SRI LANKA STANDARD 831 : 1988

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SPECIFICATION FOR

PORTABLE FIRE EXTINGUISHERS, FOAM TYPE (MECHANICAL)

SRI LANKA STANDARDS INSTITUTION

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SLS 831 : 1988

Gr.9

SRI LANKA STANDARDS INSTITUTION
53, Dharmapala Mawatha,
Colombo 3,
Sri Lanka.

DRAFTING COMMITTEE ON PORTABLE FIRE EXTINGUISHERS, FOAM TYPE (MECHANICAL)

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SRI LANKA STANDARD
SPECIFICATION FOR PORTABLE FIRE EXTINGUISHERS, FOAM TYPE (MECHANICAL)

FOREWORD

This Sri Lanka Standard was authorised for adoption and publication by the Council of the Sri Lanka Standards Institution on 1988-10-04, after the draft, finalised by the Drafting Committee on Fire Protection and Fire Fighting, had been approved by the Mechanical Engineering Divisional Committee.

All values in this standard have been given in metric units.

This standard applies to rechargeable metal bodied portable fire extinguishers of foam type in which foam is generated and expelled either by pressure of gas stored under pressure in the body of the extinguisher or by pressure of gas released from a compressed gas cartridge.

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 observation shall be rounded off in accordance with CS 102. The number of figures to be retained in the rounded off value shall be the same as that of the specified value in this standard.

The assistance derived from the publications of the Standards Association of Australia, the British Standards Institution and the Bureau of Indian Standards in the preparation of this standard is gratefully acknowledged.

1 SCOPE

This standard lays down requirements regarding capacity, principal materials construction, method of operation, performance and tests of portable fire extinguisher of foam type (Mechanical) either stored pressure or gas cartridge type.

In the case of stored pressure type foam is expelled by gas stored under pressure in the body of the extinguisher and foam is expelled by pressure of gas released from a compressed gas cartridge in the case of gas cartridge type.

2 REFERENCES

ISO	3882	Metallic and other non-organic coatings - Review of methods of measurement of thickness.
BS	381 C	Colours for identification, coding and special purpose.
CS	102	Presentation of numerical values.
SLS	268	ISO metric screw threads. Part 1 Basic and design profiles Part 2 Pitch/diameter combination
SLS	374	Standard atmospheric conditions for conditioning and testing
SLS	428	Random sampling methods
SLS	724	Gas cartridge for portable fire extinguishers.
SLS	752	Rating and fire testing of fire extinguishers.

3 DEFINITIONS

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

3.1 portable fire extinguisher : A first aid fire fighting appliance which can be carried by hand and operated by hand and the mass not exceeding 20 kg.

3.2 foam (stored pressure) type extinguisher : An extinguisher in which foam is expelled by means of an inert gas, stored with, or dissolved in water under pressure.

3.3 foam (gas cartridge) type extinguisher : An extinguisher which relies compressed gas from a cartridge to expel the foam.

4 REQUIREMENTS

4.1 Material

4.1.1 *Body*

The body of the extinguisher shall be of metal and so designed as to meet the specified strength requirements (see **4.2.1, 6.1 and 6.2**). The metal used in the construction of the body shall be of carbon steel a suitable grade of austenitic stainless steel,or a non-ferrous metal.

The top end (dome) and the bottom end (dish) shall be concave to internal pressure to a radius not exceeding the diameter of the body. Reversed curvature ends shall not be used.

A skirt/base ring shall be provided to keep the extinguisher in the upright position. The heel radius of the skirt/base ring shall be not less than four times the thickness of the material used in the construction of the body.

1.2 *Fittings*

Fitting shall be constructed of austenitic stainless steel, carbon steel or a non-ferrous metal or of other equally durable material of adequate strength which should not decompose under fire fighting conditions and yield toxic gases or vapours.

4.2 Design and construction

4.2.1 *Basis for design*

The extinguisher shall be designed to withstand without rupture or leak at a pressure of not less than :

a) 3.75 times the equilibrium pressure ; or

b) 4.13 times the equilibrium pressure if failure occurs at a joint in a test to destruction.

