SRI LANKA STANDARD 795 : PART 4 : 2002
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SPECIFICATION FOR
COATED FABRICS
PART 4 : POLY VINYL CHLORIDE (PVC) COATED WOVEN FABRICS FOR FOOTWEAR INDUSTRY

SRI LANKA STANDARD INSTITUTION

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SLS 795 : PART 4 : 2002

Gr. 7

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This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD
SPECIFICATION FOR COATED FABRICS
PART 4 : POLY VINYL CHLORIDE (PVC) COATED WOVEN FABRICS FOR FOOTWEAR INDUSTRY

FOREWORD

This standard was approved by the Sectoral Committee on Textiles, Clothing and Leather and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 2002-11-14.

This part is one of the series of standards for coated fabrics. Other parts in the series are

Part 1	:	Polyvinyl chloride (PVC) coated woven fabrics for upholstery
Part 2	:	Polyvinyl chloride (PVC) coated knitted fabrics for upholstery
Part 3	:	Polyvinyl chloride (PVC) coated fabrics for water resistant clothing

This part covers PVC-coated fabrics used in footwear industry for upper and lining for certain type of shoes and chappals, cover materials for insoles, etc.

PVC-coated fabrics consist of PVC polymer/co-polymer composition which is either calendered and then laminated or is spread as a plastisol on to dyed/undyed textile material.

Non-expanded PVC-coated fabrics are manufactured by applying to one side of a woven cloth a continuous solid coating of suitably plasticized, stabilized and pigmented polymer of vinyl chloride or a co-polymer (major constituent of which is vinyl chloride or a combination of both).

Expanded PVC-coated fabrics are manufactured similar to that of non-expanded PVC, but one layer is expanded or foamed. It forms a continuous expanded layer between the top skin and the base fabric.

Guidelines for the determination of a compliance of a lot with the requirements of this standard based on statistical sampling and inspection are given in Appendix A.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with CS 102. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this specification.

In the preparation of this specification, technical assistance obtained from the following publications is gratefully acknowledged.

i) IS 8699 - Specification for PVC coated fabrics for footwear industry.

ii) IS 2244 Glossary of terms relating to treated fabrics

1 SCOPE

This standard prescribes the requirements for PVC-coated fabrics for footwear industry coated on woven (Grey or dyed) fabrics. These coated fabrics may be in plain embossed, printed or in any other surface finish.

This standard does not cover requirements for PVC-coated fabrics based on non-woven materials, knitted fabric backing and the coating without a continuous skin.

2 REFERENCE

IS 2244 Glossary of terms relating to treated fabrics
SLS 62 Determination of colour fastness of textile material to light
CS 63 Determination of colour fastness of textile material to rubbing
CS 102 Presentation of numerical values
SLS 428 Random sampling methods
SLS 732 Tests for plastics
Part 1 Qualitative evaluation of bleeding of colourant
SLS 761 Tests for rubber or plastic coated fabrics
Part 1 Determination of roll characteristics
Part 3 Determination of breaking strength and elongation at break
Part 4 Determination of resistance to damage by flexing (dynamic method)
Part 5 Standard atmospheres for conditioning and testing
Part 6 Determination of coating adhesion

SLS 795 Coated fabrics
Part 1 : Polyvinyl chloride (PVC) coated woven fabrics for upholstery

3 DEFINITIONS

For the purpose of this specification the definitions given in IS 2244 : 1992 shall apply.

4 TYPES AND GRADES

4.1 The material shall be of two types:

Type A - Expanded PVC-coated fabrics, nominal thickness in range of 0.8 to 1.9 mm

Type B - Non-expanded PVC-coated fabric

4.1.1 Type A fabrics shall be manufactured in the following four grades:

a) Grade 1 - Mainly used as upper material for gents' and ladies' shoes.

b) Grade 2 - Used as upper material for children's shoes.

c) Grade 3 - Mainly used as a lining or a cover material for insole.

d) Grade 4 - Mainly used for socks or lining material or cover for insole in ordinary foot-wear.

4.1.2 Type B fabrics shall be manufactured in the following three grades:

a) Grade 1 - Used for shoe uppers, sandals, straps for chappals (sandals) and also for lining materials for shoes.

b) Grade 2 - Used for socks or insole cover in medium quality footwear and also in shoe uppers of ordinary usage.

d) Grade 3 - Used for ordinary socks or as a binding material, and also as insole cover for ordinary footwear.

