SRI LANKA STANDARD 1066 : 1995

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SPECIFICATION FOR RADIATOR HOSES

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standard
SPECIFICATION FOR RADIATOR HOSES

SLS 1066 : 1995

Gr. 7

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Sri Lanka

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

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

Sri Lanka Standard
SPECIFICATION FOR RADIATOR HOSES

FOREWORD

This standard was finalized by the Sectoral Committee on Polymers and Polymer Products and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 1995-07-20.

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 an 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.

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.

In the preparation of this specification, the assistance derived from the following publications is gratefully acknowledged:

i) JIS D 2602 : 1977 - Water hose for Automobiles.
ii) JIS K 6301 : 1975 - Physical testing methods of vulcanized rubber.
iii) JIS K 6330 : 1982 - Testing methods for rubber hoses.
iv) IS 2765 : 1964 - (Reprinted May 1977) - Radiator hoses.

1 SCOPE

This standard prescribes the requirements and methods of test for radiator hoses used in automobiles.

2 REFERENCES

CS 102 Presentation of numerical values
SLS 297 Methods of testing vulcanized rubber
Part 2 : Tensile stress-strain properties
Part 4 : Hardness
Part 5 : Accelerated ageing
SLS 428 Random sampling methods

3 TYPES

Radiator hoses shall be of two types :

Type 1 - External reinforcement type (hose with reinforcement layer on its outer surface).
Type 2 - Internal reinforcement type (hose with reinforcement layer between inner and outer rubber linings).

4 REQUIREMENTS

4.1 Material

4.1.1 *Rubber lining*

The rubber lining shall be seamless, uniform, free from air bubbles and other surface defects. The compound used for the rubber lining shall comply with requirements given in Table 1 when tested in accordance with the methods given in Column 4 of the table.

NOTE

The physical properties should be tested only when required by the purchaser.

4.1.2 Test pieces required for determination of characteristics given in Table 1 shall be prepared from a sample drawn from the same batch of rubber compound used for moulding of radiator hoses and valcanized under identical conditions as the radiator hoses supplied by the manufacturer (see A.2.4).

Table 1 - Requirements for the rubber compound

Sl No. (1)	Characteristic (2)	Requirement (3)	Method of Test (4)
(i)	Tensile strength, MPa, min.	8	SLS 297 : Part 2
(ii)	Elongation at break, per cent, min.	300	SLS 297 : Part 2
(iii)	Hardness, IRHD	60 to 75	SLS 297 : Part 4
(iv)	Heat ageing at 120°C for 70 h.		SLS 297 :Part 5
	(a) Change in tensile strength, per cent, max.	-20	
	(b) Change in elongation at break, per cent, max.	-30	
	(c) Change in hardness, per cent, max.	+15	
(v)	Oil resistance as change in mass, per cent, max.	50	Appendix B

4.1.2 *Reinforcement plies*

The reinforcement plies shall be of woven fabric or braided yarn made out of cotton, rayon, polyester or polyamide.

4.2 **Shape**

The shape of the radiator hoses shall be straight or bent.

4.3 **Dimensions**

4.3.1 *Internal diameter*

The internal diameter of the radiator hose and the corresponding tolerance shall be as specified in Table 2.

Table 2 - Internal diameter and corresponding tolerance of radiator hoses

Internal diameter mm	Tolerance mm
5.5	+ 0.2 - 0.4
7.5	
9	
12	+ 0.3 - 0.5
13	
16	
20	+ 0.4 - 0.6
21	
22	
24	
25	
27	
28	
30	+ 0.5 - 0.7
33	
34	
37	
39	
44	+ 0.5 - 1.2
49	
54	
59	
64	
69	
74	

4.3.2 *Thickness*

The thickness of the radiator hose and the corresponding tolerance shall be as specified in Table 3.

Table 3 - Thickness and the tolerance of radiator hoses

Thickness, min, mm	Tolerance, mm
	Types 1 and 2
3	± 0.5
3.5	
4	
4.5	± 0.7
5	± 0.8
6	± 1.0

NOTE

The tolerances for internal diameter and thickness shall apply only to the straight part of the tube.

4.4 Performance characteristics

The radiator hoses shall comply with the requirements given in Table 4 when tested in accordance with the methods given in Column 6.

Table 4 - Performance characteristics of radiator hoses

Sl No.	Characteristic	Requirement		Method of Test
		Type 1	Type 2	
(1)	(2)	(3)	(4)	(5)
(i)	Hydraulic pressure test as change in outside diameter, per cent, max.	15	15	Appendix C
(ii)	Bursting strength, min, kPa.	785	590	Appendix D
(iii)	Adhesion strength between rubber lining and fabric min, N/mm.	12	12	Appendix E
(iv)	Heat ageing at 120°C for 70 h.	No cracks or any other defects		Appendix F

5. PACKAGING AND MARKING

5.1 Packaging

Packaging shall be done as agreed to between the purchaser and the supplier.

5.2 Marking

Each radiator hose shall be legibly or indelibly marked or labelled with the following :

a) Name and address of the manufacturer including the country of origin;
b) Trade name;
c) Batch or code number;
d) Internal diameter and the type; and
e) Year of manufacture.

