SRI LANKA STANDARD 784 : 1987

UDC 621.43-46 : 631.347.3

SPECIFICATION FOR

CONE FAN AND DEFLECTOR (IMPACT) TYPE HYDRAULIC SPRAY NOZZLES FOR PEST CONTROL EQUIPMENT

SRI LANKA STANDARDS INSTITUTION

Gr.9

SRI LANKA STANDARD

SPECIFICATION FOR CONE, FAN AND DEFLECTOR (IMPACT) TYPE HYDRAULIC SPRAY NOZZLES FOR PEST CONTROL EQUIPMENT

FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 1987-05-19, after the draft, finalized by the Drafting Committee on Hydraulic Spray Nozzles, had been approved by the Mechanical Engineering Divisional Committee.

Nozzles constitute the major functional components of the sprayers used for spraying pesticides and agrochemicals. The dimensions and other characteristics of nozzles differ with different manufacturers. This standard is, therefore, being issued with the objective of providing interchangeability and desired performance of nozzles.

All values in this standard are in SI units.

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 **SLS 102**. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

The assistance derived from the publications of the International Organization for Standardization, the British Standards Institution and the Indian Standards Institution in the preparation of this standard is gratefully acknowledged.

1 SCOPE

This standard covers material, constructional, dimensional, marking, testing and sampling requirements for cone, fan and deflector (impact) type nozzles used with equipment for spraying pesticides and agrochemicals.

2 REFERENCES

ISO	228	Pipe threads where pressure-tight joints are not made on the thread.
SLS	102	Presentation of numerical values.
SLS	268	ISO metric screw threads.
SLS	428	Random sampling methods.
SLS	756	General requirements for sprayers.

3 DEFINITIONS

For the purpose of this standard the following definitions shall apply :

3.1 body (see Fig 2a) : The main component into or on which the other components of the nozzle fit.

3.2 boom : A fixture, carrying the nozzle.

3.3 boss : Part of the boom (see **3.2**) or lance (see **3.11**) to which the body (see **3.1**) or cap (see **3.4**) is screwed.

3.4 cap (see Fig. **2b**) : The component which retains the assembled parts in or on the body (see **3.1**).

3.5 cone spray nozzle (hollow or solid) : A nozzle which produces a circular spray pattern. (see Fig. 3a).

3.6 deflector (impact) spray nozzle : A nozzle which produces a wide-angled flat spray pattern. (see Fig. 3b).

3.7 disc (see Fig. 2c): The disc shaped component containing the final orifice of a cone spray nozzle (see **3.5**) or of some type of fan spray nozzle (see **3.8**).

3.8 fan spray nozzle : A nozzle which produces a narrow elliptical spray pattern (see Fig. 3c).

3.9 gasket (see Fig. 2d) : A compressible insert placed between the two surfaces to obtain a liquid or gas tight sealing.

3.10 hydraulic spray nozzle : The device which transforms the liquid being ejected under pressure into a spray.

3.11 lance : A tube through which the liquid reaches a nozzle.

3.12 spray angle : The angle subtended at the final orifice by the edges of the spray pattern (see Fig.1).

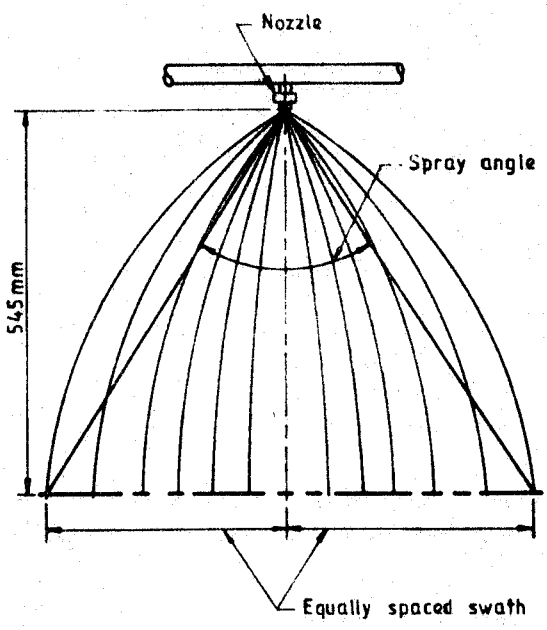


FIGURE 1 - Spray angle

3.13 **strainer** (see Fig. 2e) : The component for separating foreign matter from the spray liquid.

