

Unofficial Translation

In the event of any doubt or misunderstanding arising from this translation, the standard in Thai will be held to be authoritative

Notification of Ministry of Industry
No.1970 (B.E. 2537 (1994))
issued under the Industrial Product Standards Act
B.E. 2511(1968)
Re : Amendment of Thai Industrial Standard for
Dry Chemical Portable Fire Extinguishers (Amendment No.2)

Whereas it is expedient to amend the Thai Industrial Standard for dry chemical portable fire extinguishers, standard No.TIS 332-2531 (1987).

By virtue of Article 15 of the Industrial Product Standards Act B.E. 2511 (1968), the Minister of Industry hereby issues a notification for an amendment to the Thai industrial standard for dry chemical portable fire extinguishers, standard No.TIS 332-2529 (1986) annexed to the Notification of the Ministry of Industry No.1067, B.E.2529 (1986) dated 31 July B.E.2529 (1986) as amended by the Notification of the Ministry of Industry No. 1304, B.E. 2531(1988) dated 16 February B.E. 2531(1988) as follows :

1. The standard number "TIS 332-2531(1988)" shall be amended to read "TIS 332-2537(194)".
2. The provision in clause 6.3.1 shall be repealed and replaced by the following:

"6.3.1 When the distinguisher is operated at a temperature of $27\pm 2^{\circ}\text{C}$, it shall discharge not less than 85% of its contents as indicated on the label within the discharge time limit specified in table 1."
3. The provision in clause F.2 shall be repealed and replaced by the following:

"F.1 A wood crib is to consist of layers of dried rubber wood (Dipterocarpus spp.) having cross sectional dimensions as given in Table F.1 with a tolerance of ± 5 mm and a moisture content not exceeding 15% as calculated from as sample dried to constant weight $103\pm 2^{\circ}\text{C}$. The crib is to be constructed on 65 x 40 mm angle irons placed on supports at a height above floor as specified in table F.2. The individual wood members are to be laid in alternate layers forming a rectangle. The wood members forming the outside edges of the crib are to be stapled or nailed together as shown in Figure F.1. The size of the wood members and the wood crib arrangement shall comply with Table F.1."

Table F.1
Size of wood members and wood crib arrangement
(clause F.2)

Classification and rating	Number of wood members	Cross-sectional dimensions of wood members	Number of layers	Number of wood members in each layer
		mm x mm x mm		
1-A	50	45 x 45 x 500	10	5
2-A	78	45 x 45 x 600	13	6
3-A	98	45 x 45 x 750	14	7
4-A	120	45 x 45 x 850	15	8
6-A	153	45 x 45 x 1000	17	9
10-A	209	45 x 45 x 1200	19	11
20-A	160	45 x 90 x 1500	10	15 on edge
30-A	192	45 x 90 x 1850	1 (top layer) 10	10 flat 18 on edge
40-A	224	45 x 90 x 2200	1 (top layer) 10 1 (top layer)	12 flat 21 on edge 14 flat

Table F.2
Pan size, fuel amount and height of supports above floor
(clauses F.2 and F.3)

Classification and rating	Pan size	Fuel charge	Height of supports above floor
	mm x mm x mm	dm ³	mm
1-A	525 x 525 x 100	1.0	400
2-A	525 x 525 x 100	2.0	400
3-A	680 x 680 x 100	3.0	400
4-A	680 x 680 x 100	4.5	400
6-A	810 x 810 x 100	7.0	400
10-A	960 x 960 x 300	10.0	800
20-A	1360 x 1360 x 300	20.0	800
30-A	1670 x 1670 x 300	27.0	800
40-A	1900 x 1900 x 300	45.0	800

5. The provision in clause G.2 shall be repealed and replaced by the following:
 "G.2 The test fire is conducted using a pan, squarer in shape, made of steel of a thickness as given in Table G.1 and not less than 200 mm in depth. The pan is provided with angle of the size as given in Table G.1 to reinforce the upper edge. The reinforcing angle is to be continuous around the perimeter of the pan. The size of the pan shall be as specified in Table G.1."

6. Table G.1 shall be repealed and replaced by the following:

Table G.1
Effective discharge time, pan size and fuel charge
(clause G.2)

Classification and rating	Minimum effective discharge time seconds	Pan size mm x mm	Steel thickness mm	Reinforcing angle mm x mm x mm	Fuel charge
1-B	8	475 x 475	6	38 x 38 x 5	12.0
2-B	8	675 x 675	6	38 x 38 x 5	25.0
5-B	8	1075 x 1075	6	38 x 38 x 5	60.0
10-B	8	1525 x 1525	6	38 x 38 x 5	120.0
20-B	8	2150 x 2150	6	38 x 38 x 5	250.0
30-B	11	2650 x 2650	12	38 x 38 x 6.5	350.0
40-B	13	3050 x 3050	21	38 x 38 x 6.5	475.0
60-B	17	3725 x 3725	12	38 x 38 x 6.5	720.0
80-B	20	4300 x 4300	12	38 x 38 x 6.5	950.0

This shall enter into effect after a period of 300 days as from the date of publication in the Government Gazette.

Given on this date of 29 April B.E.2837 (1994)
Major General Sana Kajornprasat
Minister of Industry

Published in the Government Gazette Vol.11, Part 43 ngor., dated 31 May B.E.2537 (1994)

TIS 332-2531 (1988)
Thai Industrial Standard
for
DRY CHEMICAL PORTABLE FIRE EXTINGUISHERS

1. Scope

- 1.1 This standard specifies types, sizes, components and construction, requirements, marking and labelling, sampling and criteria for conformity, and testing for dry chemical portable fire extinguishers applicable to classes A, B and C fires excluding class D fires.

