SRI LANKA STANDARD 930 : 2003

UDC 632.95 : 595.77

SPECIFICATION FOR
MOSQUITO MATS
(FIRST REVISION)

SRI LANKA STANDARDS INSTITUTION

SPECIFICATION FOR MOSQUITO MATS (FIRST REVISION)

SLS 930 : 2003
(Attached AMD No.1 and 2)

Gr. 8

SRI LANKA STANDARDS INSTITUTION
No. 17, Victoria Place,
Elvitigala Mawatha,
Colombo – 08.
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 MOSQUITO MATS
(FIRST REVISION)

FOREWORD

This standard was approved by the Sectoral Committee on Chemicals and Polymer Technology and was authorized for adoption and publication as a Sri Lanka Standard by the Council of Sri Lanka Standards Institution on 2003-03-24.

This specification was first published in 1991. In this first revision synthetic pyrethroids have been recommended as active ingredients.

This specification is subject to the provisions of the Control of Pesticides Act No. 33 of 1980 and the regulations framed thereunder.

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.

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

MS 1044 : 1986 Malaysian Standard Specification Mosquito Mats
Part 1 : Physical and Chemical requirement
Part 2 : Method for the evaluation of biological efficacy

1 SCOPE

This specification prescribes the requirements and methods of sampling and test for mosquito mats to be used with an electrical vaporizer to vaporize the active ingredient.

2 REFERENCES

CS 102 Presentation of numerical values.
SLS 428 Random sampling methods.

3 DEFINITIONS

For the purpose of this specification, the following definitions shall apply:

3.1 knock-down : Rapid paralysis of insects due to the effect of an insecticide where they no longer maintain their normal posture but lie on their back or sides, showing movements.

3.1.2 *KT 95 value* **:** Knockdown time for 95 per cent of test insects under test conditions.

3.2 moribund : Test insects in a dying state showing signs of life which are incapable of locomotion.

3.3 mortality : Number of insect deaths in a given period.

4 REQUIREMENTS

4.1 Active ingredients

A mosquito mat shall contain d-allethrin, d-trans allethrin, or prallethrin approved by Registrar of pesticides. Recommended levels for 8 hrs. duration are in Table **1**. It may contain suitable quantities of other synthetic pyrethroids having an equivalent degree of biological efficacy to the standard mat, when tested by the method prescribed in Appendix **E**.

TABLE 1 – Active Ingredients of Mosquito Mats

Sl No. (1)	Active ingredient (2)	Active ingredient content per mat, min (3)	Method of test (4)
i)	d – allethrin	40 mg	Appendix **B**
ii)	d – trans allethrin	20 mg	Appendix **C**
iii)	prallethrin	08 mg	Appendix **D**

NOTE

Any active ingredient other than above registered under the Control of Pesticides Act shall also be permitted at prescribed level for use in the manufacture of mosquito mats. . Test methods for such active ingredients shall be those submitted and accepted for the registration of the product.

4.2 Other materials

Perfume, dyestuff, stabilizers, synergists and release controllers approved by Registrar of Pesticides may be added to the mosquito mats.

4.3 Size

The size of a mat shall be 22 mm x 35 mm. The tolerance on the width and the length shall be ± 0.20 mm .

4.4 Performance characteristics

When a mat is heated continuously on an electric vaporizer for minimum 8 hours, or for the duration claimed it shall evaporate sufficient quantity of active ingredient which shall be equal or more effective in biological efficacy, than that achieved by the standard mat for that specified period.

5 PACKAGING AND MARKING

5.1 Each mosquito mat shall be suitably sealed to prevent volatalization of the active ingredient and to prevent contamination of the mats.

5.2 Each package shall be legibly and indelibly marked or labelled with the following :

a) Name of the product ;
b) Name and address of the holder of the licence under the control of Pesticides Act, No. 33 of 1980 ;
c) Registered trade mark/trade name, if any ;
d) Batch or code number ;
e) Date of manufacture ;
f) Number of mats in the package ;
g) Common name of the active ingredient and its content ;
h) Directions for use ; and
j) Shelf life.