3.14 swirl core or swirl plate (see Fig. 2f) : The part of the cone spray nozzle (see **3.5**) which imparts rotation to the liquid passing through it.

3.15 **tip** (see Fig. 2g) : The component containing the final orifice of a fan spray nozzle (see 3.8) or of some type of cone spray nozzle (see **3.5**).

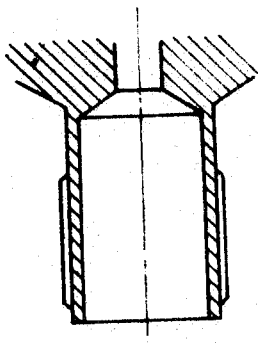
4 DESIGNATION

4.1 The nozzle shall be designated by its type (cone, fan, or deflector), pressure in kilopascals, spray angle in degrees, discharge rate in ml/min and thread size (see **5.2.2**).

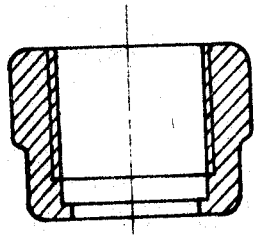
4.2 For example a cone type nozzle for pressure of 100 kPa giving a spray angle of 60° with discharge rate of 150 ml/min and having M12 x 1.5 thread shall be designated as ;

C	75
60	150
M12 x 1.5	

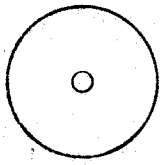
NOTE - C - cone type, F - fan type, D - deflector (impact) type.



