SRI LANKA STANDARD 726 : 1985

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SPECIFICATION FOR

COMPRESSION KNAPSACK SPRAYERS

PART I - NON - PRESSURE RETAINING TYPE

SRI LANKA STANDARDS INSTITUTION

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PART 1 : NON-PRESSURE RETAINING TYPE

SLS 726:Part 1:1985

Gr. 10

SRI LANKA STANDARDS INSTITUTION
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Sri Lanka.

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FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 1985-11-20, after the draft, finalized by the Drafting Committee on Agricultural Sprayers, had been approved by the Mechanical Engineering Divisional Committee.

This specification deals only with compression type knapsack sprayers.

They are of two types:

a) Non-pressure retaining type; and

b) Pressure retaining type.

It is intended to prepare Part II of this standard to cover 'Pressure retaining type' sprayers.

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 should be the same as that of the specified value in this specification.

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

1 SCOPE

This specification covers design and construction, workmanship and finish, material, performance, marking, testing and sampling requirements for compression knapsack sprayers, non-pressure retaining type used for spraying pesticides and agrochemicals. The sprayers of this type shall have a working pressure not exceeding 400 kPa.

2 REFERENCES

CS 102 Presentation of numerical values

CS 124 Test sieves

SLS 428 Random sampling methods

SLS ... Hydraulic spray nozzles for pest control equipment (Under preparation)

SLS ... Spray lance for manually operated sprayer (Under preparation)

SLS ... Cut-off device for manually operated sprayer (Under preparation)

3 DEFINITIONS

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

3.1 check valve assembly: A device which will allow flow of either liquid or air in one direction only and which will prevent any loss of pressure when closed.

3.2 compression sprayers: A sprayer, the tank of which is a pressure vessel and the air pressure is created either by inbuilt pump or from outside.

3.3 cut-off valve: The hand-operated mechanism situated between the discharge outlet and the nozzle which controls the flow of liquid from the sprayer.

3.4 declared working pressure: The working pressure of the sprayer as declared by the manufacturer.

3.5 dip tube: A tube which has its lower opening immersed in a pressure container and through which the liquid can flow.

3.6 discharge outlet: An adapter on the tank to which the hose is connected.

3.7 filler bung: A device for closing the opening of the filler ring.

3.8 gasket: A compressible insert made from similar materials to that of a washer, usually flat and specially shaped, and placed between two surfaces to obtain a liquid or gas-tight seal.

3.9 plunger washer: A circular moulded or U-shaped piece of leather, rubber,plastic etc., used in plunger pumps to provide a liquid or gas-tight seal between a plunger and cylinder when operated in one direction and to collapse when operated in the opposite direction.

4 REQUIREMENTS

4.1 Material

4.1.1 The container including bottom, sides, top and/or removable filler hole cover shall preferably be made of stainless steel. Alternatively, other materials may be used, provided that the finished unit complies with all other requirements of this specification.

4.1.2 All other metal parts that normally come into contact with the pesticide shall be preferably stainless steel, or brass, bronze, copper or monel. They shall preferably be of the same material to minimize electrolitic potential deterioration.

4.1.3 With the exception of the handle of the pump, no wooden parts shall be used in the construction of the sprayer or the component parts thereof.

4.1.4 The material used for different components shall be declared by the manufacturer.

4.2 Design and construction

4.2.1 *Capacity*

The liquid capacity and the volume of the air space of the sprayer shall be clearly marked on the machine. The container shall be capable of discharging the full usable liquid contents after receiving one full charge of air to the recommended working pressure.

4.2.2 *Weight*

The total dry weight of the sprayer, when empty, but equipped with discharge line and accessories for operation, shall be declared.

4.2.3 *Tank*

The construction of the tank shall be such that it is able to withstand the tests laid down in Appendices E, F and G. The skirt shall project a minimum of 12 mm beyond the lowest portion of the bottom of the tank. The skirt may be integral with the tank or attached separately.