2. Definitions

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

- 2.1 DRY CHEMICAL PORTABLE FIRE EXTINGUISHER hereinafter referred to as "FIRE EXTINGUISHER": A first aid portable fire fighting appliance of which the body is made of metal or other material, and components are generally as shown in Figure 1.
- 2.2 GAS CONTAINER TYPE : An extinguisher in which the extinguishing medium is expelled by means of a compressed gas released from a gas container attached to or fitted into the extinguisher.
- 2.3 STORED PRESSURE TYPE : An extinguisher in which the extinguishing medium is expelled by means of dry inert gas stored with the extinguishing medium under pressure.

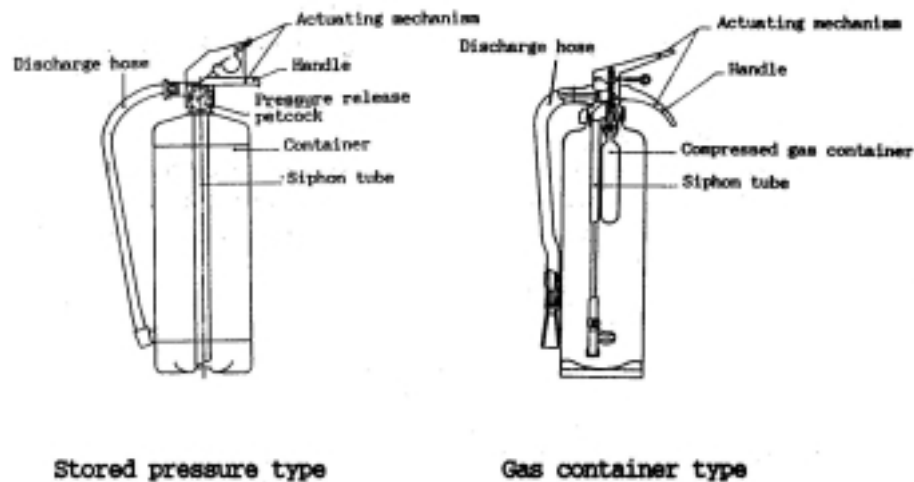


Figure 1 Components of fire extinguisher
(clause 2.1)

2.4 WORKING PRESSURE:

- 2.4.1 For gas container type - the maximum pressure developed in a correctly charged extinguisher when the extinguisher is ready for use;
- 2.4.2 For stored pressure type - the pressure developed in a correctly charged extinguisher when filled with inert gas.

- 2.5 CLASS A FIRES: Fires in ordinary combustible materials such as wood, cloth, paper, rubber, and many plastics.
- 2.6 CLASS B FIRES: Fires in flammable and combustible liquids, gases, greases and oils.
- 2.7 CLASS C FIRES: Fires which involve energized electrical equipment or materials which have electrical current.
- 2.8 CLASS D FIRES: Fires in combustible metals, such as magnesium, sodium, potassium, zirconium, and titanium.

3. Types**3.1 Extinguishers are classified into 2 types:**

- 3.1.1 Gas container type
- 3.1.2 Stored pressure type

4. Sizes

- 4.1 The sizes of extinguishers are specified in accordance with the mass of the charge of the extinguishing medium, which shall not be less than 1 kg and not more than 14 kg.

5. Components and construction**5.1 Body**

- 5.1.1 The body of the extinguisher shall be made of suitable materials and so designed as to withstand the pressure of clause 6.4. The minimum wall thickness shall be the greater of the value calculated from the following formula which shall not be less than 0.6 mm.

$$t = 2.45 \frac{D}{T}$$

Where t = wall thickness, in mm
 D = internal diameter of body, in mm
 T = tensile strength of metal used for the body, in MPa

- 5.1.2 Where the internal diameter of the body does not exceed 100 mm and the bottom end is integral with it, the end may be convex to pressure.
- 5.1.3 Where the internal diameter of the body exceeds 100 mm, the top and the bottom ends of the body shall be concave to pressure to a radius not exceeding the diameter of the body.
- 5.1.4 The heel radius of the bottom end having projection pressed out to form feet shall be at least 4 times the thickness of the material used in the construction of the body.
- 5.2 Fittings
 Fittings shall be constructed of austenitic stainless steel or other materials and satisfy the requirement of the test of Appendix A.
- 5.3 Neck ring
 The neck ring shall be made of a material having a tensile strength of not less than 185 MPa, being integral with the body or firmly secured to the body by welding in accordance with the method set out in Appendix B. The neck ring shall provide a clear opening sufficient to permit inspection of the interior of the extinguisher.

5.4 Operating head and cup

The operating head and cup shall be constructed of austenitic stainless steel or other material having a tensile strength of not less than 185 MPa, secured to the neck ring or to the top end by a screw thread of not less than 4 revolutions, the closure being such that there is not loss of pressure when the extinguisher stands for prolonged periods in its normal position. The operating head shall contain the actuating mechanism and be provided with vents to permit the release of pressure remaining in the body before the complete removal of the head or cap.

If the vents are provided at the screws of the operating head or of the cap, they shall be located at the place where the remaining pressure is released when not more than half of the screws are untightened.

5.5 Actuating mechanism

The actuating mechanism shall be of corrosion resistant material of adequate strength. Where a plunger rod of 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 or the gas container and allow the contents to be discharged. It shall be designed to prevent jamming. Safety devices shall be provided to prevent accidental operation.