5.3 A number of such packages shall be suitably packed in a carton. Each carton shall be legibly and indelibly marked with the following :

a) Name of the product ;
b) Name and address of the holder of the licence under the control of Pesticides Act, No. 33 of 1980 ;
c) Registered trade mark/trade name, if any; and
d) Number of packages.

NOTE

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

6. METHOD OF TEST

6.1 Tests shall be carried out as prescribed in Appendices **B** to **E** of this specification.

6.2 During analysis, unless otherwise stated, reagents of analytical grade and distilled water or water of equivalent purity shall be used.

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 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 test or any other procedure, appropriate schemes of sampling and inspection should be adopted.

A.1 LOT

In any consignment all the packages of mosquito mats belonging to one batch of manufacture or supply shall constitute a lot.

A.2 SCALE OF SAMPLING

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

A.2.2 The number of packages to be selected from a lot shall be in accordance with Table **2**.

TABLE 2 - Scale of sampling

Number of packages in the lot (1)	Number of packages to be selected (2)
Up to 100	5
101 to 200	6
201 to 300	7
301 to 500	8
501 and above	10

A.2.3 The packages 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 package selected as in **A.2.2** shall be inspected for packaging and marking requirements.

A.3.2 A mat from each package inspected as in **A.3.1** shall be measured for size requirements.

A.3.3 Sufficient number of mats from each package inspected as in **A.3.1** shall be tested for the requirement given in **4.1** and **4.4**.

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 package inspected as in **A.3.1** satisfies the relevant requirements.

A.4.2 The values of the expressions $\bar{x} - 1.1s$ and $\bar{x} + 1.1s$ (see Notes) calculated using the test results on size lie between the specified values of the 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 deviations of the observations from their mean by one less than the number of observations in the sample.

A.4.3 The mats tested as in **A.3.3** satisfy the relevant requirements.

APPENDIX B
DETERMINATION OF D-ALLETHRIN

B.1 PRINCIPLE

d-allethrin is extracted with acetone from mat and then determined by gas chromatograph equipped with flame ionization detector (FID).

B.2 APPARATUS

B.2.1 Balance weighing accurately up to 1 mg or less

B.2.2 Mechanical shaker

B.2.3 Micro-litre syringe, 5-10 µl capacity

B.2.4 Gas chromatograph
Equipped with a flame ionization detector and coupled to a printer or an integrator or a data processor or a computer. Indicative operating parameters as follows ;

Column : *Glass, meter in length and 3 mm i.d, packed with 10 per cent OV 101 on Chromosorb WHP (80-100 mesh)*

Temperature : *Column Oven – 200 ^0C ; Injector – 260 ^oC ; Detector 260 ^0C*

Gases : *N_2 – 30 ml/min ; H_2 – 30 ml/min; Air –300 ml/min*

NOTE :

Operating parameters of the GC should be validated with reference materials/standards.

B.3 REAGENTS

B.3.1 Acetone –AR grade

B.3.2 Internal standard : n-di butyl phthalate

B.4 PROCEDURE

B.4.1 Preparation of Internal Standard Solution

Weigh accurately about 0.1 g of n- dibutyl phthalate in a 25 ml volumetric flask, dissolve and dilute to volume with acetone. This will give a solution of 4.0 mg/ml of n-dibutyl phthalate.

B.4.2 Preparation of standard allethrin solution

Weigh, accurately about 0.1 g of d-allethrin into a 25-ml volumetric flask, dissolve and dilute to volume with acetone. This will give a solution of 4.0 mg/ml of d-allethrin.

B.4.3 Preparation of working standard solution

Pipette 10 ml of d-allethrin standard solution (**B.4.2**) into 25 ml of volumetric flask. Add 10 ml of internal standard solution (**B.4.1**) by a pipette and dilute to mark with acetone. Dilute 10 times before injecting.

B.4.4 Preparation of sample solution.