4.2.4 *Straps*

4.2.4.1 Two straps of adequate length shall be provided for carrying the sprayer. Provisions for the adjustment of the length of each strap shall be made.

4.2.4.2 A suitable non-absorbent padding shall be provided with each strap at least on the portions that rests on the shoulder of the operator.

4.2.4.3 A back rest shall be provided so that the sprayer rests on the back of the operator comfortably.

4.2.5 *Filler hole*

4.2.5.1 A filler hole having a minimum 30 mm in bore diameter if circular, or in minor axis if oval, shall be provided.

4.2.5.2 The hole shall be covered with a spill-proof filler bung to prevent leakage during mounting of the sprayer on the back of the operator and during its operation. The bung may be threaded with pressure releasing hole on the side.

NOTE - If self-closing filler hole and cap are provided, the provision of 4.2.5.2 shall not apply.

4.2.6 *Strainer*

4.2.6.1 A removable strainer on the filling hole or a separate filling funnel with strainer shall be provided to filter the liquid while filling in the tank. The strainer shall have the aperture size in range of 300 to 425 micrometers (see CS 124).

4.2.6.2 Where a dip-tube is fitted, a strainer shall be provided at the liquid intake of aperture size not greater than 500 micrometers and not less than 300 micrometers and with an area of not less than 5 cm^2. This strainer shall be easily removable for cleaning or replacement.

4.2.6.3 A strainer shall be fitted on every sprayer upstream of the cut-off valve. The dimensions of this shall be not greater than 300 micrometers or smaller than 180 micrometers and the surface area shall be not less than 9 cm^2. Flow through the strainer shall be from the outer surface inwards. Where confined in a tubular member, the strainer shall have a clearance of not less than 2 mm in the annular space.

4.2.6.4 All strainers shall be easily accessible for cleaning or replacement and shall be of sufficient strength to resist accidental damage or collapse during use. Where plastic materials are used, the aperture size shall conform to the sizes given above and the total aperture area shall be the same.

4.2.7 *Pressure gauge*

At the option of the purchaser, a pressure gauge shall be provided.

It shall be graduated to 125 per cent of the declared working pressure in kPa, and the entire background of the portion of the scale above the declared working pressure shall be coloured red. The dial cover shall be of shatter-proof material. The gauge shall be fitted on the top of the tank either in a recess or protected by a suitable guard.

4.2.8 *Pump*

4.2.8.1 The diameter of the pump bore shall be 25 mm or more but not so large that the maximum force required to depress the handle, with the tank at the declared working pressure, exceeds 490 N. The pump cylinder shall be detachable from the tank. The pump cylinder shall withstand the test specified in Appendix A.

4.2.8.2 The plunger shaft shall be not less than 10 mm diameter. Constructional stability shall be such that the top of the plunger shaft, at the extreme top of the stroke, shall have a displacement of not more than 13 mm on either side of its vertical axis under a horizontally applied load of 20 N at this point. Spring-loaded stops or rubber buffers shall be provided to limit upward and downward travel of the plunger shaft.

4.2.8.3 The plunger washer shall be made of synthetic rubber, chrome tanned leather or other suitable material. Where in the form of a cup-washer, it shall be not less than 2 mm thick and have a depth of face at least 10 mm in contact with the bore of the pump cylinder. A suitable spring or disc, with chamfered edges shall be provided to hold the washer skirt in position against the barrel face without distortion. A backing disc shall be provided with a clearance in the bore of the pump barrel of not more than 0.8 mm.

4.2.8.4 The handle shall be of a 'D' or 'T' shape. If of D shape, it shall have a grip not less than 130 mm long with an inside vertical clearance of not less than 35 mm. The grip shall be attached with handle support. If of T shape, the length of the either side from the centre of piston rod shall be not less than 100 mm. The diameter of the handle grip in both the types shall be not less than 25 mm.

4.2.8.5 The sprayer shall be fitted with a convenient quick action device for locking the handle. If wire is used, it shall be not less than 3 mm in diameter. The device shall be able to hold the handle properly when the handle is placed at its lowest possible position.