The equilibrium pressure being the pressure in the extinguisher when the extinguisher is correctly charged and heated to a temperature of 65 °C. The charged extinguisher shall be maintained at a temperature of 65 °C for a minimum period of 24 hours prior to equilibrium pressure determination.

4.2.1.1 Wall thickness

The minimum wall thickness t, expressed in millimetres, of any extinguisher body shall be the greater of :

$$t = 2.5 \times \frac{D}{T}$$

and $t = 0.6$ mm

where, D is the internal diameter of body, in millimetres, and
T is the tensile strength of metal used for the body, in magapascals.

4.2.1.2 Standard test pressure

The standard test pressure shall be not less than 1.5 times the equilibrium pressure or 2.5 MPa, whichever is the greater, for a continuous period of 5 minutes without leakage or visible distortion. This test shall be carried out before any external finish is applied to the extinguisher.

4.2.2 *Circumferential and longitudinal joints*

4.2.2.1 Methods

Joints shall be made by one of the methods set out in 4.2.2.2 and 4.2.2.3.

4.2.2.2 Riveted construction

The overlap of lap joints and the width of the flanges of domes or dishes shall be not less than 20 mm.

The overlap in the case of flanges shall be wholly overlapped by cylindrical portion of the body. Rivet holes in both longitudinal and circumferential joints shall be precisely punched or drilled; not less than 20 mm and not more than 25 mm pitch. Rivets shall be of carbon steel or of stainless steel as applicable for steel bodies and of annealed copper for copper bodies. In either case rivets shall be not less than 5 mm diameter. The joints shall be finally soldered or brazed as applicable.

4.2.2.3 Welded construction

Welded construction shall be of one of the following types as appropriate to material :

a) Fusion welding ;

i) oxy-acetylene welding
ii) electric arc welding

b) Resistance welding ;

i) spot welding
ii) stitch welding
iii) seam welding

For further details refer Appendix **A** and Appendix **B**.

4.2.2.4 Swaged construction

Swaged construction may be applied only to the joint between body and the bottom end. An internal swage of not less than 6 mm deep shall be formed in the body at least 25 mm from the end of the body to retain the bottom end in position while pressure is applied. The joint shall finally be soldered, brazed or welded.

4.2.3 *Protective finishes*

4.2.3.1 Internal surfaces

Unless made of a corrosion-resistant metal or of austenitic stainless steel, the body of the extinguisher shall have all internal surfaces completely protected against corrosion by means of suitable metallic and/or organic lining (s).

Metallic linings based on zinc shall be applied either by electrical deposition to a thickness of not less than 0.013 mm or by spraying to a thickness of not less than 0.075 mm. There shall be no visible uncoated areas. The thickness of the coating shall be measured by any suitable method given in **ISO 3882**.

The lining shall be capable of withstanding the type approval tests specified in Appendix C without cracking of the internal surface or loss of adhesion between the lining and the body. (see **6.4**)

4.2.3.2 Internal components

All components of carbon steel or non-ferrous metal within the body of the extinguisher shall be suitably protected against corrosion and not contribute towards corrosion of the body.

4.2.3.3 External surface

The external surface of the body shall be finished to comply with the requirements for marking and colour identification in **5** and **4.3**.

Unless made of a corrosion resistant metal or of austenitic stainless steel, the body of the extinguisher shall have all external surface completely protected against corrosion.

4.2.4 *Neck ring*

The neck ring shall be of austenitic stainless steel, carbon steel or copper alloy. The neck ring shall be firmly secured to the body by brazing or by welding using one of the methods in **4.2.2.3**.

If fitted with an internal flange it may be secured by soldering and with an adequate number of rivets of not less than 5 mm in diameter.

The neck ring shall provide a clear opening of not less than 25 mm in diameter. The parallel screw thread for the attachment of the cap shall be not less than 16 mm in effective length and shall be in accordance with **SLS 268 : Part 1 and SLS 268 : Part 2**.