Take 01 mat into stoppered conical flask. Add 10 ml of internal standard and 15 ml of acetone by a pipette. Sonicate for 30 minutes. Dilute 10 times before injecting.

B.4.5 Estimation

Inject 2 µl of each the standard solution and sample solution. Measure the peak heights/areas of the internal standard and d-allethrin both in the standard and sample solutions.

B.5 CALCULATION

B.5.1 Calculate the relative response factor for each injection of the working standard solution and take the mean.

$$\text{Relative response factor} = \frac{A}{B \times m_1 \times P}$$

where,

A is the peak height/area of d-allethrin, in the working standard solution;

B is the peak height/area of n-di buty1 phthalate, in the working standard solution;

m_1 is the mass, in milligrams, of d-allethrin, in the working standard solution ; and

P is the percentage purity of analytical standard.

B.5.2 Calculate the d-allethrin content of the sample as follows :

$$\text{d-allethrin content, per mat} = \frac{E}{R \times D}$$

where,

E is the mean peak height/area of d-allethrin, in the sample solution ;

R is the mean relative response factor ; and

D is the mean peak height/area of n-dibuty1 phthalate, in the sample solution.

APPENDIX C
DETERMINATION OF D- TRANS ALLETHRIN

C.1 PRINCIPLE

d- trans allethrin is extracted with acetone from mat and then determined by gas chromatograph equipped with flame ionization detector (FID).

C.2 APPARATUS

C.2.1 Balance weighing accurately up to 1 mg or less

C.2.2 Mechanical shaker

C.2.3 Micro-litre syringe, 5-10 µl capacity

C.2.4 Gas chromatograph
Equipped with a flame ionization detector and coupled to a printer or an integrator or a data processor or a computer. Indicative operating parameters as follows ;

Column : *Glass, meter in length and 3 mm i.d, packed with 10 per cent OV 101 on Chromosorb WHP (80-100 mesh)*

Temperature : *Column Oven – 200 ^{0}C ; Injector – 260 ^{o}C ; Detector 260 ^{0}C*

Gases : *N_2 – 30 ml/min ; H_2 – 30 ml/min; Air –300 ml/min*

NOTE :

Operating parameters of the GC should be validated with reference materials/standards.

C.3 REAGENTS

C.3.1 Acetone –AR grade

C.3.2 Internal standard : n-di butyl phthalate

C.4 PROCEDURE

C.4.1 Preparation of Internal Standard Solution

Weigh accurately about 0.1 g of n- dibutyl phthalate in a 25 ml volumetric flask, dissolve and dilute to volume with acetone. This will give a solution of 4.0 mg/ml of n-dibutyl phthalate.

C.4.2 Preparation of standard allethrin solution

Weigh, accurately about 0.1 g of d-trans allethrin into a 25-ml volumetric flask, dissolve and dilute to volume with acetone. This will give a solution of 4.0 mg/ml of d- trans allethrin.

C.4.3 Preparation of working standard solution

Pipette 5 ml of d-trans allethrin standard solution (C**.4.2**) into 25 ml of volumetric flask. Add 5 ml of internal standard solution (C**.4.1**) by a pipette and dilute to mark with acetone. Dilute 5 times before injecting.

C.4.4 Preparation of sample solution.

Take 01 mat into stoppered conical flask. Add 5 ml of internal standard and 20 ml of acetone by a pipette. Sonicate for 30 minutes. Dilute 5 times before injecting.

C.4.5 Estimation

Inject 2 µl of each the standard solution and sample solution. Measure the peak heights/areas of the internal standard and d- trans allethrin both in the standard and sample solutions.

C.5 CALCULATION

C.5.1 Calculate the relative response factor for each injection of the working standard solution and take the mean.

$$\text{Relative response factor} = \frac{A}{B \times m_1 \times P}$$

where,

A is the peak height/area of d-trans allethrin, in the working standard solution;

B is the peak height/area of n-dibuty1 phthalate, in the working standard solution;

m_1 is the mass, in milligrams, of d- trans allethrin, in the working standard solution ; and

P is the percentage purity of analytical standard.