4.2.8.6 The check valve shall be both liquid and air-tight. It shall be tested by applying a pressure of twice the declared working pressure to the tank filled sufficiently to immerse the check valve in the liquid. It shall have met this requirement if not more than 2 ml of liquid enters the pump cylinder, while it is under pressure, in a period of 15 minutes.

4.2.9 *Air inlet valve (for alternative charging)*

At the option of the purchaser, for the purpose of supplying air pressure to the tank from an outside source, an air inlet valve shall be provided.

4.2.10 *Air pressure safety valve*

If the air inlet valve referred to in 4.2.9 is provided, the sprayer shall be fitted with an air pressure safety valve, which shall operate within ± 40 kPa of the declared working pressure of the sprayer. It shall then be capable of discharging an amount of air in each second of which the free volume is at least equal to the displacement of 5 strokes of the pump. The discharge aperture shall also be at least equal in area to that of the air inlet valve, referred to in 4.2.9. All metal parts of the valve shall be non-corrodible and any gaskets and seals shall conform to the specification laid down in 4.2.16.

Where there is no other method for releasing the residual air charge in the container the air pressure safety valve shall be so constructed that the air charge can be easily released by the operator without alteration to the setting.

Each valve shall be tested and set by the manufacturer before fitting to the sprayer and locked so that the operator cannot accidentally change the setting.

The valve shall be fitted to the top of the container.

It shall be easily replaceable, and an air-tight seal may be effected by a gasket.

NOTE - It is recommended that manufacturers do not supply replacement parts for the air pressure safety valve but only the complete unit.

4.2.11 *Nozzle*

Unless otherwise specified by the purchaser, nozzles shall comply with SLS ... Hydraulic spray nozzles for pest control equipment. (Under preparation).

4.2.12 *Lance*

The lance shall conform to SLS ... Spray lance for manually operated sprayer. (Under preparation).

4.2.13 *Cut-off valve*

The cut-off valve shall conform to SLS ... Cut-off device for manually operated sprayer. (Under preparation).

4.2.14 *Dip tube*

Where a dip tube is fitted, it shall be of not less than 6 mm bore. It shall be easily detachable from the tank for cleaning purposes and shall extend to within not less than 6 mm, or more than 13 mm, from the bottom of the tank and remain in this position throughout the period of operation.

4.2.15 *Hose and hose connection*

4.2.15.1 A delivery hose of at least one metre in length shall be provided. The hose shall be connected with discharge outlet and cut-off device through hose connection.

4.2.15.2 The hose connection shall be either of nut-nipple and ferrule type or clip type.

4.2.15.3 The hose and hose connection shall withstand the test prescribed in Appendix B.

4.2.16 *Gaskets*

Gaskets where fitted to a male thread, shall be recessed into the metal for at least one third of their thickness. Where fitted to a female thread, they shall at no time obstruct the passage of the liquid. They shall, be of a chemically resistant material and comply with the test in Appendix C.

4.2.17 *Discharge tube*

4.2.17.1 A discharge pipe shall be provided to take out the liquid from the tank.

NOTE - In some designs, a dip tube is provided in place of discharge pipe, if fitted, it shall be immersed from top of the tank and shall be easily detachable from the tank.

4.2.17.2 A shut-off cock shall be provided in the discharge pipe or dip tube. It shall be capable of allowing free flow of liquid, when open, without stoppage and leakage.

4.2.17.3 The discharge outlet shall be of nipple or threaded type. The engaged length of the thread or nipple shall be not less than 10 mm.

4.2.18 *Pressure relief valve*

A pressure relief valve to adjust normal working pressure of the tank shall be provided. It shall operate within ± 1 per cent of the normal working pressure of the sprayer.

4.2.19 *Operating conditions and maintenance*

Recommendations for operating conditions and maintenance are specified in Appendix D. Spare parts catalogue shall also be provided with the sprayer.

4.3 Workmanship and finish

4.3.1 The components of the sprayer shall have a smooth finish and shall be free from burrs, sharp edges and other visual defects that may be detrimental for their use.

