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~~Draft~~ Sri Lanka Standard

SPECIFICATION FOR PORTABLE FIRE EXTINGUISHERS FOAM TYPE (CHEMICAL)

SRI LANKA STANDARDS INSTITUTION

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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 89/12/28 after the draft, finalized by the Drafting Committee on Portable fire extinguishers foam type (chemical) 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 chemical foam type in which foam is expelled by a chemical reaction of bicarbonate of soda with an acid salt and expelled by gas produced therein.

This type of fire extinguisher is now obsolete in many countries. However, this standard is prepared solely to guide the present local manufacturers.

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 Indian Standards Institution in the preparation of this standard is gratefully acknowledged.

1 SCOPE

This standard lays down requirements regarding capacity, principal materials, construction chemical charge, anti corrosive treatment, method of operation, performance and tests of portable fire extinguisher of chemical foam type.

2 REFERENCES

ISO	3882	Metallic and other non-organic coatings-review of methods of measurement of thickness
BS	381C	Colours for Identification, Coding and Special purposes.
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	752	Rating and fire testing of fire extinguishers.

Contd...2/-

3 DEFINITIONS

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

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

3.2 chemical foam type portable fire extinguisher : A portable fire extinguisher generating foam as the extinguishing medium by means of a chemical reaction.

3.3 reversible (turnover) type extinguisher : An extinguisher in which the chemical reaction between an acid salt solution and a sodium bicarbonate solution is brought about by inverting the extinguisher.

3.4 splash - proof type extinguisher : An extinguisher in which the acid salt solution container is provided with a breakable seal so that the solution cannot splash over.

4 REQUIREMENTS

4.1 Materials

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 suitable grade of austenitic stainless steel, carbon steel or a non-ferrous metal.

The top end (dome) and the bottom end (dish) shall be concave to 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.

4.1.2 Fittings

Fittings 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.

NOTE - The equilibrium pressure is 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.

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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 megapascals.

4.2.1.2 Standard test pressure

The standard test pressure shall be not less than 1.5 times the equilibrium pressure (see 4.2.1) or 2.5 MPa, whichever is the greater (see 6.1).

4.2.2 Circumferential and longitudinal joints

Joints shall be made by one of the methods set out in 4.2.2.1 and 4.2.2.2.

4.2.2.1 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 alloy bodies. In either case rivets shall be not less than 5 mm diameter. The joints shall be finally soldered or brazed as applicable.

4.2.2.2 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.

4.2.2.3 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.

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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. The thickness of the coating shall be measured by any suitable method given in ISO 3882. There shall be no visible uncoated areas.

The linings 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 surfaces 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 4.2.2.2.

If fitted with an internal flange it may be secured by soldering and by using 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 75 ± 1 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 Head cap

The cap 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 cap shall have two side lugs or hand wheel or hand grip to help the removal of cap 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 cap. The centres of the vent holes shall be 6.5 mm from the face of the cap joint washer. The cap shall be threaded for fixing to the neck ring on the body for not more than 16 mm in effective length and the parallel threads shall be in accordance with SLS 268:Part 1 and Part 2.

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4.2.6 Head cap washer

The cap washer shall be of good quality leather, rubber or plastics, of suitable composition.

4.2.7 Handle and supporting fittings

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

A reversible type extinguisher shall have a handle at the bottom.

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 specified level of the solution in the body before inserting the inner container shall be indicated on the exterior of the body and also be permanently indicated on the interior or means shall be provided to demonstrate that the solution level is correct.

4.2.9 Expansion space

An expansion space shall be provided above the solution level in the body of the extinguisher which shall not be less than 5 per cent of the total volume of the extinguisher.

4.2.10 Discharge fittings

4.2.10.1 Discharge nozzle

The discharge nozzle shall be made of a corrosion resistant material of adequate strength. The discharge nozzle shall be fitted with a protecti cap capable of being readily removable or being blown off once the extinguisher is operated.

4.2.10.2 Discharge hose and fittings

Where a discharge hose in provided, hose and its fittings shall be durable and shall be of sufficient strength to meet the test requirements of 6.3.

