirements | | Sample Size for Critical Requirements |
|---|---|---|---|
| | Sample Size | Acceptance Number | |
| (1) | (2) | (3) | (4) |
| Up to 50 | 3 | 0 | 1 |
| 51 ,, 100 | 5 | 0 | 2 |
| 101 ,, 300 | 8 | 0 | 3 |
| 301 ,, 500 | 13 | 1 | 4 |
| 501 and above | 20 | 2 | 5 |

**B-1.3.1** These canvas/duck and paulins shall be selected at random and in order to ensure the randomness of selection, a random number table shall be used. For guidance and use of random number tables, IS : 4905-1968* may be referred. In the absence of a random number table, following procedure may be adopted:

Starting from any canvas/duck or paulins in the lot, count them in one order as 1, 2, 3 .....up to $r$ and so on, where $r$ is the integral part of $N/n$ ( $N$ and $n$ being the number of canvas/duck and paulins in the lot and sample respectively ). Every $r$th canvas/duck and paulins so counted shall be withdrawn to constitute the sample.

*Methods for random sampling.

## B-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

**B-2.1** The number of canvas/duck and paulins, selected according to col 1 and 2 of Table 3 shall be examined for non-critical ( visual, dimensional and tactile ) requirements. A canvas/duck and paulins failing in one or more of these requirements, shall be considered as defective. The lot shall be considered to have satisfied these requirements if the number of defectives found in the sample is less than or equal to the corresponding acceptance number given in col 3 of Table 3.

**B-2.2** The number of canvas/duck and paulins as given in col 4 of Table 3, shall be tested for critical requirements ( other than non-critical ). These canvas/duck and paulins may be selected from those, already tested and found satisfactory according to **B-2.1.** A canvas/duck and paulins failing in any of these requirements, shall be considered as defective. The lot shall be considered to have met these requirements if none of the canvas/duck and paulins in the sample is found defective.

**B-2.3** The lot shall be declared as conforming to the requirements of the specification if **B-2.1** and **B-2.2** are satisfied.