C.5.2 Calculate the d-trans allethrin content of the sample as follows :

$$\text{d-trans allethrin content, per mat} = \frac{E}{R \times D}$$

where,

E is the mean peak height/area of d- trans allethrin, in the sample solution ;

R is the mean relative response factor ; and

D is the mean peak height/area of n-dibuty1 phthalate, in the sample solution.

APPENDIX D
DETERMINATION OF PRALLETHRIN

D.1 PRINCIPLE

Prallethrin is extracted with acetone from mat and then determined by gas chromatograph equipped with flame ionization detector (FID).

D.2 APPARATUS

D.2.1 Balance weighing accurately up to 1 mg or less

D.2.2 Mechanical shaker

D.2.3 Micro-litre syringe, 5-10 µl capacity

D.2.4 Gas chromatograph

Equipped with a flame ionization detector and coupled to a printer or an integrator or a data processor or a computer. Indicative operating parameters as follows ;

Column : *Glass, meter in length and 3 mm i.d, packed with 10 per cent OV 101 on Chromosorb WHP (80-100 mesh)*

Temperature : *Column Oven – 200 ^0C ; Injector – 260 ^oC ; Detector 260 ^0C*

Gases : *N_2 – 30 ml/min ; H_2 – 30 ml/min; Air –300 ml/min*

NOTE :

Operating parameters of the GC should be validated with reference materials/standards.

D.3 REAGENTS

D.3.1 Acetone –AR grade

D.3.2 Internal standard : n-benzyl butyl phthalate

D.4 PROCEDURE

D.4.1 Preparation of Internal Standard Solution

Weigh accurately about 0.05 g of n-benzyl butyl phthalate in a 25 ml volumetric flask, dissolve and dilute to volume with acetone. This will give a solution of 2.0 mg/ml of n-benzyl butyl phthalate.

D.4.2 Preparation of standard Prallethrin solution

Weigh, accurately about 0.05 g of prallethrin into a 25-ml volumetric flask, dissolve and dilute to volume with acetone. This will give a solution of 2.0 mg/ml of prallethrin.

D.4.3 Preparation of working standard solution

Pipette 5 ml of prallethrin standard solution (**D.4.2**) into 25 ml of volumetric flask. Add 5 ml of internal standard solution (**D.4.1**) by a pipette and dilute to mark with acetone.

D.4.4 Preparation of sample solution.

Take 01 mat into stoppered conical flask. Add 5 ml of internal standard and 20 ml of acetone by a pipette. Sonicate for 30 minutes.

D.4.5 Estimation

Inject 2 µl, of each the standard solution and sample solution. Measure the peak heights/areas of the internal standard and prallethrin both in the standard and sample solutions.

D.5 CALCULATION

D.5.1 Calculate the relative response factor for each injection of the working standard solution and take the mean.

$$\text{Relative response factor} = \frac{A}{B \times m_1 \times P}$$

where,

A is the peak height/area of prallethrin, in the working standard solution;

B is the peak height/area of n-benzyl buty1 phthalate, in the working standard solution;

m_1 is the mass, in milligrams, of prallethrin, in the working standard solution ; and

P is the percentage purity of analytical standard.

B.5.2 Calculate the prallethrin content of the sample as follows :

$$\text{prallethrin content, per mat} = \frac{E}{R \times D}$$

where,

E is the mean peak height/area of prallethrin, in the sample solution ;

R is the mean relative response factor ; and

D is the mean peak height/area of n-benzyl buty1 phthalate, in the sample solution.

APPENDIX E
DETERMINATION OF BIOLOGICAL EFFICACY

E.1 PREPARATION OF STANDARD MOSQUITO MAT

E.1.1 Blank mosquito mats

Size of the blank mat shall be 22mm x 35mmx 2.8mm and weight shall be 800mg to 860 mg

E.1.2 Standard solution

E.1.2.1 *Composition*

d – trans allethrin	20.0 mg
Piperonyl butoxide	35.0 mg
Dibutyl hydroxyl toluene	3.0 mg

E.1.2.2 *Preparation*

Dissolve the required quantities of the above materials (E**.1.2.1**) in a suitable quantity of low aromatic white spirit(AR grade acetone) in a volumetric flask to contain 20 mg of d – trans allethrin in the resultant solution.