4.3.2 Exposed metallic parts shall have a protective coating which will prevent surface deterioration. The steel used for hose ferrule, hose clip piston rod, buffer, spreader and locking device shall be plated with cadmium, zinc or nickel.

4.4 Dimensional requirements

The dimensions of different components of the sprayers shall be as laid down in 4.2.

4.5 Performance requirements

4.5.1 *Tank*

4.5.1.1 When tested according to the test specified in Appendix E, there shall be no air leakage from the tank.

4.5.1.2 When tested according to the test specified in Appendix F, the tank shall show no sign of cracks.

4.5.1.3 When tested according to the test specified in Appendix G, the tank shall show no sign of leakage.

4.5.2 *Strap*

When tested according to the test specified in Appendix H, the straps and their assembly or any part thereof shall not break or permanently deform.

5 MARKING

5.1 Sprayers shall be marked legibly and indelibly with the following:

a) Name and address of the manufacturer and/or registered trade mark;

b) Country of manufacture;

c) Capacity of the sprayer;

d) Maximum working pressure of the sprayer; and

e) Batch number or code number.

5.2 Each sprayer 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 a 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.

6 SAMPLING

6.1 Lot

All sprayers of same type, and assembled by one manufacturer, using components of same specification shall constitute a lot.

6.2 Scale of sampling

6.2.1 The samples from each lot, shall be tested for ascertaining the conformity of sprayers to the requirements of this specification.

6.2.2 The number of sprayers to be selected from the lot shall be in accordance with Table 1.

TABLE 1 - Scale of sampling

Number of sprayers in the lot	Number of sprayers to be selected
Up to 150	3
151 to 300	4
301 to 500	5
501 and above	8

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

6.3 Number of tests

6.3.1 Each sprayer selected as in 6.2.2 shall be examined for marking requirement.

6.3.2 Each sprayer selected as in 6.2.2 shall be tested for the requirements given in 4.1 to 4.4 as far as possible.

6.3.3 Two sprayers in case of lots having less than 500 sprayers or four sprayers otherwise, shall be selected from the sample selected as in 6.2.2 and shall be tested for performance requirements.

(The testing shall be in accordance with the sequence given in 4).

6.4 Criteria for conformity

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

6.4.1 Each sprayer examined as in 6.3.1 satisfies the marking requirements.

6.4.2 Each sprayer tested as in 6.3.2 satisfies the relevant requirements.

6.4.3 Each sprayer tested as in 6.3.3 passes the performance tests.

APPENDIX A

PRESSURE CHAMBER OR PUMP CYLINDER TEST

A.1 Pneumatic test

A hose shall be attached to the opening in pressure chamber or pump cylinder. In case there are a number of openings, the openings other than the one in which the hose is attached, shall be sealed. The pressure chamber or pump cylinder shall then be pneumatically pressurized to minimum 1½ times of the normal working pressure of the sprayer, and the pressure shall be retained for a minimum period of 5 minutes. The pressure chamber of the pump cylinder shall be disconnected then immersed in water and examined for leaks or deformation.

A.2 Hydraulic test

With a similar connection as that in 4.1, the pressure chamber or the pump cylinder shall be pressurized to a static hydraulic pressure of minimum 2½ times of the normal working pressure and the pressure shall be retained for a minimum period of 5 minutes. The pressure chamber or the pump cylinder shall then be examined for leaks or deformation.

A.3 Conformity

The pressure chamber or the pump cylinder shall be deemed to have passed the tests if no leakage or deformation is found during the above tests.

APPENDIX B

HOSE CONNECTION TEST

B.1 The hose connections shall be subjected to a static hydraulic pressure test equal twice the working pressure of the hose for a period of 5 minutes without leakage or structural failure.

B.2 The hose connection, after being fitted and removed five times, shall not cause the cover or the lining to be damaged sufficiently to interfere with subsequent fittings.