4.2.5 *Operating head*

The operating head shall be of austenitic stainless steel, carbon steel or copper alloy or other equally durable material of adequate strength as defined in **4.1.2**. The operating head shall have two side lugs or hand wheel or hand grip to help the removal of head in the absence of a spanner. At least three equidistant holes shall be drilled through the cap to form a vent for the release of any pressure remaining in the body during removal of head. The centres of the vent holes shall be 6.5 mm from the face of the head joint washer. The head shall be threaded for fixing to the neck ring on the body for not more than 16mm in effective length and the parallel threads shall be in accordance with **SLS 268 : Part 1 and SLS 268 : Part 2.**

4.2.6 *Actuating mechanism*

The actuating mechanism shall be of corrosion-resistant material of adequate strength.

Where a piercer is employed, it shall be of sufficient length to ensure that when driven to its maximum stroke it will effectively pierce the sealing device and allow the contents to be discharged. It shall be designed to prevent jamming.

4.2.7 *Handle and supporting fittings*

Carrying handles and supporting fittings fixed to the steel body shall be reveted, welded or brazed thereto. Anycarrying handles and supporting fittings fixed to a non-ferrous metal body shall be reveted. A carrying handle shall provide sufficient clearance for convenient hand grip and shall be of adequate strength.

The extinguisher shall be provided with a bracket or a holder into or on which it can be mounted and from which it can be readily removed.

4.2.8 *Liquid level indicator*

The liquid level to which the extinguisher should be filled shall be clearly indicated inside the extinguisher by embossing the container. Where a siphon tube forms part of the body assembly,the liquid level may be clearly indicated by a permanent projection on the siphon tube.

Means to prevent overfilling may be used as an alternative.

4.2.9 *Pressure indicating device*

A pressure gauge or other suitable device shall be fitted to the stored pressure type extinguisher, to indicate the pressure inside the extinguisher. The gauge/device shall be suitably marked to indicate the pressure at which the extinguisher shall be charged and also to indicate when it is wholly or partially discharged.

4.2.10 *Expansion device*

Means shall be provided in the case of gas cartridge type to prevent the liquid content in the siphon tube being raised above the normal level by the expansion of air in the body with a rise in temperature.

4.2.11 *Gas cartridge*

In the case of gas cartridge type, gas cartridge used shall be of either high pressure or low pressure type which shall comply with the requirements laid down in SLS 724.

4.2.12 *Discharge fittings*

4.2.12.1 Siphon tube

The siphon tube shall be of a length sufficient to ensure the discharge of 95 per cent of the extinguishing medium when the extinguisher is operated in the normal upright position. The tube shall be straight as practicable and located so as not to make difficult the cleaning of the interior of the body.

The siphon tube and its attachement (s) shall be located and fixed so as not to disengage when subjected to a steadily applied force of 50 N at a temperature of 20 ^{o}C.

4.2.12.2 Strainer

A suitable strainer shall be provided at the intake end of the siphon tube. The area of each hole in the strainer shall be less than the area of the smallest orifice between the strainer and the discharge nozzle and shall be less than the area of the discharge nozzle outlet. The aggregate area of the holes in the strainer shall be such that the requirements of **4.7.1** are complied with when 50 per cent of the holes are blocked.

4.2.12.3 Discharge nozzle

The discharge nozzle shall be constructed of copper alloy or other corrosion resistant material of adequate strength.

4.2.12.4 Discharge hose and fittings

A discharge hose shall be provided. The hose and its fittings shall be of durable material and of sufficient strength to comply with the requirements of **6.3**. The hose shall be of such length that the nozzle terminates at a point not less than 10 mm above the base of the extinguisher. The discharge hose and its attachment (s) shall be located and fixed to the siphon tube so as not to disengage when subjected to a steadily applied force of 50 N at a temperature of 20 °C.

4.3 Colour

Colour of the extinguisher shall be pale cream conforming to colour reference 352 of **BS 381 C**.