5 REQUIREMENTS

5.1 General requirements

The material shall be made by suitably coating the base fabric with polyvinyl chloride. It shall be flexible and shall not have an unpleasant odour during usage. Base fabric shall be made up of natural or synthetic yarn.

5.2 Appearance

The material shall be of uniform surface finish and shall contain no bubbles, blisters and shall be substantially free from foreign matter. Edges shall be smooth and free from cuts.

5.3 Colour, Grain, Embossing & Finish

The colour, grain and finish of the material shall be as agreed between the purchaser and the supplier.

5.4 **Width**

The width of the material when measured in accordance with SLS 761 : Part 1 shall be as agreed to between the purchaser and the supplier.

5.5 **Length**

The length of the material when measured in accordance with SLS 761 : Part 1 shall be as agreed to between the purchaser and the supplier.

5.6 **Specific requirements**

The final material of Type A and Type B shall also comply with the requirements given in Table 1 and Table 2 respectively, when tested in accordance with the methods given therein.

TABLE 1 - Requirements for expanded PVC-coated fabrics for footwear industry (Type A)

Sl. no.	Characteristic	Requirement				Method of test
		Grade 1	Grade 2	Grade 3	Grade 4	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(i)	Thickness, mm	1.7 – 1.9	1.4 – 1.6	0.8 – 0.9	0.8 – 0.9	SLS 761 : Part 1
(ii)	Total mass, g/m², min.	1250	1000	750	550	SLS 761 : Part 1
(iii)	Breaking strength, min. kg/5-cm width					
	Warp direction	80.0	60.0	37.5	25.0	SLS 761 : Part 3
	Weft direction	65.0	35.0	25.0	20.0	
(iv)	Elongation at break %					
	Warp direction	10 – 20	10 – 20	20 – 30	20 – 30	SLS 761 : Part 3
	Weft direction	15 - 25	15 - 25	60 - 120	60 - 120	
(v)	Resistance to damage by flexing (No. of flexing cycles in thousands), min	100	100	40	40	SLS 761 : Part 4

TABLE 2 - Requirements for non-expanded PVC coated fabric for footwear industry (Type B)

Sl. no. (1)	Characteristic (2)	Requirement (3)			Method of test SLS (4)
		Grade 1	Grade 2	Grade 3	
(i)	Thickness, mm	0.8 – 1.0	0.6 - 0.9	0.5 – 0.6	SLS 761 : Part 1
(ii)	Total mass, g/m^2, min.	900	700	400	SLS 761 : Part 1
(iii)	Breaking strength, kg/5-cm, Width, min.				
	Warp direction	60.0	37.5	25.0	SLS 761 : Part 3
	Weft direction	35.0	25.0	20.0	
(iv)	Elongation at Break %				
	Warp direction	10 – 20	20 – 30	20 – 30	SLS 761 : Part 3
	Weft direction	15 – 25	60 – 120	60 – 120	
(v)	Resistance to damage by flexing (No. of flexing cycles in thousands), min.	150	40	40	SLS 761 : Part 4

5.7 **Coating**

The compound used for coating shall be made from suitably compounded vinyl chloride polymer or co-polymer. It shall be pigmented to meet specified colour requirements. The coating shall be uniformly applied on one side of the base fabric and shall be substantially free from pin holes, cracks and other flaws. It shall be on the back side of cotton base fabric in case of Grades 1 and 2. The coating shall satisfy the requirements given in **5.7.1** to **5.7.5**.

5.7.1 **Resistance to Cold**

The coating shall withstand a bending test around a 6-mm diameter steel pin without cracking after an exposure of one hour, at 0 ± 2 °C or lower as agreed between the purchaser and the supplier. The steel pin also shall be kept at the test temperature and the test shall be done as quickly as possible.

5.7.2 **Colour fastness to dry and wet rubbing**

The coating shall be tested for dry and wet rubbing as specified in CS 63. The sample shall be considered satisfactory when colour fastness of any test piece is greater than 4 on the grey scale for assessing change in colour.

NOTE : Metallic shades and printed material are not likely to withstand this test. If the test is required for metallic shades the number of abrading cycles shall be as agreed to between the purchaser and the supplier.