5.6 Discharge fittings

5.6.1 Siphon tube

The siphon tube shall be of sufficient length to ensure the discharge of not less than 85% of the extinguishing medium.

5.6.2 Discharge hose and fittings

The discharge hose and its fittings shall be made of a material which will not be attacked by the contents of the extinguisher and shall be of sufficient strength to withstand a pressure of not less than double working pressure when tested as prescribed in Appendix A. The hose shall not be subject to pressure until the extinguisher is operated. Any reinforcement used in the hose shall be completely embedded. Where provision is made for the hose to wrap around the body of the extinguisher and for the nozzle end of the hose to be attached to the operating head, or where the nozzle end of the hose is attached to the clip on the body, the length of the hose shall not exceed 1 m. Where no such provision is made and the hose hangs down by the side of the extinguisher, 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.

5.6.3 Discharge nozzle

The discharge nozzle shall be constructed of corrosion resistant material.

5.7 Pressure indicating device

The stored-pressure type extinguisher shall be fitted with a device which will indicate whether or not the pressure in the extinguisher is less than the working pressure marked thereon.

5.8 Sealing device

The extinguisher shall incorporate means for sealing the extinguishing medium from the atmosphere to prevent the ingress of moisture.

5.9 Handle and supporting fitting and fixture

The handle and supporting fittings and fixture shall be of adequate strength, and shall be designed for the convenience in use.

5.10 Joints

Where the extinguisher is constructed of metal, longitudinal and circumferential joints shall be made by welding or brazing using one of the methods set out in Appendix B. Where it is constructed of austenitic stainless steel, it shall satisfy the test requirement prescribed in Appendix C and if of aluminium, it shall be seamless.

5.11 Compressed gas container

5.11.1 Compressed gas container shall be designed and constructed in accordance with clause 5.11.2, 5.11.3 or 5.11.4, whichever is the case. For gas container type extinguisher which has the gas container attached to the body, the safety device shall be attached to the extinguisher. Safety value operating at 2.5 times the filling pressure shall be provided.

5.11.2 High pressure compressed gas container (filling pressure exceeding 3.5 MPa) shall be seamless and shall be constructed of steel, copper or copper alloy or aluminium alloy.

5.11.3 Low pressure compressed gas container (filling pressure not exceeding 3.5 MPa) shall be constructed of steel, copper or copper alloy in accordance with the following requirements.

(1) Steel container shall be seamless or constructed from welded tube. Where welded tube is used, the tube shall be welded in accordance with Appendix B. The ends shall be of steel and shall be attached by welding.

(2) Copper or copper alloy container shall be constructed either-

(2.1) by means of deep pressing with the closure by spinning or by attachment of the separate ends; or

(2.2) from seamless tube. The ends shall be of the same kind of material and shall be attached by screwing or welding using the method described in Appendix B.

5.11.4 Seamless gas container shall be designed to withstand a pressure of not less than 3 times the filling pressure at 38°C. Other types of gas containers shall withstand a pressure of not less than 4 times the filling pressure at 30°C when tested in accordance with the method specified in Appendix A.

5.11.5 Filling requirements

Care shall be taken to ensure that the container and the gas are free from moisture. Where carbon dioxide is used it shall comply with TIS 568, "Industrial carbon dioxide". The leakage test shall comply with the method specified in Appendix D.

5.12 Protective finishes

5.12.1 Internal surface shall be protected to resist corrosion caused by extinguishing medium and expellant by applying lacquer for instance. At the commencement of filling, the internal surface of the extinguisher shall be clean, dry and free from corrosion.

5.12.2 Unless made of a corrosion resistant material, the body on the external surface shall be suitably protected to resist corrosion by applying putty for instance.

Prior to brushing, spraying, plating or enamelling in accordance with clause 7.1.3, the external surface of the extinguisher shall be clean, dry and free from corrosion.

6. Requirements

6.1 General characteristics

The extinguisher shall be designed to be operated in the normal upright position, i.e. with the operating head at the top, and shall incorporate the safety device to prevent accidental operation.

6.2 Charge

Dry chemical powder used as the extinguishing medium shall retain its free-flowing properties at all times and shall not be compact.

Compliance is checked by the test specified in Appendix E.

6.3 Performance

6.3.1 When the extinguisher is operated at a temperature of $27 \pm 2^\circ\text{C}$, it shall discharge not less than 85% of its contents within the time limits in Table 1.

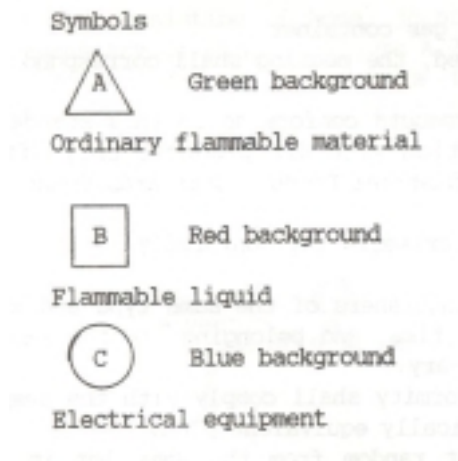
Table 1
Discharge time
(clauses 6.3.1 an 6.3.3)

Size of extinguisher kg	Discharge time, s	
	min.	max.
1 up to but not exceeding 3	8	15
3 up to but not exceeding 5	10	15
5 up to but not exceeding 9	10	20
9 up to 14	10	30