NOTE

Attention is drawn to the certification marking facilities offered by the Sri Lanka Standards Institution. See the inside back cover of this standard.

6 METHODS OF TEST

Tests shall be carried out in accordance with the methods given in SLS 297 : Parts 2, 4 and 5 and Appendices B to F of this specification.

APPENDIX A
COMPLIANCE OF A LOT

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

Where compliance with this standard is to be assured based on manufacturer's control systems coupled with type testing and check tests or any other procedure, appropriate scheme of sampling and inspection should be adopted.

A.1 LOT

In any consignment, all radiator hoses of the same dimensions belonging to one batch of supply or manufacture shall constitute a lot.

A.2 SCALE OF SAMPLING

A.2.1 Samples shall be tested for each lot for ascertaining its conformity to the requirements of this specification.

A.2.2 The number of radiator hoses to be selected from a lot shall be in accordance with Table 5.

TABLE 5 - Scale of sampling

Number of radiator hoses in the lot (1)	Number of radiator hoses to be selected (2)
Up to 50	4
51 to 90	5
91 to 150	7
151 and above	10

A.2.3 The radiator hoses shall be selected at random. In order to ensure randomness of selection random numbers as given in SLS 428 shall be used.

A.2.4 In order to test for physical requirements (see Note) moulded test sheet of the same composition and vulcanized under the same conditions as the radiator hoses of the lot shall be provided by the manufacturer with the lot.

NOTE

This parameter should be tested only when required by the purchaser.

A.3 NUMBER OF TESTS

A.3.1 Each radiator hose selected as in A.2.2 shall be inspected for marking requirements.

A.3.2 Each radiator hose selected as in A.2.2 shall be measured for internal diameter and the thickness.

A.3.3 Four radiator hoses selected as in A.2.2 shall be tested as follows:

(a) One hose shall be tested for hydraulic pressure.
(b) Another hose shall be tested for burst strength.
(c) The third hose shall be tested for adhesion.
(d) The fourth hose shall be tested for ageing.

A.3.4 If requested, by the producer moulded test sheet obtained as in A.2.4 shall be tested for physical requirements for rubber compound.

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 radiator hose inspected as in A.3.1 satisfies the relevant requirements.

A.4.2 The values of the expressions $\bar{x} - 1.1s$ and $\bar{x} + 1.1s$ calculated using the test results on measurement of internal diameter and thickness, lie between the specified values.

A.4.3 Four radiator hoses tested as in A.3.3 satisfy the following:

(a) The value of the expression $\bar{x} + 1.1s$ calculated using the test results on measurement of hydraulic pressure is not greater than the specified value.

(b) The value of the expression $\bar{x} - 1.1s$ calculated using the test results on measurement of burst strength and adhesion strength is not less than the specified value.

(c) The radiator hose tested for ageing satisfies the relevant requirement.

A.4.4 The moulded test sheet tested as in A.3.4 satisfy the relevant requirements.

NOTES

1) Mean ($\bar{x}$) = The sum of values of the observations divided by the number of observations.

2) Standard deviation (s) = The positive square root of the quotient obtained by dividing the sum of squares of the deviations of the observations from their mean by one less than the number of observations in the sample.

APPENDIX B
OIL IMMERSION TEST

B.1 MATERIAL

B.1.1 Acetone

B.1.2 Mineral oil, conforming to the following requirements.

Kinematic viscosity at 37.8°C	32 + 1 Cst
Aniline point	69.5° + 1°C
Flash point	165° + 3°C

B.2 PREPARATION OF TEST PIECES

Cut rectangular rubber strips of size 50 mm X 25 mm having a thickness not more than 1.5 mm. Buff both faces only to the extent necessary to ensure smoothly buffed faces.

B.3 PROCEDURE

Weigh the test pieces to the nearest milligram. Immerse the test pieces completely in the mineral oil and allow to stand for 70 hours at 100°C. Avoid excessive evaporation by filling the container loosely with a cork stopper. Remove the test pieces from the oil, cool to room temperature in a fresh sample of the same liquid for 30 to 60 minutes. Dip each test piece in acetone and blot lightly with filter paper. Immediately reweigh the test pieces.

B.4 CALCULATION

$$\text{Change in mass, per cent} = \frac{m_1 - m_o}{m_o} \times 100$$

Where,

m_1 is the mass of the test piece, in g, after immersing in mineral oil; and

m_o is the mass of the test piece in g, before immersing.

APPENDIX C
HYDRAULIC PRESSURE TEST

C.1 APPARATUS

C.1.1 Pressure Application Device

C.2 PROCEDURE

Take approximately one metre length of the radiator hose. Close one end and fill the hose with water . Mark lines of 500-mm interval at the middle of the hose as shown in Figure 1. Measure the outside diameter at a defined point between the marked lines.

Apply internal pressure upto 98 kPa using the pressure application device (C.1.1). Maintain this pressure for 5 minutes and examine the presence of abnormalities such as leakages and local swelling. Decrease the internal pressure till it reaches zero and leave for 10 minutes at that stage. Measure the outside diameter.