4.4 Size

The liquid capacity of the extinguisher, when filled, to the marked liquid level or to the overfill level when an overfill device is used, shall be not less than 9 litres.

4.5 Method of operation

The extinguisher shall be designed to be operated in the normal upright position with the operating head at the top.

The extinguisher shall incorporate a safety device to prevent accidental operation. This device may form part of the actuating mechanism or of the support bracket.

Mechanical means shall be provided whereby the sealing device is opened or pierced, thus following the contents of the extinguisher to be discharged.

4.6 Charge

4.6.1 The charge in the case of stored pressure type shall consist of the following :

a) Foam-producing material being a mixture of foam concentrate and water.

b) Inert gas stored under pressure.

4.6.2 The charge in the case of gas cartridge type shall consist of the following :

a) Foam-producing material being a mixture of foam concentrate and water, and stored in the body of the extinguisher.

b) Compressed gas in a gas cartridge. The cartridge shall be treated in accordance with 4.2.3.2.

A non-combustible, non-toxic trace gas that is compatible with the extinguisher medium and materials of construction may be added to the charge to facilitate testing for leakage of gas.

4.7 Performance requirements

4.7.1 *Discharge time and pattern*

The form of the nozzle and the area of the orifice shall be such that when the extinguisher is correctly charged and operated in its normal working position under standard atmospheric conditions as given in 4 of SLS 374 : 1976 and under still air conditions, it shall discharge not less than 95 per cent of its contents. The jet shall be maintained at an effective range of not less than 4.5 m for a period of 30 s and the required discharge shall take place in not more than 90 s. The foam-producing material shall :

(a) not be liable to stratification;

(b) be stable;

(c) produce a foam consisting of a mass of minute bubbles which will not be easily broken down by intense heat ;and

(d) produce a volume of foam at least 8 times the capacity of the extinguisher.

Not more than 3 s shall elapse between the operation of the control mechanism and commencement or recommencement of the discharge.

4.7.2 *Intermittent discharge*

Where the extinguisher is designed for intermittent discharge, it shall be capable of operating satisfactorily with an interrupted discharge cycle of 3 s open and 10 s shut, and not more than 3 s shall elapse between the opening of the control valve and the recommencement of the discharge.

4.7.3 *Fire test*

Fire tests for this type of extinguisher when carried out in accordance with SLS 752, shall comply with the rating marked on the extinguisher.

5 MARKING

5.1 Every extinguisher shall be marked legibly and indelibly with the following information :

(a) the manufacturer's name, address and brand name (if any);
(b) the words "MECHANICAL FOAM (STORED PRESSURE) TYPE" or "MECHANICAL FOAM (GAS CARTRIDGE) TYPE"
(c) method of operation ;
(d) the net charge of the liquid in litres ;
(e) fire rating ;
(f) the liquid level to which the extinguisher is to be recharged ;
(g) a declaration to the effect that the extinguisher conforms to the standard test pressure ;
(h) marking of suitability for various classes of fires;
(j) the year of manufacture ;and
(k) the words, as indicated below.

"**WARNING**

DC NOT USE ON LIVE ELECTRICAL EQUIPMENT AND WIRING ".

NOTE - Information b), c) and k) should be given in Sinhala, Tamil and English. Refer Appendix D *for Sinhala and Tamil translations.*

5.2 Serial number

The serial number shall be legibly stamped on the skirt/base ring.

5.3 SLS Certification Marking

The extinguishers may also be marked with the 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 TESTS

6.1 Standard test

Every extinguisher body shall be tested and shall be capable of withstanding for a period of 5 minutes an internal pressure of 1.5 times the equilibrium pressure (see **4.2.1**) or 2.5 MPa, whichever is the greater, without leakage or visible distortion.

This test shall be carried out before any external finish is applied to the extinguisher.

6.2 Test to destruction

An extinguisher body shall be tested to destruction by internal hydrostatic pressure. Rupture shall not occur at a pressure of less than 3.75 times the equilibrium pressure or 4.13 times the equilibrium pressure if failure occurs at a joint.