E.1.3 Procedure

Inject standard solution (E**1.2**) containing 20 mg of d – trans allethrin into a blank mat by means of a micro syringe. Seal the mat immediately in an aluminium foil.

E.2 APPARATUS AND TEST MOSQUITOES

E.2.1 Glass chamber, of 70 cm x 70 cm x 70 cm in size (see **Fig. 1**).

E.2.2 Electric vaporizer

E.2.3 Test mosquitoes, twenty, sucrose-fed female mosquitoes aged 2 days to 10 days, from the established laboratory strains of ***Culex quinquefasciatus***

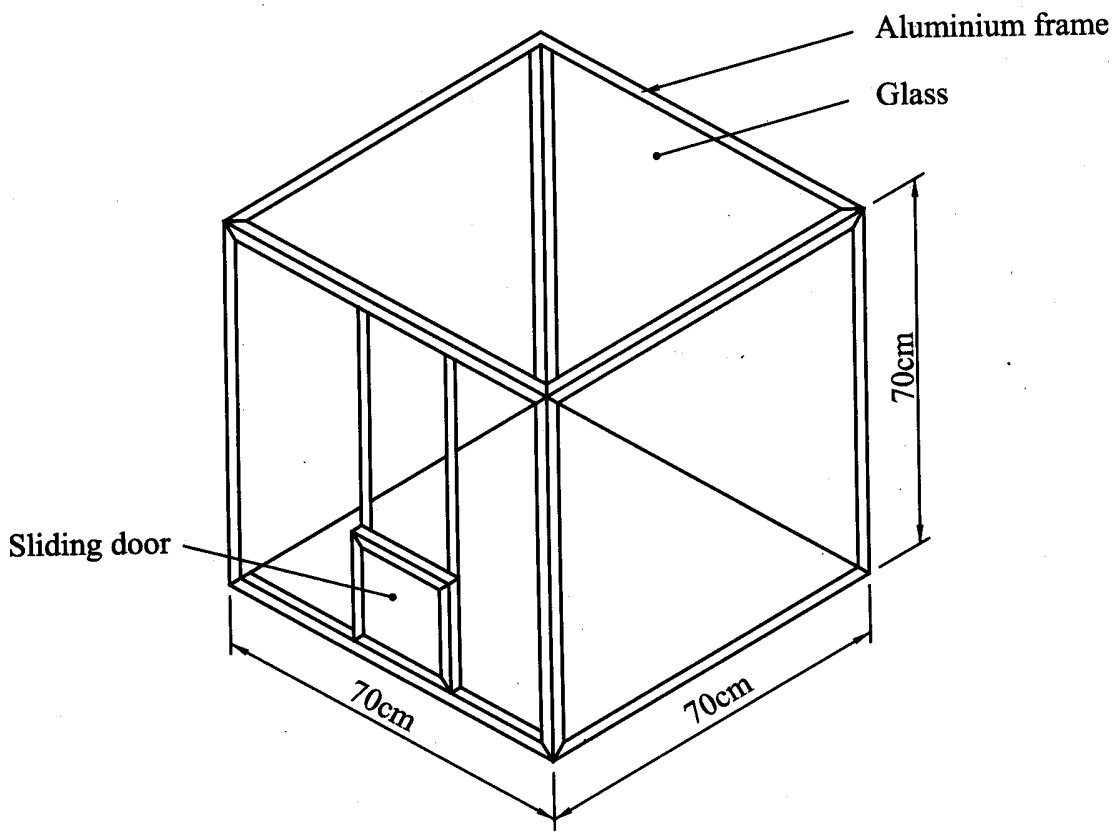

FIGURE 1 - Construction and dimensions of the glass chamber

E.3 PROCEDURE

E.3.1 Place the standard mosquito mat (E**.1**) on the steel plate of the electric vaporizer (E**.2.2**). Allow the mat to heat outside the glass chamber but well away from the test insects for 30 minutes. Introduce the vaporizer with the heated mat into the glass chamber (E**.2.1**) (see Note). Close the chamber door and continue the heating for 3 minutes. Remove the vaporizer and the mat from the chamber. Allow the mat to be heated continuously in a similar manner outside the chamber and well away from the test insects (see E**.2.3**).