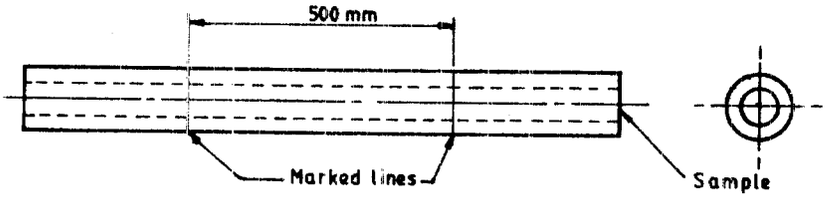

FIGURE 1 - Sample of radiator hose

C.3 CALCULATION

$$\text{Change in outside diameter, per cent} = \frac{D_2 - D_1}{D_1} \times 100$$

Where,

D_1 is the outside diameter, in mm, before applying pressure; and
D_2 is the outside diameter, in mm, after subjecting to the maximum pressure.

APPENDIX D
DETERMINATION OF BURSTING STRENGTH

D.1 APPARATUS

An equipment which permits the application of controlled internal pressure to the test specimen.

D.2 PROCEDURE

Take approximatly one metre length of the radiator hose and close at one end. Apply an internal pressure between 980 kPa and 1960 kPa so that the bursting occurs within a period of one to two minutes. Measure the bursting pressure.

APPENDIX E
DETERMINATION OF ADHESION STRENGTH

E.1 APPARATUS

E.1.1 Tensile testing machine.

E.2 PREPARATION OF THE TEST PIECE

Insert a wooden column into the radiator hose and cut a uniform, ring-shaped test piece of length 20.0 $\pm$ 0.5 mm. The cut end shall be at right angles to the direction of the axis. If the internal diameter of the ring-shaped test piece exceeds 100 mm, cut it open to prepare the strip-shaped (Figure 2) test piece.

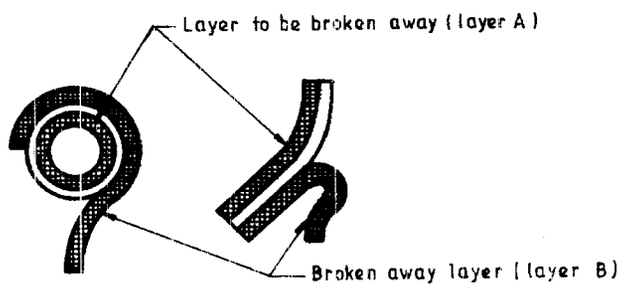

FIGURE 2 - Ring-shaped and strip-shaped test pieces

E.3 PROCEDURE

E.3.1 Fix one end of the test piece (Layer A) to the one jaw of the tensile testing machine (E.1.1). In case of strip-shaped test piece, fix layer B to the other jaw of the tensile testing machine so that layers A and B make an angle of about 180°. In case of ring-shaped test piece, insert a wooden column into the test piece, so that layers A and B make an angle of about 90° with the tangent to the layer A at a spot where the layer B breaks away and the reaction of breaking away makes an angle of 90° to the axis of the rotation.

E.3.2 Run the tensile testing machine at a constant cross-heads speed of (a) 50 mm/min for strip-shaped test pieces and (b) 25 mm/min for ring-shaped test pieces.

* Record the load required to separate the components.

NOTE

If tearing-off of rubber occurs during the test, make a cut with a small knife and continue the test.

E.4 CALCULATION

$$\text{Adhesion strength N/mm} = \frac{W}{l}$$

where,
W is the peeling load in N; and
l is the width of the test piece in mm.

Report the adhesion strength as the average of six values.

APPENDIX F
HEAT AGEING TEST

F.1 APPARATUS

F.1.1 Air-oven, thermostatically controlled at 120° ± 2°C.

F.2 PROCEDURE

Cut a suitable straight length of the radiator hose and age at 120° ± 2°C for 70 hours in an air-oven (**F.1.1**) as prescribed in **SLS 297 : Part 5.** Leave at room temperature for about 3 hours. Bend the sample rapidly to an angle of about 90° as shown in Figure 3 and examine for any cracks and other defects.

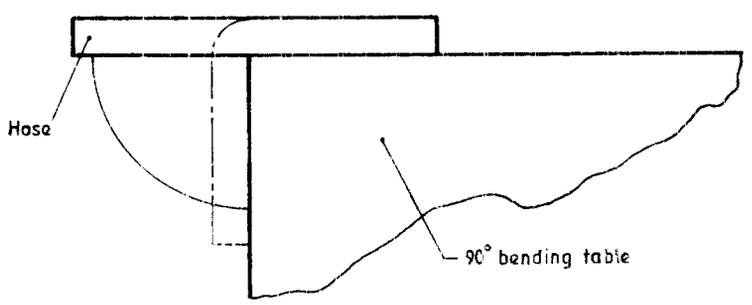

FIGURE 3 - Bending of the Sample

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SRI LANKA STANDARDS INSTITUTION

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