- 6.3.2 The extinguisher shall be capable of controlling or putting fires when tested in accordance with Appendix F, G or H, whichever is the case.
- 6.3.3 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 valves and the recommencement of the discharge. The discharge times shall comply with Table 1.
- 6.4 Pressure resistance
When tested in accordance with Appendix A,
- 6.4.1 the extinguisher body shall withstand for 5 min without rupture or distortion an internal pressure of not less than double working pressure or 2.4 MPa;
- 6.4.2 the gas container shall withstand for 5 min without rupture or distortion an internal pressure (test pressure) of not less than double filling pressure at 38°C;
- 6.4.3 the discharge hose and fittings shall not be ruptured when subjected to a test pressure of double working pressure when the extinguisher is opened or not less than 2.4 MPa.
- 6.4.4 Test to destruction
The extinguisher body and the gas container shall withstand without rupture or breakage a pressure of 4 times the working pressure or not less than 3.5 MPa. The manufacturer shall be responsible for doing test to destruction as the routine test and recording the result for evidence.
- 6.5 Leakage of gas
Stored pressure type extinguisher shall be free from leakage when tested in accordance with Appendix D.

7. Marking

- 7.1 Marking of the extinguisher body
- 7.1.1 Every extinguisher shall bear at least number, letter or mark indicating legibly and clearly the following information.
- (1) The word "DRY CHEMICAL TYPE"
 - (2) Type designation
 - (3) Size in kg
 - (4) Symbols of classes of fires applicable to the extinguisher as follows.



- (5) Discharge time and capacity of extinguisher
 - (6) Instruction for operation
 - (7) Name of manufacturer, factory, trade-mark or distributor
 - (8) Working pressure in Pa at $27 \pm 2^\circ\text{C}$.
 - (9) Weight of extinguisher body in kg
 - (10) Overall weight of extinguisher when full in kg
 - (11) Maximum weight of expelling medium in g (for gas container type only)
 - (12) The words "RECHARGE AFTER USE"
 - (13) Year of manufacture of the body
- 7.1.2 Marking as specified in clause 7.1.1 shall be made by stamping on the extinguisher or on other metal plates soldered to the extinguisher, or shall be displayed on the extinguisher by means of painting or approved durable label. The marking required under clauses 7.1.1(1), (2), (4) and (5) shall be separated from all other markings on the extinguisher and shall be in numbers and letters not less than 5 mm high and of such a contrast with the background as to be readily and distinctly visible. The year of manufacture required under clause 7.1.1
- 7.1.3 The body of the extinguisher shall be red.
- 7.1.4 A manual for use shall be provided in accordance with TIS 405, "General principle of manual for use and maintenance of portable fire extinguishers".
- 7.2 Marking of the gas container
Every gas container shall bear at least number, letter or mark indicating legibly and clearly the following information.
- (1) Name and address of manufacturer or factory
 - (2) Weight of the container in g
 - (3) Weight of the container when full in g
 - (4) Test pressure in MPa
 - (5) Year of manufacture of the gas container
- 7.3 In case foreign language is used, the meaning shall correspond to that in Thai specified above.
- 7.4 Any person who manufactures products conforming to this standard may use the Standards Mark in connection with his products only after having received a license from The Industrial Product Standards Council.

8. Sampling and criteria for conformity

- 8.1 Lot: Not more than 3000 extinguishers of the same type and size, manufactured at the same period of time, and belonging to the same group in any single transaction or delivery.
- 8.2 Sampling and criteria for conformity shall comply with the sampling plan specified below or other technically equivalent plan.
- 8.2.1 Samples shall be taken at random from the same lot in quantities specified in Table 2.

Table 2
Sampling plan
(clauses 8.2.1 and 8.2.2)

Lot size units	Sample size units	Acceptance number
Up to 90	3	0
91 to 500	13	1
501 to 1200	20	2
1201 to 3000	32	3

8.2.2 Criteria for conformity

Provided that all samples satisfy the requirements of clauses 6.1, 6.3, 6.4, 6.5 and 7, and the number of samples which fail to meet the requirement of clause 6.2 does not exceed the acceptance number specified in Table 2, that lot shall be deemed as conforming to this standard.

Appendix A Hydraulic test

(clauses 5.2, 5.6.2, 5.11.4 and 6.4)

Prior to the test, the pressure indicating device and safety device may be removed.

A.1 Apparatus comprising:

- A.1.1 a suitable hand or motor operated hydraulic pump capable of producing a hydrostatic pressure of not less than double test pressure consisting of a check valve and others as necessary as shown in Figure A.1,
- A.1.2 fittings consisting of hose, joint, cap of extinguisher and others as necessary as shown in Figure A.2,
- A.1.3 a portable hydrostatic test cage for placing the extinguisher for protective purpose; the interior of the test cage can be seen from outside, as shown in Figure A.3.