APPENDIX C

GASKET, WASHING AND 'O' RINGS IMMERSION TEST

C.1 All sealing devices shall be removed from the equipment and immersed in a test solution 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 of 27 ± 3 °C. The gaskets, washers and 'O' rings shall then be replaced in their original position on the equipment. The equipment shall then be charged with clean water to the maximum working pressure plus 40 kPa and the total contents discharged through the nozzle without leakage.

APPENDIX D

RECOMMENDATIONS ON OPERATING CONDITIONS AND MAINTENANCE

D.1 GENERAL

Each sprayer should be capable of operation in any part of the country and instructions for the use, care and maintenance of the sprayer and a list of spare parts, should be provided by the manufacturer.

D.2 PREVENTIVE MAINTENANCE

D.2.1 Upon receipt, each sprayer should be charged with clean water, examined and tested under simulated operating conditions, and any adjustments found necessary should be made at this time.

D.2.2 After testing, each sprayer should be cleaned and dried immediately, when storage is necessary, the sprayer should be kept in a dry place.

D.2.3 Spare parts should be checked and stored in a manner to protect them against deterioration.

D.2.4 When transported, each sprayer should be adequately protected against damage. It should be carefully handled, stored and protected at all times.

D.2.5 After each day's operation and prior to storage for the night or conveyance to another location, the following maintenance shall include.

a) Removal of pesticides from the tank;

b) Thorough cleansing of the sprayer with water and detergent followed by thorough flushing with clean water;

c) Complete drying, if possible, of the sprayer, or storage in such a way that it can drain dry inverted with filler plug removed; and

d) Inspection and selection of sprayers for such repair as can be carried out in the field.

D.3 PERIODIC TESTING

Each sprayer should be tested periodically for leakage by a hydraulic pressure test of twice the maximum working pressure plus 40 kPa, by a competent person.

APPENDIX E

TANK LEAKAGE TEST

E.1 Each tank manufactured shall be tested for leakage by a hydraulic pressure test of twice the maximum working pressure plus 40 kPa without leakage. This test shall be carried out without any of the fittings or accessories in position.

E.2 After final assembly, but excluding the carrying straps, the container shall be charged with air to the maximum working pressure plus 40 kPa and the whole submerged in water, and there shall be no air leakage whatsoever.

APPENDIX F

TANK FATIGUE TEST

F.1 To ensure the material and construction of the tank are such as not to break down with fatigue under normal use, tanks selected according to 6.3.3 shall withstand without failure 12 000 cycles from 0 to the maximum working pressure plus 40 kPa.

F.2 Fatigue stress may be simulated by the apparatus shown in Figure 1. The dip tube of each tank is connected to the manifold by means of a copper tube or a rubber hose. A small angle-valve is provided at each point of connection with the manifold in order that any connected may be closed off as desired.

F.3 The tank under test is filled completely with water; the top and any other openings are closed. The manifold is filled with water to a point within approximately 200 mm of the filler hole. The water level may be checked at filling or during testing by observing from which of the three vent fittings water will flow upon opening.

F.4 Air pressure from a power-driven compressor and reservoir is applied to the top of the manifold through a pressure-regulating valve and an electrically operated three-way valve. A timer switch, driven by a small electric motor, opens and closes the three-way valve approximately five times a minute. When electrical energy is applied to the three-way valve, compressed air flows from the source into the manifold at a pressure determined by the setting of the regulating valve. When the valve is de-energized, the air flows out of the manifold to the atmosphere. The result is that pressure is applied to and released from the water in the manifold which, in turn, transmits the pressure to all parts of the sprayer. Water can be dispensed with in this system and air substituted. But owing to the large volume of the total system, a considerable amount of air would have to move in and out during each cycle, compressor capacity and power consumption would be unduly large, and a three-way valve with very large air passages would have to be employed to permit movement of the large volume of air.