6.3 Test for fittings

Every hose, operating head and associated fittings shall be checked for clear passage and shall be capable of satisfactorily withstanding for 5 minutes the standard test pressure specified in **6.1**. Fittings may be tested separately.

6.4 Test for continuity of organic lining

Every extinguisher, the internal surface of which is coated with an organic lining, shall be tested by one of the following methods.

6.4.1 *Resistance test*

The lining shall be checked for continuity by a 500 V insulation tester connected between the metal body and an electrode immersed in water in the extinguisher body.

The resistance shall not be less than 500 M.

NOTE - *It may be necessary to add salt to the water to ensure its conductivity.*

6.4.2 *High frequency spark test*

The lining shall be checked for continuity and freedom from pinholes by combing over the entire surface with a suitable high frequency probe.

NOTES

1. In this test a high voltage spark discharge is directed to the lining. Where a defect occurs in the lining the discharge is earthed producing a strong bluish white continuous spark.

2. The surface of the lining should be clean and dry when the test is carried out. Excessive voltage or long residence time, or both, may puncture the lining, and care should therefore be taken to select the correct voltage. The voltage governs the spark length; a length of between 12 mm and 32 mm depending on the thickness of the lining will normally be adequate.

6.5 Test for leakage of gas

Every stored pressure type extinguisher shall be correctly charged and shall be tested for leakage of gas by one of the following methods.

(a) The extinguisher shall be stored for a period of not less than 21 days, following which the pressure-indicating device shall be checked to determine whether there has been any loss in pressure (corrected for temperature). Any extinguisher showing loss in pressure shall be rejected.

(b) A leak detector method may be used to check the contents.

(c) When the immersion method is used to check the contents, the extinguisher shall be filled and then completely immersed in a tank of clean water for 24 h. Means shall be provided for trapping escaping gas.

An immersion test may be applied to an extinguisher, provided that it does not have long term deleterious effects on the extinguisher.

Extinguishers showing loss of contents exceeding the equivalent of 5 per cent by mass in five years in (b) and (c) above shall be rejected.

7 INSTRUCTIONS ON MAINTENANCE

Written instructions shall be issued by the manufacturer to the customer covering maintenance procedure.

The extinguishers shall be tested for discharge time and pattern as specified in **4.7.1** and the body pressure tested as specified in **6.1** para 1 at intervals not exceeding 5 years.

8 SAMPLING

8.1 Lot

All foam type fire extinguishers of same size produced by the same manufacturer from similar material under almost identical conditions of manufacture shall be grouped together to constitute a lot.

8.2 Scale of sampling

8.2.1 Each lot shall be considered individually for the purpose of evaluation of quality in accordance with this specification.

8.2.2 Each fire extinguisher in the lot shall be examined for tests specified in **6.1, 6.3, 6.4** and **6.5** as applicable.

NOTE - The manufacturer shall satisfy himself that the items of the lot conform to these requirements. If requested he shall issue a certificate to this effect.

8.2.3 The number of items (fire extinguishers) to be selected from a lot shall be in accordance with Column 1 and Column 2 of Table 1.

TABLE 1 - Scale of sampling

Number of items in the lot	Number of items to be selected	Sub sample size
Up to 25	5	2
26 to 50	8	3
51 to 100	13	5
101 to above	20	8

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

8.3 Number of tests

8.3.1 Each item selected as in 8.2.3 shall be examined visually for the relevant requirements given in 4 and 5.

8.3.2 From the items examined visually and found satisfactory, a sub sample of size as given in Column 3 of Table 1 shall be taken at random and selected to requirements given in 4.7.