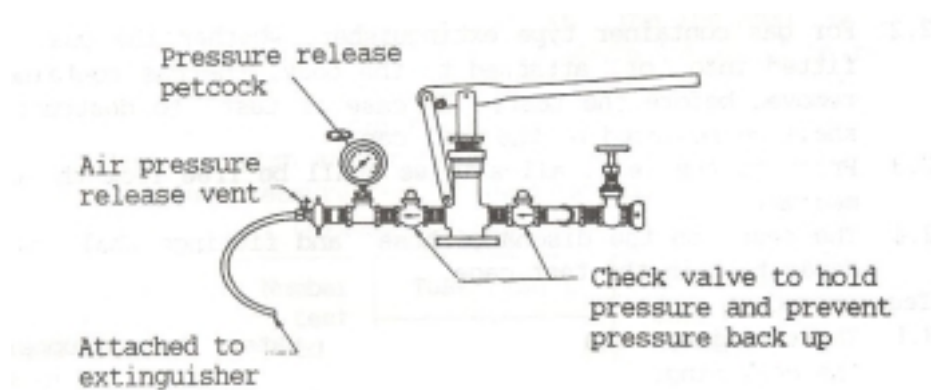


Figure A.1 Hydraulic pump
(clause A.1.1)

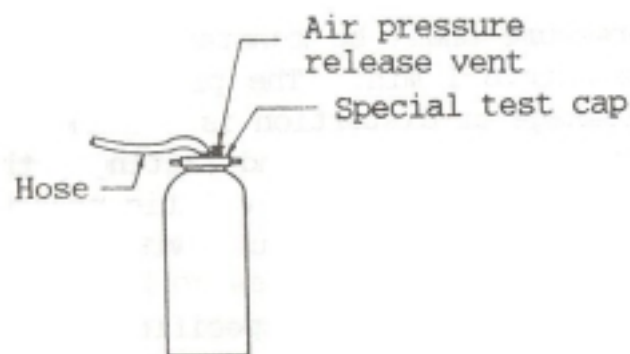


Figure A.2 Hydrostatic testing of extinguisher through fill collar
(clauses A.1.2 and A.3.2)

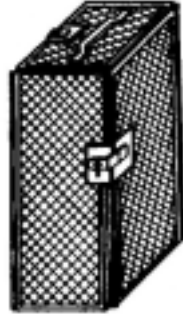


Figure A.3 Hydrostatic test cage
(clause A.1.3)

A.2 Preparation of samples

- A.2.1 For stored pressure type extinguisher, the cap shall be removed and replaced by the test cap.
- A.2.2 For gas container type extinguisher, whether the gas container is fitted into or attached to the body, the gas container shall be removed before the test. In case of test to destruction, its cap shall be replaced by the test cap.
- A.2.3 Prior to the test, all samples shall be free from the extinguishing medium.
- A.2.4 The test on the discharge hose and fittings shall be carried out separately in the test cage.

A.3 Test procedure

- A.3.1 The container shall be fitted with water to the upper threads of the neck ring.
- A.3.2 For the test of the container with the test cap as shown in Figure A.2, the test cap shall be tightly closed while the water is being filled. When the container is full of water and the air has been expelled completely, the air pressure release vent shall then be closed firmly.
- A.3.3 The hydrostatic pressure shall be constantly applied to reach the specified pressure within 1 min. The pressure shall be maintained for 5 min before leakage or distortion is examined.
- A.3.4 For the test on the discharge hose and fittings, the discharge hose shall be full of water before the hydrostatic pressure is constantly applied to reach the specified pressure within 1 min. Leakage or distortion shall, then, be examined.
- A.3.5 For routine test, the pressure as specified in clause 6.4.1 or 6.4.2, whichever is the case, shall be applied for at least 1 min.
The test shall be carried out before the painting of extinguisher or gas container.
- A.3.6 For test to destruction, one extinguisher or gas container per 400 or its fraction shall be tested to break.
 - A.3.6.1 If any part of the body other than the joints shows sign of rupture at a pressure of less than 4 times the working pressure or filling pressure, whichever is the case, the lot shall be rejected.
 - A.3.6.2 If rupture occurs at the welds, sampling plan as specified in Table A.1 shall be applied as follows. One sample from 50% of a lot shall be drawn at random (considered as representing the lot) and tested to destruction as specified in clause A.3.6.1. If the sample fails to satisfy the requirement, the whole lot shall be rejected. If it passes the test, another sample from 75% of the lot (considered as representing the lot) shall be tested. The lot shall be deemed as conforming to the standard, if the sample passes the test. If not, another sample from 62.5% of the lot (considered as representing the lot) shall be tested. If the sample fails to meet the requirement, the lot shall

be rejected. If it passes the test, another sample from 62.5% of the lot shall be retested. The lot shall be accepted if it passes the test. If not. The whole lot shall be rejected.

Table A.1
Sampling plan and criteria for conformity
for pressure test to destruction
(clause A.3.6.2)

Representative of a lot of not more than 400 units, % of lot	Number of test piece	Test result		Criteria for conformity of whole lot
		Pass	Failure	
50	1		x	Failure
		x		Test to continue
75	1	x		Pass
			x	Test to continue
62.5	1		x	Failure
		x		Test to continue
62.5	1	x		Pass
			x	Failure

A.3.6.3 The extinguisher with rupture at the welds due to the test may be rejected or welded again. If welding is repeated, 10% of the rewelded extinguishers shall be taken at random to be subjected to the test. If any sample fails in the test, all samples shall be rejected. If all rewelded samples satisfy the requirement, they shall be retested as specified in clause A.3.6.2.

Appendix B
Welding or brazing
(clauses 5.3, 5.10 and 5.11.3)

B.1 Joint

The types of fusion welded joints used in the construction of the body of extinguisher and of gas container are as follows.

B.1.1 Longitudinal joint

Longitudinal joints shall be made as shown in Figure B.1.