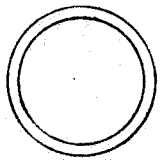
(a) - Body



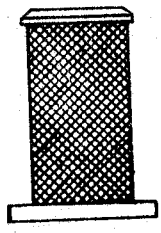
(b) - Cap



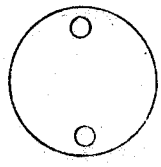
(c) - Disc



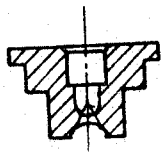
(d) - Gasket



(e) - Strainer

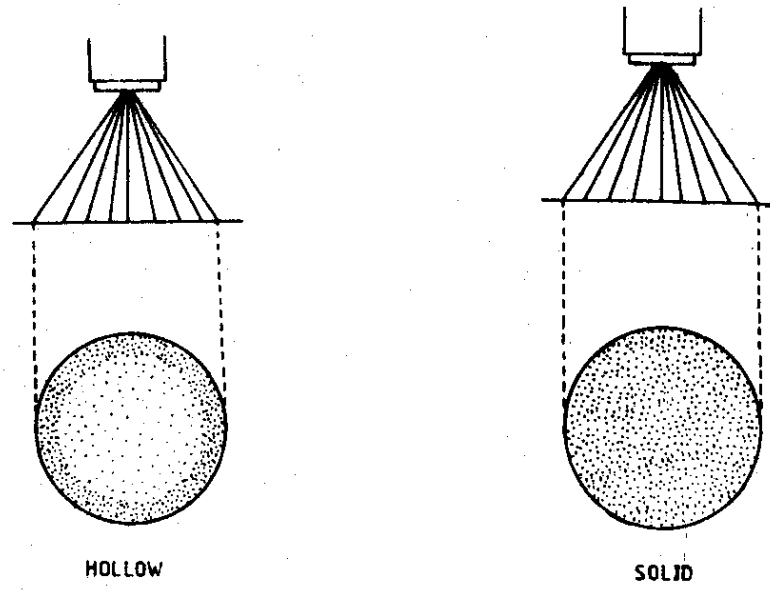


(f) - Swirl core or swirl plate

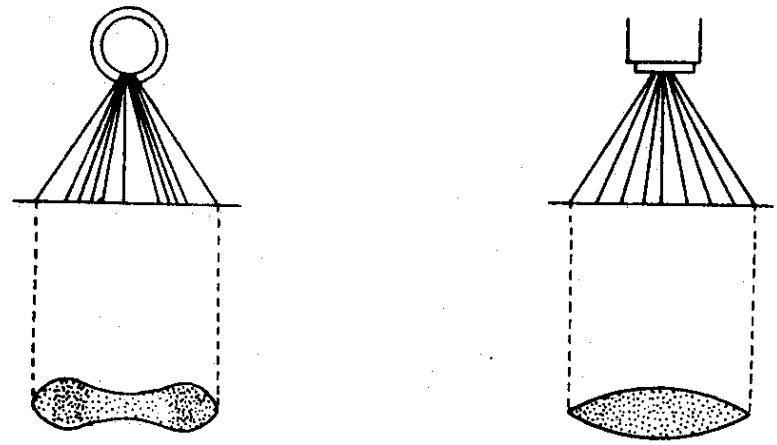


(g) - Tip

FIGURE 2 - Nozzle components



(a) - Cone spray nozzle



(b) - Deflector (impact) spray nozzle

(c) - Fan spray nozzle

FIGURE 3 - Spray patterns

5 REQUIREMENTS

5.1 Materials

The materials for the different components of the nozzle shall be selected from Column 2 of Table 1. The materials shall conform to the relevant Sri Lanka Standards.

NOTE - When there is no relevant standard for any materials used they should conform to any other national standard approved by the Sri Lanka Standards Institution.

TABLE 1 - Material for different components of nozzle

Component	Material
Body and cap	Brass, Stainless steel, 1) Plastics
Disc, tip and swirl core	Brass, Stainless steel, Nickel and Nickel alloys, Tungsten carbide, 1) Plastics, Ceramics.
Gasket	2) Elastomers, Fibre, Leather
Strainer	Brass, Bronze, Stainless steel 1) Plastics.

NOTES

1. *The action of pesticides and agrochemicals on the components should not cause dissolution, swelling, degradation of the plastic materials to an extent that would impair the usage of components in any manner.*

2. *These are polymeric materials with rubbery properties such as natural and synthetic general purpose rubbers, polyurethene elastomers, plasticised thermoplastic materials (such as PVC). Hard thermosets should be avoided. The action of agrochemicals and pesticides on the gasket should not cause dissolution, swelling, degradation of the polymeric materials used, to an extent that would impair its usage in any manner.*

5.2 Construction

5.2.1 *Description*

The nozzle shall consist of body, cap, disc or tip and gasket. Cone nozzle may also be provided with swirl core or swirlplate. A strainer may be provided in the nozzle. Disc or tip may be integral with the cap. In some designs the nozzle boss may perform the function of the body and the cap may be screwed directly on the boss.

5.2.2 *Threads*

5.2.2.1 The nozzle body or cap shall be attachable directly or through the adopter to the boom or lance by means of metric thread M 12 x 1.5 or M 18 x 1.5 (see SLS 268) or alternatively pipe thread G $\frac{1}{4}$ or pipe thread G 3/8 (see ISO 228).

NOTE - Metric thread is preferable.

5.2.2.2 If the nozzle is equipped with a strainer the connecting dimension of the nozzle shall comply with the requirements of SLS 756 : Part 1.

5.2.3 *Strainer*

If a strainer is provided it shall have the aperture size in the range of 300 µm to 425 µm.

5.3 Workmanship and finish

5.3.1 The components of the nozzles shall be of good workmanship, free from burrs and other defects.

5.3.2 The mating faces of the cap, tip and nozzle body or boss shall be finished properly so as to seal on the end face of the nozzle body or boss. A gasket shall be used for proper sealing.

5.3.3 The screw thread shall be well formed and the crest of the threads shall be free from burrs or any other defects which may prevent free engagement.

5.4 Performance

5.4.1 *Rate of discharge*

When tested in accordance with the method given in **8.1** the nozzle shall provide a rate of discharge which shall not differ by ±5 per cent from the value declared by the manufacturer/supplier at the specified pressure.

NOTE - The specified pressure shall be either 100 kPa or 300 kPa.

5.4.2 *Spray angle*

The spray angle shall be declared by the manufacturer. The spray angle when tested in accordance with the method given in **8.2** shall not differ by ± 5° from the declared value.

5.4.3 *Uniformity of distribution*

When tested in accordance with the method given in **8.3** the nozzle shall meet the relevant requirements.