8.3.3 One item shall be selected from the sub sample and tested for the requirements given in 6.2.

8.4 Criteria for conformity

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

8.4.1.1 Each fire extinguisher examined as in 8.3.1 satisfies the relevant requirements given in 4 and 5.

8.4.1.2 All fire extinguishers of the sub sample tested as in 8.3.2 satisfy the relevant requirements.

8.4.1.3 The fire extinguisher tested as in 8.3.3 satisfies the relevant requirements.

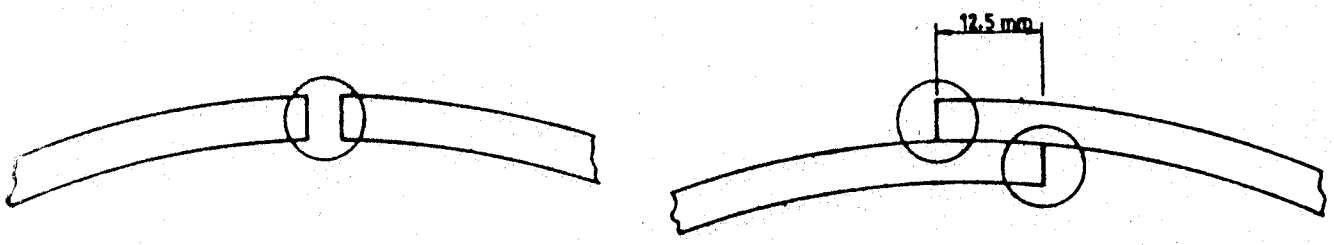
APPENDIX A
FUSION WELDING

A.1 Fusion welding joints

The type of fusion welded joints used in the construction of the body of the extinguisher and of the pressure containers shall be as follows :

a) Longitudinal joints

Longitudinal joints shall be made as shown in Figure 1.