Units in millimetres

Figure B.1 Longitudinal joint
(clause B.1.1)

B.1.2 Circumferential joint

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

Where L = thickness of material
R = radius of not less than 1/10 of diameter of the body

Units in millimetres

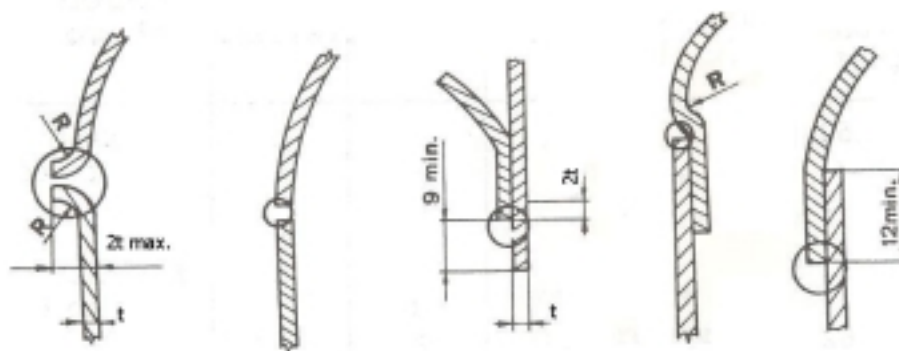


Figure B.2 Circumferential joints
(clause B.1.2)

B.2 Surface conditions

The surface to be welded and the surrounding materials for a distance of 12 mm shall be free from scale, grease, paint, dirt, or other surface deposits.

B.3 Weld test

The test shall be carried out at the factory

B.3.1 Butt-welded joint

The specimens shall be bent round a former having a diameter of 12 mm, one with upper side of the weld in tension through an angle of 180° without showing sign of crack or flaw, the other with the under side of the weld in tension through an angle of 90°, without showing sign of crack or flaw.

B.3.2 Fillet-welded lap joint

The specimens shall be broken through the weld, which shall show adequate fusion between the deposited and parent metals, adequate root penetration, general soundness of the weld metal, and a throat thickness at least equal to the plate thickness.

Appendix C
Intracrystalline corrosion test for austenitic stainless steel
(clause 5.10)

The test shall be carried out at the factory

C.1 Preparation of test pieces

C.1.1 If the steel is not to be welded, a test piece shall be prepared from a representative sample of the steel.

C.1.2 If the steel is to be welded, 2 or more test pieces not less than 2 cm long shall be prepared from a representative sample of the steel and shall be welded together by the method specified in Appendix B in a manner representative of the most severe welding condition to which the steel is to be subjected. The weld shall be centrally placed and at right angle to the length of the test piece (see Figure C.1). The test piece shall then be dressed and cleaned.

C.2 Reagent and preparation

C.2.1 Copper (II) sulfate solution

Dissolve 111 g of copper (II) sulfate pentahydrate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) in 98 g of concentrated sulfuric acid (1.84 g/cm^3) and dilute to 1 dm^3 with distilled water.

C.3 Test procedure

The test piece shall be immersed for 72 h in boiling copper (II) sulfate solution. Precaution shall be taken during boiling to prevent concentration due to evaporation. Then, the test piece shall be dropped on to a metal or concrete surface and shall emit a clear metallic ring. The test piece shall then be bent cold through an angle of 90° around a radius equal to 3 times the thickness of the test piece. There shall be no evidence of cracking.

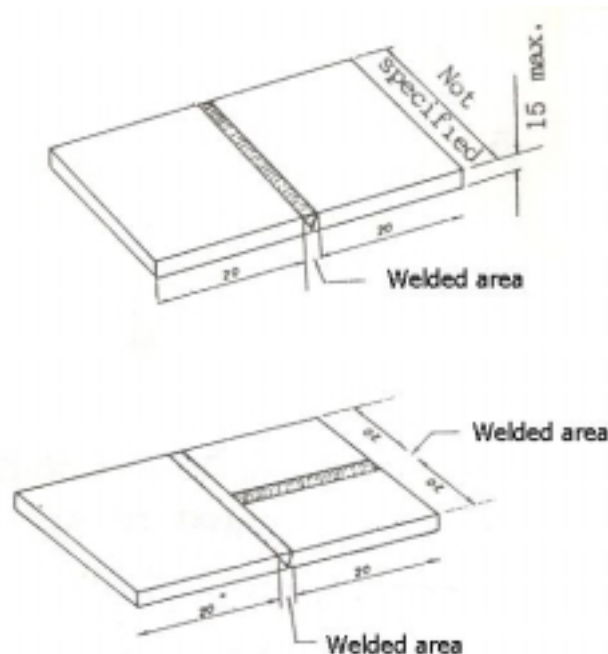


Figure C.1 Welding
(clause C.1.2)

Appendix D
Checking for leakage of gas
(clause 5.11.5 and 6.5)

Checking for leakage of gas shall be carried out by one of the following methods:

- D.1 The charged extinguisher shall be weighed or the pressure measured, and shall be stored for a period of not less than 21 days. Reweighing remeasurement shall be carried out at the end of this period. Any extinguisher showing loss of weight or pressure shall be rejected.
- D.2 The charged extinguisher shall be completely immerse in a tank of clean water for 24 h. Means shall be provided for trapping escaping gas. Any extinguisher showing loss of weight or pressure shall be rejected.

Appendix E
Powder compaction test
(clause 6.2)

E.1 Test procedure

The extinguisher shall be held in a vertical position and dropped vertically 500 times from a height of 15 mm at a rate of one time per second. It shall then be stored at a temperature of $27\pm 2^{\circ}\text{C}$ for 3 months. At the completion of this period, the extinguisher shall be subjected to the test for performance and shall satisfy the requirement specified in clause 6.3.1.