NOTE - Any other method of test may be used provided such a method shows as defective all nozzles which would not meet the test described in **8.3**.

5.4.4 *Droplet size*

When tested in accordance with the method given in **8.4** the nozzle shall meet the relevant requirements.

5.4.5 *Gaskets*

When tested in accordance with the method given in **8.5** the gaskets shall meet the relevant requirements.

6 PACKING

Each nozzle shall be securely packed separately for convenience and safe handling in transit. The package shall also be marked with the particulars given in **7**.

7. MARKING

7.1 Each nozzle may be marked legibly and indelibly with the following :

a) Manufacturer's name or registered trade mark;
b) Designation; and
c) Batch or code number.

7.2 Each nozzle may also be marked with Certification Mark of the Sri Lanka Standards Institution illustrated below on permission being granted for such marking by the Sri Lanka Standards Institution.

NOTE - The use of the Sri Lanka Standards Institution Certification Mark (SLS Mark) is governed by the provisions of the Sri Lanka Standards Institution Act, and the regulations framed thereunder. The SLS mark on products covered by a Sri Lanka Standard is an assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by the Institution and operated by the producer. SLS marked products are also continuously checked by the Institution for conformity to that standard as further safeguard. Details of conditions under which a permit for the use of the Certification Mark may be granted to manufacturers or processors may be obtained from the Sri Lanka Standards Institution.

8 METHODS OF TEST

8.1 Rate of discharge test

8.1.1 Connect the nozzle under test to a supply of clean water at controlled pressure (100 kPa or 300 kPa), the pressure being indicated by a pressure gauge, positioned immediately before the nozzle and having full scale reading of pressure not exceeding twice and not less than 1½ times, that to be read. The fluctuation of the pressure shall be not more than ± 10 per cent from the controlled pressure.

8.1.2 Turn on the supply and adjust the pressure and direct the spray, for a period timed by a stop watch, into a receiving vessel so designed as to collect the whole of the spray from the nozzle. The period shall be not less than 60 seconds nor less than the time required to discharge 500 ml.

8.1.3 Direct the spray away from the vessel and turn off. Measure the volume of the water collected and calculate the discharge rate per minute.

8.1.4 Repeat the above for at least four times and obtain an average rate of discharge per minute. The permissible variation between tests is within ± 5 per cent of the average.

8.2 Spray angle test

8.2.1 Carry out the test at a place protected from draughts by screens. Mount the nozzle on a test bench. The height of the tip of the nozzle from the floor shall be 545 mm. The floor may be smooth or corrugated. Use of a patternator (see Fig. 4) should be preferred. Connect the nozzle to a supply of clean water. Connect a pressure gauge positioned immediately before the nozzle and having full scale reading of pressure not exceeding twice and not less than 1½ times that to be read.

8.2.2 Direct the spray at controlled pressure and declared discharge (see 5.4.1) from the nozzle on the floor. The fluctuation of the pressure shall be not more than ± 10 per cent of the controlled pressure.

8.2.3 Calculate the angle (see Fig.1) or measure it by means of a protractor and compass.

NOTE - A period of pre-test usage may be applied to the nozzles undergoing test to overcome variation in initial observations.

8.3 Uniformity of distribution test

8.3.1 *Apparatus*

The apparatus for this test shall be as described in Appendix B.

8.3.2 *Procedure*

The test procedure shall be as follows :

8.3.2.1 Carry out the test by directing spray, at declared rate of discharge and specified pressure (see **5.4.1**), from the nozzle on to a patternator protected by screens from draughts.

8.3.2.2 In the case of fan spray nozzles, mount the nozzle so that the axis of the spray sheet is at right-angles to the upper surface of the trough divisions on the patternator and the nozzle tip at a height of 545 mm above the trough divisions. In the case of the cone nozzles, mount the nozzle so that the axis of its spray cone is at right-angles to the upper surface of the trough divisions on the patternator and the nozzle tip at a height of 545 mm above the trough divisions.

8.3.2.3 Test cone spray nozzle in two or three positions, the original setting, a second setting following rotation of the nozzle disc or tip in its mounting through 90° and, where the swirl core can be rotated in the body, reassemble with this component turned through 90°.