5.7.3 **Colour fastness to daylight**

Test pieces shall be tested for colour fastness to daylight as specified in SLS 62. Sample shall be considered satisfactory when colour fastness of any test piece is not less than 4 on the grey scale for assessing change in colour.

5.7.4 **Resistance to heat and loss of mass of coating on heating**

The coating shall not show any signs of exudation or stickiness when exposed to heat and loss of mass shall not be greater than 3 percent, when tested as specified in Appendix B.

5.7.5 **Stability at vulcanization temperature (Applicable only to shoe components used in hot air vulcanized shoes)**

A specimen of 100 cm^2 is kept in an air circulating oven, coated side facing upwards on a wire-mesh. After exposure for 55 minutes at 130 ºC, the specimen shall be removed very carefully along with the wire-mesh. It shall be cooled in the standard atmosphere for 30 minutes and examined. The coating surface shall not show any tackiness or any deterioration in shade, or blisters.

5.8 **Resistance to gelling**

A test specimen of convenient size shall be double folded (coated surface outer most) and dipped in acetone for 30 seconds. The specimen shall then be removed from acetone and laid on a surface with coated side upper most for drying in standard atmosphere. After drying coating shall be examined and shall not show any crack.

5.9 **Resistance to sulfide staining**

White and light coloured PVC material shall not stain when in contact with sulfur or sulfur containing shoe components or packaging material, when tested as prescribed in Appendix C.

5.10 **Adhesion of print (For printed PVC coated fabrics)**

The number of cycles to remove either the print pattern or any area of printed material shall be greater than 5 when examined as in Appendix D of SLS 795 : Part 1.

NOTE : In case of metallic and white printing inks adhesion of print shall be subject to the agreement between the purchaser and the supplier.

5.11 **Adhesion of coating**

The plies shall not separate more than 10 mm in a load of 27.5 N (2.75 kgf) in any of the test pieces taken when tested as prescribed in SLS 761 : Part 6.

6 PACKAGING AND MARKING

6.1 The material shall be securely packed in the form of a roll, minimum of 15 meters in length containing not more than 2 pieces. Short length shall not be less than 5 meters.

6.2 **Marking**

Each roll shall be marked with the following information.

a) Name of the material;

b) Name of the manufacturer;

c) Length of material, in metres;

d) Width of material, in centimeters;

e) Grade and Type of material and

f) Month and year of manufacture.

APPENDIX A
COMPLIANCE OF A LOT

The sampling scheme given in this Appendix should be applied where compliance of a lot to the requirements of the standard is to be assessed based on statistical sampling and inspection.

Where compliance with this standard is to be assured based on manufacturing control system coupled with type testing and check tests of any other procedure, appropriate schemes of sampling and inspection should be adopted.

A.1 LOT

In any consignment all the rolls of fabric of the same type and belonging to one batch of manufacture shall constitute a lot.

A.2 SCALE OF SAMPLING

A.2.1 The number of rolls to be selected from each lot shall be in accordance with Table 1.

Table 1 - Scale of sampling

No. of rolls in the lot (1)	No. of rolls to be selected (2)
Upto 15	2
16 – 35	3
36 – 50	4
51 and above	5

A.2.2 The rolls shall be selected at random. In order to ensure randomness of selection, tables of random numbers as given in SLS 428 shall be used.

A.3 NUMBER OF TESTS

A.3.1 Each roll selected as in A.2.1 shall be inspected for packaging (6.1) and marking (6.2) requirements.

A.3.2 Each roll selected as in A.2.1 shall be inspected for width (5.4) and length (5.5) requirements.

A.3.3 One piece shall be selected at random from each roll selected as in A.2.1 and a sample of size given in Figure 1 (Appendix D) shall be cut from each piece so selected and examined for appearance (5.2). Test specimens (see Note) shall be cut from each of these samples and tested for the requirements given in **5.6** to **5.11**.

NOTE : The method of selecting specimens from each sample shall be in accordance with Figure 1 of Appendix D.

A.4 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of this specification if the following conditions are satisfied :

A.4.1 Each roll inspected as in A.3.1 and A.3.2 satisfies the relevant requirements.

A.4.2 Each specimen examined for appearance as in A.3.3 satisfies the relevant requirements.