Appendix F
Class A fires test
(clause 6.3.2)

- F.1 The test shall be conducted outdoors condition of essentially still air.
- F.2 A wood crib is consist of layers of nominal 50 mm x 50 mm rubber wood (Diptrocarpus spp.) having a moisture content between 9% and 13% in which samples are dried to constant weight in an oven at a temperature of $103\pm 2^{\circ}\text{C}$. The crib is to be constructed on two 64 mm x 38 m angle irons placed on concrete blocks at the height of 400 mm. The individual wood members in each layer are to be evenly spaced in forming a square. The wood members forming the outside edges of the crib are to be stapled or nailed together as shown in Figure F.1. The size of wood crib and the arrangement of wood members in crib shall comply with Table F.1.

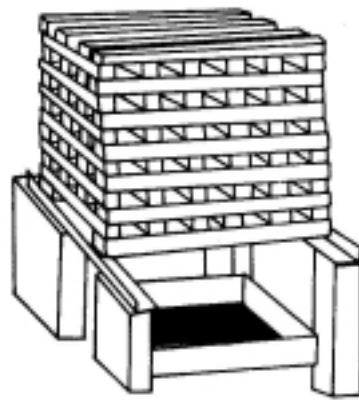


Figure F.1 Wood crib construction
(clause F.2)

Table F.1
Wood crib construction
(clause F.2)

Classification and rating	Number of wood members	Nominal size and length of wood members mm	Number of layers	Number of wood members in a layer
1-A	50	50 X 50 X 500	10	5
2-A	78	50 X 50 X 650	13	6
3-A	98	50 X 50 X 780	14	7
4-A	120	50 X 50 X 850	15	8
6-A	153	50 X 50 X 975	17	9

- F.3 Ignition of the crib is to be accomplished by the burning of n-hexane in a square pan. The dimensions of the pan and the amount of fuel to be burned are as specified in table F.2.
- F.4 Preparation is required to activate an extinguisher. The igniting fire will burn for 8-10 min the stick members in a few top rows or until the stick members in the rows have been reduced to diameters of $1/2$ - $2/3$ of the the original dimensions, whichever happens first. After the preburn period, the crib fire is to be attacked, using the extinguisher under test. The crib is to be attacked from the front from the an initial

distance of not less than 1.8 m. The operator may reduce the distance of attack and direct the discharge at the sides, top and bottom of the crib. In no case shall the discharge be directed at the back of the crib.

Table F.2
Wood crib ignition arrangement
(clause F.3)

Classification and rating	Pan size mm	N-hexane charge dm ³
1-A	530 x 530 x 100	1
2-A	530 x 530 x 100	2
3-A	685 x 685 x 100	3
4-A	685 x 685 x 100	4
6-A	810 x 810 x 100	6

F.5 During the preburn period, the following observations are to be made and recorded at intervals:

- (1) Height of flame above top of crib
- (2) Amount of side area covered by flame
- (3) Burnout time of n-hexane charge

After the preburn period, the following times are to be recorded:

- (1) Application of extinguisher
- (2) Fire under control or extinguished
- (3) End of effective discharge

F.6 After the application of the extinguisher, observations are to be made and recorded concerning the presence and location of any glowing embers and the increase or decrease of the intensity of such glowing combustion until the fire reignites or is completely extinguished. In the event of reignition, the time is to be recorded and the method of subsequent attack is to be described.

F.7 At the end of the test, the amount of extinguishing medium used and the condition and number of charred members of the crib are to be recorded.

Appendix G
Class B fires test
(clause 6.3.2)

- G.1 The test shall be conducted outdoors under condition of essentially still air.
- G.2 The test fire is conducted using a steel pan, squarer in shape, not less than 6 mm in thickness and 200 mm in depth. The pan with provided with a 45 mm at min. Wide angle to reinforce the upper edge. The reinforcing angle is to be continuous around the perimeter of the pan. The size of the pan is to be as specified in Table G.1

Table G.1
Pan size and n-hexane used
(clause G.2)

Classification and rating	Pan size mm	N-hexane charge dm ³
1-B	480 x 480	12
2-B	680 x 680	24
5-B	1075 x 1075	60
10-B	1520 x 1520	120
20-B	2150 x 2150	245

- G.3 The test fuel in the pan shall consist of not less than a 50 mm layer of the flammable liquid. The surface of the layer is to be located 150±5 mm below the top edge of the pan. (Water can be added if necessary).
- G.4 The flammable liquid to be used in the test shall be n-hexane.
- G.5 The test is to be conducted by experienced personnel who is to be protected against heat.
- G.6 Preparation is required to activate the extinguisher and the test fuel is to be allowed to burn for 60 s before attacking the fire with the extinguisher.
- G.7 The fire is to be attacked only from the front in the side to side sweeping motion.
- G.8 During the attack period, the following times are to be recorded:
- (1) Application of extinguisher
 - (2) Fire in pan is controlled or extinguished
 - (3) End of effective discharge
- G.9 After the application of the extinguisher, observations are to be made and recorded including method of attack, amount of extinguishing medium used and condition of fire.
- G.10 In the event the extinguishment is ineffective, the method of subsequent attack is to be described.

Appendix H
Class C fires test
(clause 6.3.2)

The electrical conductivity of the extinguishing medium shall be tested by measuring the current flow through the agent in powder form during the period the agent is being discharged from an extinguisher placed on an insulated platform, towards the grounding plate or target.