8.3.2.4 The total amount of liquid sprayed for each individual test shall be approximately equal to the amount of liquid sprayed for obtaining the standard distribution pattern referred to in **8.3.3**.

8.3.3 *Criteria for conformity*

In the test described, the amounts of liquid registered in the tubes of the patternator (see Fig. 4) shall be within $\pm$ 20 of the standard distribution pattern accepted for that particular designation of nozzle.

NOTE - The standard pattern shall be as prescribed by the Department of Agriculture.

8.4 Droplet size test

8.4.1 Use the nozzle to spray water on to a sample of paper of established spread factor (usually 2) from a height of 545 mm above the sample.

8.4.2 Examine the droplets through a standard graticule for mean diameter and the number of droplets distributed per square centimeter of the sample.

8.4.3 Variation in average droplet size and distribution in excess of ±20 per cent of an ideal of 50 droplets per square centimeter shall be considered excessive.

8.5 Test for gasket

8.5.1 All the gaskets in the nozzle shall be immersed in a test mixture of 60 per cent kerosene, 5 per cent benzene, 20 per cent toluene and 15 per cent xylene for a period of 72 hours at a temperature range of 27 °C to 33 °C and then dried in air at the same temperature range for 24 hours. The gaskets shall then be placed in their original positions.

8.5.2 The nozzle complete with its discharge line shall be operated at its normal working conditions for 8 hours.

8.5.3 The gaskets shall be deemed to have passed this test if no leakage from the points where they are fitted is observed.

NOTE - Gasket test shall be conducted at the end of all the tests with a new set of gaskets.

9 SAMPLING

9.1 Lot

In any consignment all nozzles of same type designation and belonging to one batch of manufacture shall constitute a lot.

9.2 Scale of sampling

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

9.2.2 The number of nozzles to be selected from a lot shall be in accordance with Column 1 and Column 2 of Table 2.

TABLE 2 - Scale of sampling

Number of nozzles in the lot	Number of nozzles to be selected	Acceptance number	Sub-sample size
Up to 100	5	0	2
101 to 150	8	0	3
151 to 300	13	1	4
301 and above	20	2	5

9.2.3 The nozzles shall be selected at random. In order to ensure randomness of selection random number tables as given in SLS 428 shall be used.

9.3 Number of tests

9.3.1 Each nozzle selected as in 9.2.2 shall be inspected for the requirements in 5.2, 5.3 and 6.

9.3.2 A sub sample of size as given in Column 4 of Table 2 shall be selected from the samples selected as in 9.2.2 and tested for performance requirements given in 5.4.