A.4.3 The value of the expression, $\bar{x} - 0.8s$ (see Note), calculated using the test results on total mass per unit area, breaking strength and elongation is not less than the specified value for each requirement.

A.4.4 The value of the expression, $\bar{x} + 0.8s$ (see Note), calculated using the test results on resistance to heat and loss of mass of coating on heating is not more than the specified value for each requirement.

NOTES :

1 Mean ($\bar{x}$) = $\dfrac{\text{Sum of the observed values}}{\text{Number of values}}$

2 Standard Deviation (s) = The positive square root of the quotient obtained by dividing the sum of squares of the deviations of the test results from their arithmetic mean by one less than the number of test results.

A.4.5 The test results on resistance to damage by flexing, coating adhesion, adhesion of print, resistance to sulfide staining, colour fastness to daylight and colour fastness to rubbing satisfy the relevant requirements.

A.4.6 The measured values of thickness satisfy the relevant requirements.

APPENDIX B

RESISTANCE TO HEAT AND LOSS OF MASS OF COATING ON HEATING

B.1 PROCEDURE

Cut two test specimens each of size 100 mm x 100 mm from the sample and conditioned in atmosphere 'A'.

Weigh, to the nearest milligram, the conditioned test pieces and suspend in a hot air circulating oven for 5 hours at 100 ºC. Cool and condition the test pieces once again in atmosphere 'A' (SLS 761 : Part 5). Weigh the test pieces to the nearest milligram.

B.2 CALCULATION

$$\text{Loss in mass, per cent} = \frac{(m_1 - m_2)}{m_1} x100$$

where,

m_1 = mass, in grams of the specimen taken for test; and
m_2 = mass, in grams, of the specimen after test

APPENDIX C

DETERMINATION OF RESISTANCE TO DISCOLOURATION BY SULFUR OR ITS COMPONENTS

C.1 PREPARATION OF TEST SOLUTION

Dissolve 11 g of hydrated sodium sulfide (Na_2S. 9 H_2O) in 200 ml of distilled water at room temperature. When solution is complete add, with stirring, 6 ml of concentrated hydrochloric acid, in portions of about 0.5 ml to allow the sulfur that is precipitated to re-dissolve after each addition. Use within four hours, and at a temperature of 20 ºC ± 2 ºC.

NOTE : Hydrogen sulfide, given off by the acidified solution is poisonous. The solution should therefore be prepared, and the test carried out, in a draught chamber.

C.2 TEST SPECIMEN

Cut two test specimen, about 50 mm x 50 mm.

C.3 **PROCEDURE**

Immerse the specimen in approximately 100 ml of the freshly prepared acidified sodium sulfide solution in a 250-ml beaker. Cover with a clock glass and stir occasionally.

After 30 minute immersion, remove the specimen, wash thoroughly in distilled water and absorb surplus water between filter papers.

Immediately compare the colour of the coating of the specimen, with a sample of the original material.
Test specimen shall not show any signs of a discoloration.

APPENDIX D
METHOD OF SELECTION OF TEST SPECIMENNS

The specimens for testing shall be selected from the sample in accordance with the scheme illustrated in Figure 1 which shows the positions from which the specimens for each type of test shall be taken, except that the specimens required for testing colour fastness to day light and resistance to discolouration by sulfur or its components shall be selected from any suitable portion of the sample.

Key

M	=	Mass determination (3 pieces, 50 mm x 50 mm)
Bs (l)	=	Breaking strength (longitudinal direction) (5 pieces, 200 mm x 50 mm)
Bs (t)	=	Breaking strength (transverse direction) (5 pieces, 200 mm x 50 mm)
E (l)	=	Elongation (longitudinal direction) (3 pieces, 450 mm x 50 mm)
E (t)	=	Elongation (transverse direction) (3 pieces, 450 mm x 50 mm)
Fl (l)	=	Flexing (longitudinal direction) (3 pieces,105 mm x 65 mm)
Fl (t)	=	Flexing (transverse direction) (3 pieces, 105 mm x 65 mm)
Rb	=	Colour fastness to rubbing (dry & wet) (4 pieces 230 mm x 50 mm)
P	=	Adhesion of print (2 pieces, 230 mm x 50 mm)
Vm	=	Loss of mass of coating on heating (2 pieces, 100 mm x 100 mm)
Ad	=	Coating adhesion (2 pieces, 200 mm x 75 mm)
D	=	Resistance to sulfide staining (2 pieces, 50 mm x 50 mm)