4.2.10.3 Strainer

Where a Strainer is provided at the intake end of the nozzle connection, the area of each hole in the strainer shall be less than the area of the nozzle outlet and the aggregate area of the holes shall be not less than twice the area of the nozzle connection.

4.2.10.4 Freedom of discharge

No. tap, cock or valve shall be fitted to control the discharge of the extinguisher.

4.2.11 Inner container and supports

4.2.11.1 General

The inner container and supports shall be of sufficient strength to resist fracture or distortion to the inner cylinder caused by mechanical shock.

Contd...6/-

4.2.11.2 Non splash-proof, turn over type extinguisher

In this type the inner container has a series of port holes at the top so that when the extinguisher is inverted the two solutions can mix, the chemical reaction is initiated and foam is discharged through the nozzle.

4.2.11.3 Splash-proof, turn over type extinguisher

The inner container, containing the acid salt is sealed so that the solution cannot splash over during transportation.

a) Bayonet seal type

This embodies two valves on one stem, one of which seats upon a shoulder in the inner compartment just below the port holes and closes it, whilst the other seals the small outlet space in the cap. In this way the accidental mixing of the solutions is prevented and the passage to the nozzle is closed.

This type of extinguisher is brought into use either by operating a lever or by a half turn of the handle, before inverting.

b) Plunger type

In this type, the inner compartment is sealed by means of a mica disc and strike knob mechanisum is provided in the head. To actuate the extinguisher, the knob is struck, thus puncturing the disc, and the extinguisher is inverted. The nozzle forms a part of the body and is not sealed, thus allowing the extinguisher to 'breathe' with variations in temperature.

4.3 Colour

Colour of the extinguisher shall be pale cream conforming to BS 381 C ref : 352.

4.4 Size

The liquid capacity of the extinguisher, when filled to the marked liquid level, including the contents of the correctly filled inner container, shall be not less than 9 litres.

4.5 Method of operation

The extinguisher shall be operated in one of the following ways.

a) By turning the extinguisher over;
b) By releasing a stopper or breaking a seal and turning the extinguisher over.

4.6 Charge

The charge for the 9 litre extinguisher shall consist of :

a) Soda solution
620 g of sodium bicarbonate made into a solution together with a stabilizer, the solution being of such strength that no precipitation takes place at a temperature above 7 °C.

b) Acid salt solution
An acid salt in such proportions that when inner and outer solutions are brought into conjunction, the resulting foam shall not be acidic.

Contd...7/-

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 6 m for a period of 30 s and the required discharge shall take place in not more than 90 s.

The foam produced shall :

a) Consist of a mass of minute bubbles not easily broken down by intense heat,
b) be alkaline, and
c) produce a volume of at least eight times the capacity of the extinguisher,

4.7.2 Fire test

The classification and rating for this type of extinguisher shall be determined from the results of the appropriate fire test set out in SLS 752.

5 MARKING

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

a) The manufacture's name, address and brand name (if any);
b) The words "CHEMICAL FOAM".
c) Method of operation;
d) The net capacity 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 use for appropriate class of fire;
j) The year of manufacture;
k) The words as indicated below;

"WARNING
DO 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.

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.

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6.2 Test to destruction

An extinguishers 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 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 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 Continuty 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 continous 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 extinguisher shall be correctly charged and 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 percent by mass in five years in (b) and (c) above shall be rejected.

Contd...9/-

7 INSTRUCTIONS ON MAINTENANCE

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

The extinguishers shall be test discharged as specified in 4.7.1 the body pressure tested an specified in 6.1 para 1 at intervals not exceeding 5 years.

8 SAMPLING

8.1 Lot

All chemical foam type fire extinguishers of same size produced by the same manufacture from similar material under similar 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 and 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 test

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 tested 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.

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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.