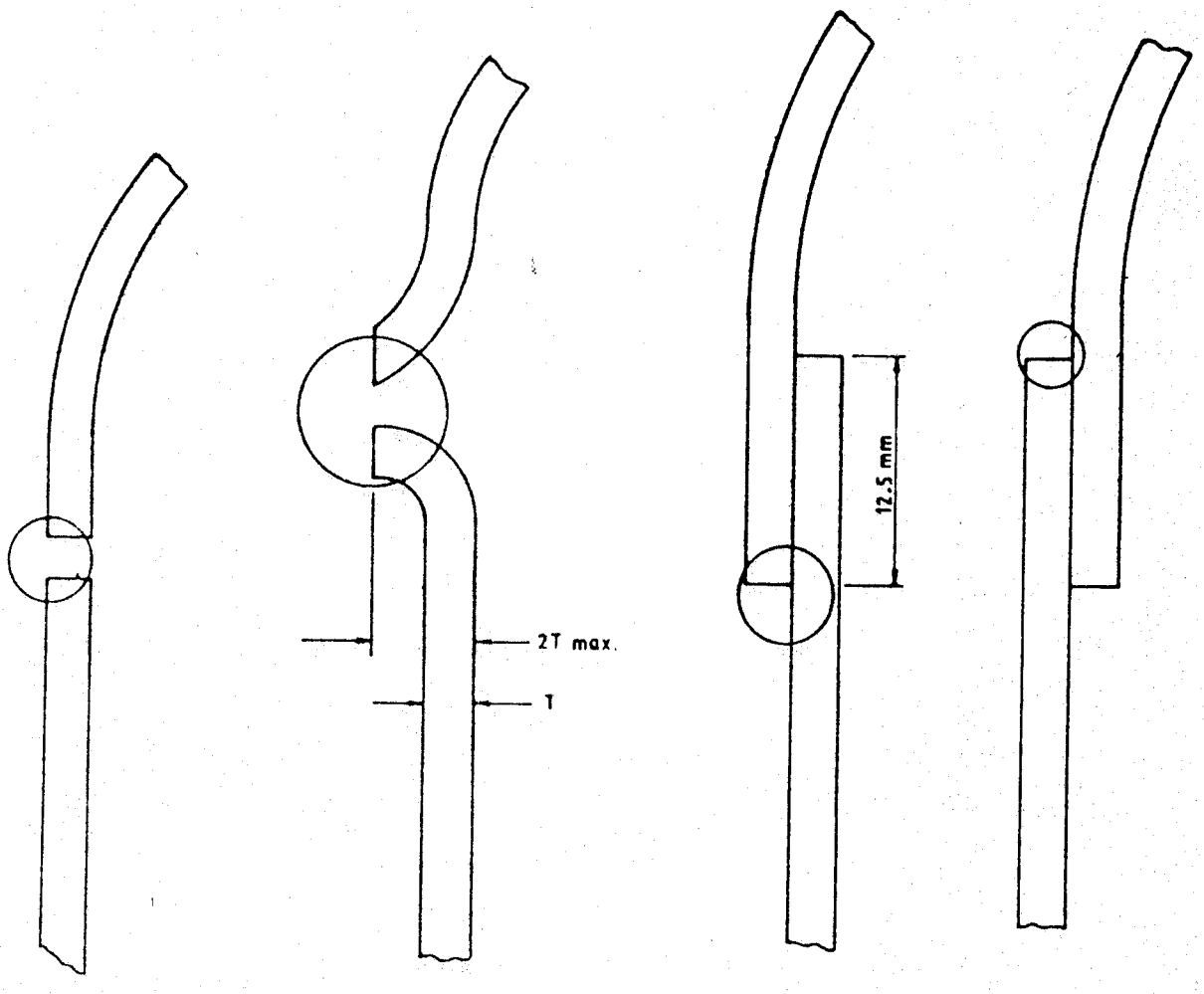


a) Butt joint b) Lap joint

FIGURE 1 - Longitudinal joints

B) Circumferential joints

Circumferential joints between the body and the domed or dished end shall be made as shown in Figure 2.



a) Butt joints b) Lap joints

FIGURE 2 - Circumferential joints

APPENDIX B

ADDITIONAL REQUIREMENTS FOR RESISTANCE WELDING

B.1 Types of joints

All joints to be resistance welded shall be lap joints with an overlap of not less than 10 mm, except for a distance of 10 mm from each end of the longitudinal joint where it may be reduce to 1.5 mm to provide a flush weld. The centre line of the circumferential joints shall be not less than 10 mm from the joint where the dome or dish become cylindrical. The cylindrical portion and the ends shall fit tightly together when assembled before welding. All the joints shall be seam or stitch welded. Before seam welding the joints shall be tacked together by spot welds not more than 100 mm apart.

B.2 Surface conditions

The surface of the material shall normally be coated with lead, tin or zinc to a thickness of not more than 0.025 mm before welding. Where this is not done, the surface shall be free from scale, grease, paint, dirt and oxide film.

APPENDIX C

TYPE APPROVAL TEST

C.1 Internal corrosion test

Fire extinguishers complying with the requirements of this standard, correctly charged and ready for operation, shall be stored for a period of 3 months.

They shall then be discharged and inspected. There shall be no signs of corrosion of the parent metal.

C.2 Organic linings impact test

A specimen extinguisher body shall be laid on its side and a mass of 4.5 kg having a spherical contact area of 25 mm diameter shall be dropped on to the extinguisher body from a height of 450 mm. The lining shall not crack or be separated from the wall of the body.

The specimen extinguisher shall then be charged and stored at room temperature at its working pressure for 5 days, after which it shall be discharged and inspected. There shall be no bubbles between the lining and the body shell or signs of lifting of the lining.

APPENDIX D

D.1 Sinhala translations of information b), c) and k) of 5.1 are as follows :

b) "යාන්ත්‍රික පෙණ (පිවනය කරන ලද) වර්ගය" සහ "යාන්ත්‍රික පෙණ (වායු පතරොම් සහිත) වර්ගය" යන වචන,

c) ක්‍රියාත්මක කරන ක්‍රමය

k) "අවවාදයයි

විදුලිය සහිත උපකරණ සහ රැහැන් සදහා භාවිතයෙන් වලකින්න" යන වචන

D.2 Tamil translations of information b), c) and k) of 5.1 are as follows :

(b) "[illegible]"

(c) [illegible]

(k) "[illegible]"

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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.

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