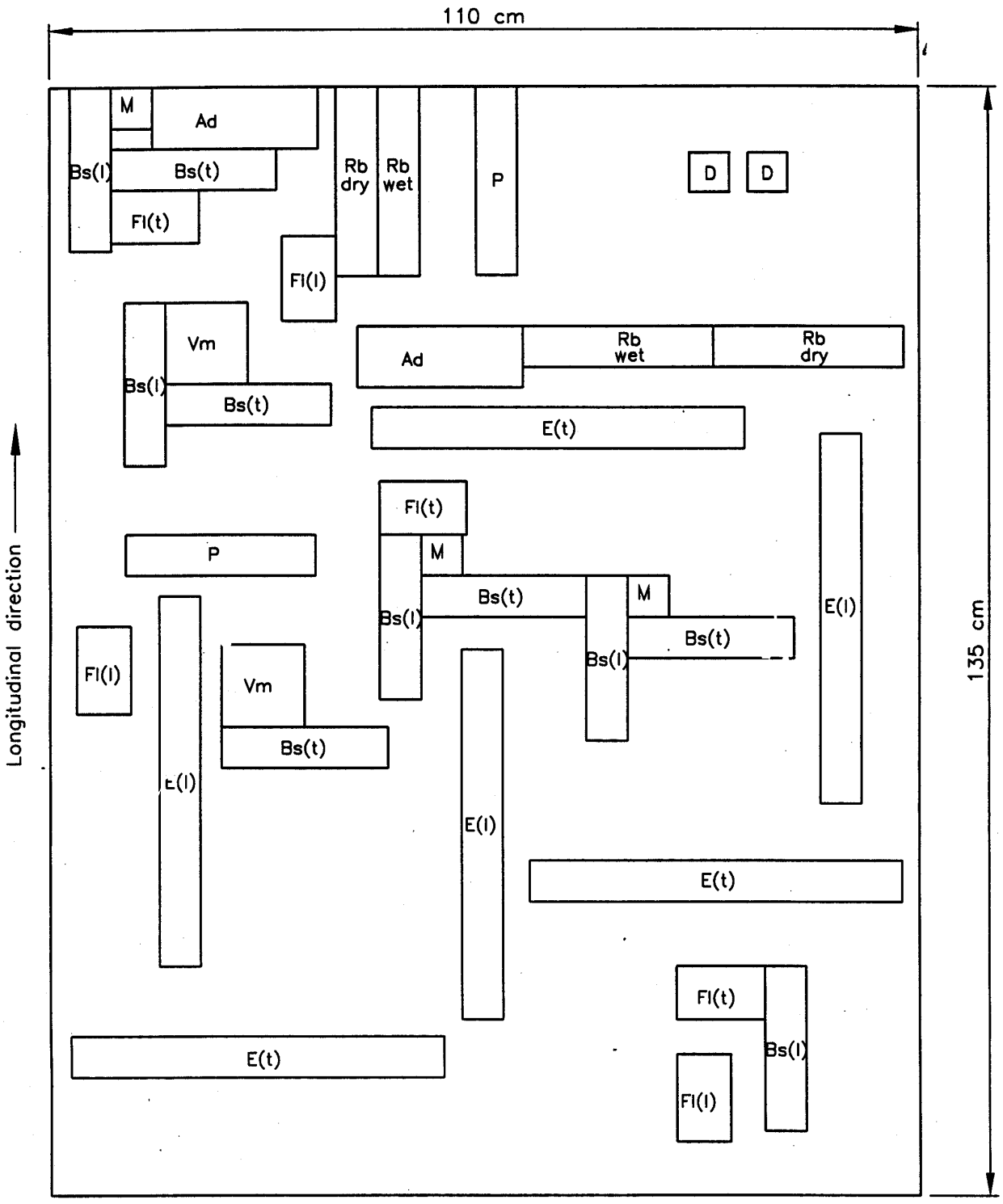

FIGURE 1 - Scheme for selection of test specimens

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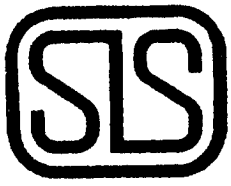

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