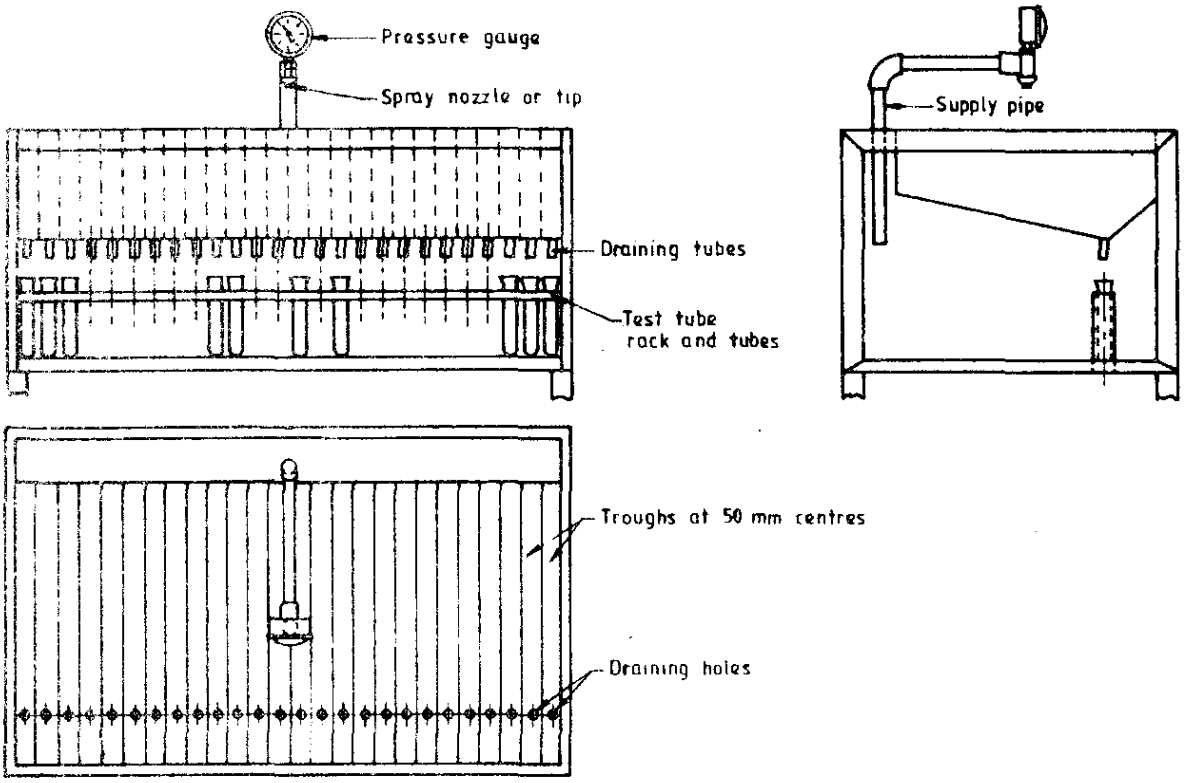
10 CONFORMITY TO STANDARD

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

10.1 Each nozzle inspected as in 9.3.1 satisfies the marking requirement.

10.2 The number of nozzles not conforming to one or more requirements given in 5.2 and 5.3 when inspected as 9.3.1 does not exceed the corresponding acceptances number given in Column 3 of Table 2.

10.3 Each nozzle tested as in 9.3.2 satisfies the relevant performance requirements.



NOTE. This is a suggested form only. Final details such as provision of height adjustment are left to the individual manufacturer.

FIGURE 4 - Patternater for distribution measurement

APPENDIX A

TEST APPARATUS FOR UNIFORMITY OF DISTRIBUTION TEST

The apparatus for the test for uniformity of distribution shall be as follows :

A.1 Apparatus

A.1.1 *A patternator* (see Fig. 4), with at least 24 channels at 50 mm centres, suitably mounted on a frame; each tube shall have a bore not greater than 24 mm and be long enough to hold 130 ml. The bore of the tubes shall be within ± 0.2 per cent of the nominal bore.

The top edge of the trough dividers shall be sharp (tapered to not more than 0.25 mm width on the edge) and straight in the horizontal plane, so that no point along this edge lies more than 1 mm from the straight line joining the corresponding points at each end. The distance between the centres of adjacent top edges shall at all points be within ± 0.25 mm of 50 mm and the total width over 24 troughs shall be 1200 ± 2 mm. The top edges of the dividers shall be so positioned that when a straight edge is laid across the full width of the front and back of the troughs no edge lies more than 1 mm below it and each divider edge shall be straight in the vertical plane to within ± 0.25 mm.

The patternator shall stand so that the plane of these edges is level within $\frac{1}{2}^{\circ}$ and the nozzle axis shall be at 90 ± $\frac{1}{2}^{\circ}$ to a straight edge laid across the centre of the trough dividers and at 90 ± 1° to the top edge of any divider.

The depths of troughs shall be at least 100 mm at the shallowest point to avoid rebound of spray droplets.

NOTE - Patternators having at least 48 channels at 25 mm centres may be used for this test, the liquid from two troughs being combined provided that the appropriate alternate edges comply with the above requirements.

A.2 *Means of holding the nozzle,* at correct height with required facilities for adjustment.

A.3 *A compressed-air supply,* or small pump giving a steady output, with a liquid supply line from a reservoir of capacity 2 litres or more.

A.4 *A constant pressure regulator and a pressure gauge,* situated as close as possible to the nozzle.

A.5 *A chart holder,* indicating the limits accepted by the Department of Agriculture as applicable to the type of nozzle under test.

A.6 *A test tube rack,* so made that the collecting tubes can be inserted in the flow when constant flow has been achieved, and retracted after a predetermined period.

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 SLSI *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)

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 and 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 and 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 fields of standardization as are of special interest to Sri Lanka.

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