NOTE

Clean the glass chamber thoroughly before use.

E.3.2 After the heated mat is removed from the chamber, introduce 20 sucrose-fed female mosquitoes (E**.2.3**) into the chamber. Count the number of knock-down mosquitoes every minute upto ten minutes. Pick up the knock-down mosquitoes and place them in a clean container with a lid containing cotton wool dipped in 5 per cent (m/V) sucrose solution. Keep the mosquitoes in a room with a temperature of 27 ± 2 ^{0}C and relative humidity between 50 per cent to 90 per cent. After 24 hours, examine the mosquitoes for mortality.

E.3.3 Repeat the above procedure using the same mat continuously heated for 1-hour, 4-hour and 8-hour periods and for the duration claimed .

E.3.4 Repeat the test three times .

E.3.5 Carrry out the above procedure (E**.3.1** to **E.3.4**) three times, using the mosquito mat under investigation and take the mean.

E.3.6 The knockdown data obtained are analyzed by probit analysis using probit paper or digital computer programme.

E**.3.7** A control test shall be carried out at the same time.

E.4 INTERPRETATION OF RESULTS

The results obtained for the mosquito mats under investigation in terms of knockdown value the respective mean of KT95 shall be equal or more effective in biological efficacy than that achieved by the standard mosquito mat.

……..

AMD NO 395

AMENDMENT NO: 01 APPR0VED ON 2009-08-26 TO SLS 930 : 2003

AMENDMENT NO: 01 TO SLS 930 : 2003
SRI LANKA STANDARD SPECIFICATION FOR MOSQUITO MATS
(First Revision)

EXPLANATORY NOTE

This amendment is issued to exclude the limitation for burning time of the mosquito mat, since the consumer demand has been identified for different burning times such as 2 hours, 5 hours, 7 hours, 12 hours etc.

AMD 395

AMENDMENT NO: 01 APPR0VED ON 2009-08-26 TO SLS 930 : 2003

SRI LANKA STANDARD SPECIFICATION FOR MOSQUITO MATS (First Revision)

4 REQUIREMENTS

4.4 Performance characteristics

Delete the text given in **4.4** and substitute the following :

" When a mat is heated continuously on an electric vapourizer for the duration declared by the manufacturer, it shall evaporate sufficient quantity of active ingredient which shall be equal or more effective in biological efficacy, than that achieved by the standard mat for that specified period, when tested by the method prescribed in Appendix **E**.

5 PACKAGING AND MARKING

Insert the following.

" k) Minimum burning time of a mat."

Amendment No: 02 approved on 2013-10-02 to SLS 930 : 2003

SRI LANKA STANDARD SPECIFICATION FOR MOSQUITO MATS
(*First Revision*)

5 PACKAGING AND MARKING

Delete the text in **5.2 e)** and substitute with the following :

"Month and Year of manufacture"

Delete the text in **5.2 j)** and substitute with the following :

" Shelf life / best before"

SRI LANKA STANDARDS INSTITUTION

The Sri Lanka Standards Institution (SLSI) is the National Standards Organization of Sri Lanka established under the Sri Lanka Standards Institution Act No. 6 of 1984 which repealed and replaced the Bureau of Ceylon Standards Act No. 38 of 1964. The Institution functions under the Ministry of Science & Technology.

The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development & formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical & Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such field of standardization as are of special interest to Sri Lanka.

Printed at the Sri Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLS/ *which includes surveillance inspection of the factory, testing of both factory and market samples.*

Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

Printed at SLSI (Printing Unit)