Contd...11/-

APPENDIX A

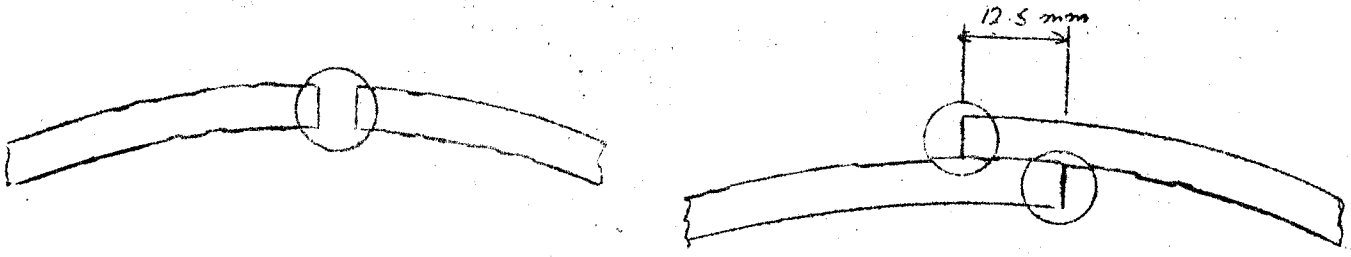
FUSION WELDING JOINTS

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.



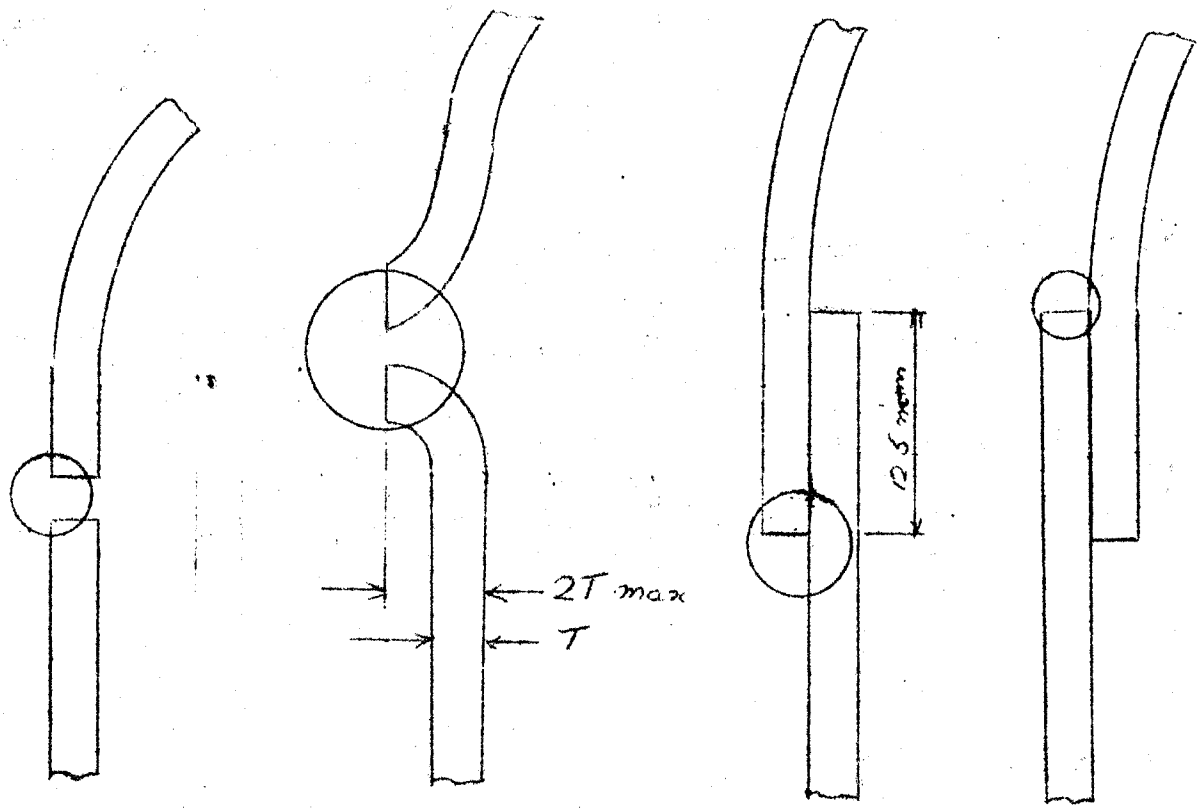
a) Butt joint

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

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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 reduced 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 TESTS

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 4.6 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.