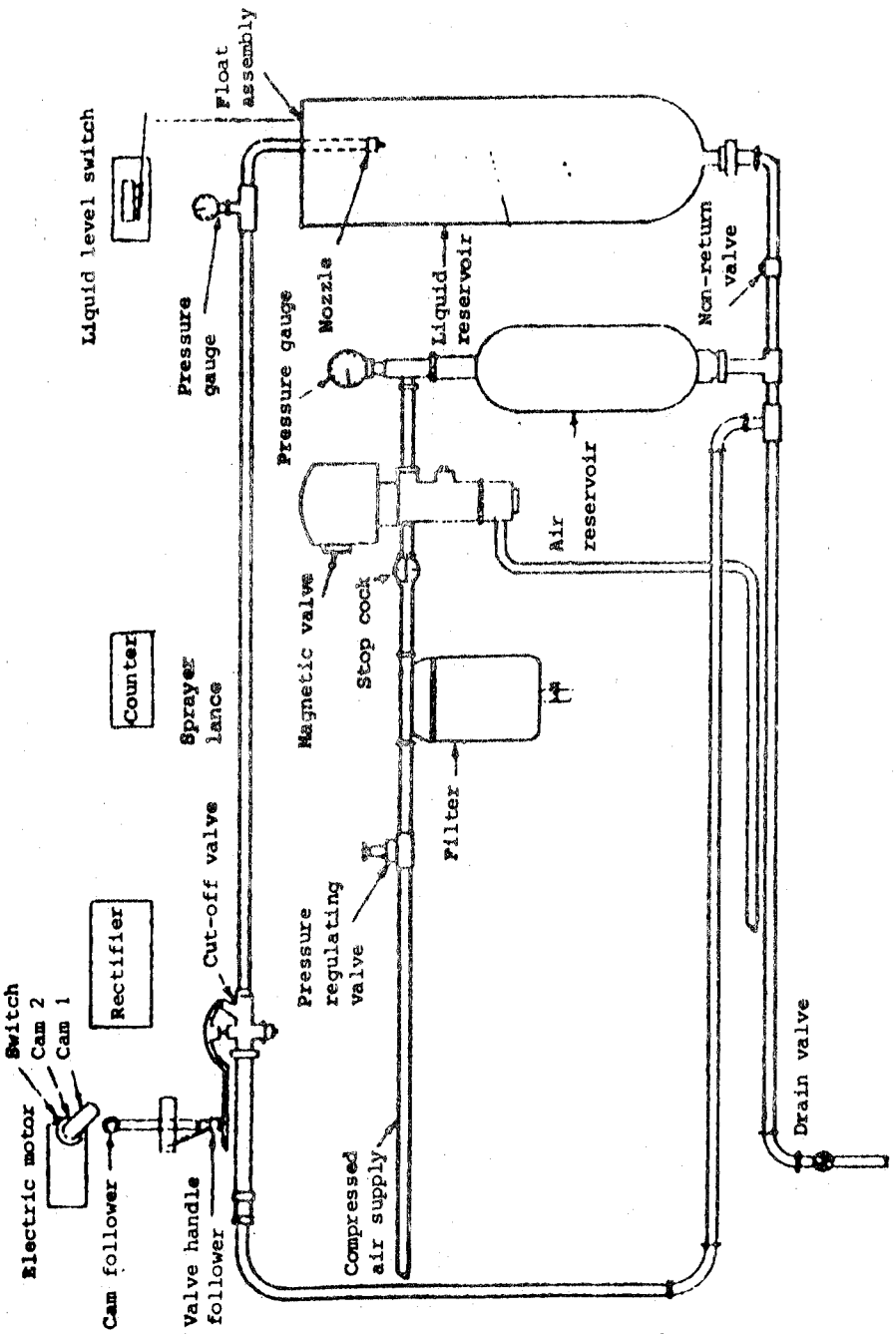

FIGURE 1 - Tank fatigue test

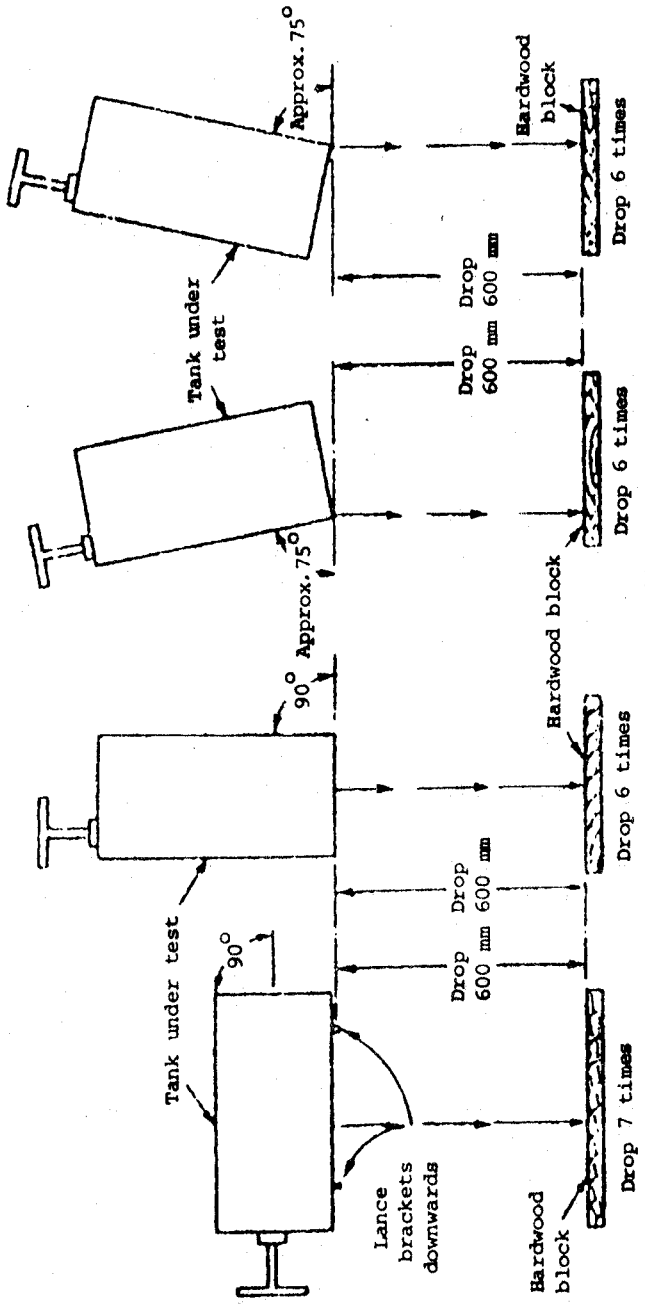

FIGURE 2 - Tank impact drop test

F.5 An electrically operated counter is connected in parallel with the terminals of the coil of the solenoid valve. Consequently, time the valve is energized to accomplish a pressure cycle, the counter registers the fact and this indicates the total number of pressure cycles accomplished.

APPENDIX G

TANK IMPACT (DROP) TEST

G.1 Tanks selected according to 6.3.3 shall be filled with water to their normal working capacity and pressurized to the maximum working pressure. Each shall be dropped for a total of 25 times from a height of 600 mm in various positions as shown in Fig. 2. The platform onto which the tanks are dropped shall consist of planed solid hard wood placed on a level cement stone or hard packed earth floor.

The tank is then subjected to a static hydraulic pressure equal to twice the maximum working pressure.

NOTE - Caution should be exercised in performing this test to avoid possible injury due to explosion of the tank. A metal cage shall be constructed, to enclose the tank during the drop.

APPENDIX H

STRAP DROP TEST

H.1 The straps, strap clips, and strap-hangers shall be tested for the strength of the whole assembly. The tank shall be filled to one half of its total liquid and air volume and the pressure raised to maximum working pressure. The sprayer shall then be hung from a solid support by its strap, simulating its carriage on the shoulder of an operator. It shall be lifted to a distance of 300 mm and allowed to drop and hang by the strap 25 times. The assembly shall be deemed to have failed to meet the requirements of this test if any part of it break or becomes permanently deformed.

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.*

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SRI LANKA STANDARDS INSTITUTION

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