H.1 Extinguisher and mounting (as shown in Figure H.1)

H.1.1 The mounting for the extinguisher may consist of an insulating platform made of four sheets of glass approximately 700 mm x 760 mm, each two layers being separated by three 50 mm ceresin blocks. The bottom plate is to rest directly on a platform of dry lumber, supported about 135 mm above the floor by wooden pins. The mounting for the extinguisher may be in another form which has equivalent insulating property.

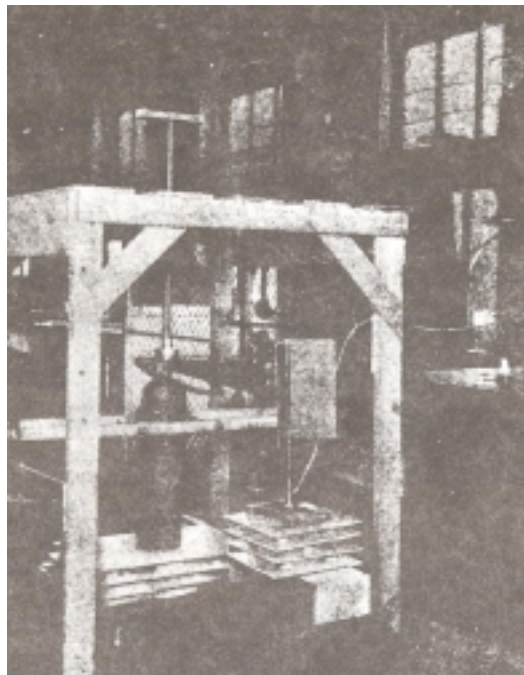


Figure H.1 Test assembly
(clause H.1)

H.1.2 The extinguisher is supported in a wooden framework or scaffold by two well-shellacked dry wooden cross bars, bolted to clamp the cylinder. The ends of these bars are to rest in insulated bearings secured to scaffold leg braes. Plates may be used to furnish additional electrical insulation between the extinguisher and the clamp and the scaffold members and to secure the nozzle so as to direct the discharge towards the target. The top of the scaffold 1.5 m above the floor, is to be wood planked to form a 1.2 m x 1.2 m working platform.

H.1.3 Operation of the extinguisher valve is to be provided by an extension rod of suitable insulated means of remote control providing for safe handling.

H.2 Target and mounting (as shown in Figure H.2)

A target of clean sheet copper, 300 mm x 300 mm, constructed for receiving the discharge from the extinguisher, is to be bent at right angle to a radius of 12 mm. The target is to be supported on a metal stem soldered to the inside of the target at the apex and secured to an insulating pedestal of phenolic composition approximately 50 mm thick. The pedestal is to be supported on an insulating platform consisting of four glass plates separated from each other by three 50 mm ceresin blocks between each two plates. The bottom is to rest on a dry wood stand 300 mm high. The target assembly is to be adjusted for height to center the target opposite the open end of the discharge nozzle. The pedestal of the target plate may be arranged in order form of equivalent insulating property.

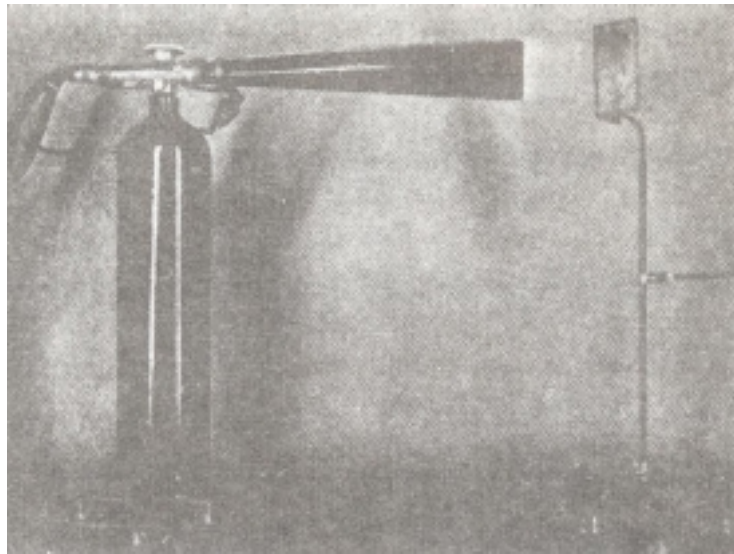


Figure H.2 Extinguisher and target
(clause H.2)

H.3 Preparation of test

The extinguisher horn handle or nozzle in all test is to be wrapped with metal foil which, in turn, is to make electrical contact with the extinguishing valve. A bare copper wire is to be strapped on the outside of the horn or nozzle and is to run from the foil to the discharge end, being at right angles across the mouth of the horn or nozzle to carry current to point of discharge. The extinguisher is to be connected to the high side of the transformer. The target, with its metallic supports, is to be connected to the grounded side of the test circuit.

H.4 Electrical circuits

H.4.1 The potential to be employed throughout the test is to be derived from a transformer rated at 50 Hz, 5 kVA capacity, 220/100 000 V. the transformer primary circuit is to be energized through an induction regulator which is to provide a continuously variable secondary voltage for 0 - to 100 000-V. The secondary potentials are to be measured through a potential transformer contained within the test transformer having ratios of 1- to 125-V and 1- to 250-V respectively, in conjunction with a suitable voltmeter. The equivalent electrical equipment may be used.

H.4.2 A 125 mm sphere gap is to be connected across the secondary of the test transformer. A gap is to be opened at all times to a point at which arc over will not occur at the potential being employed in the test. One leg of the test circuit is to be grounded at the sphere gap (See Figure H.3).

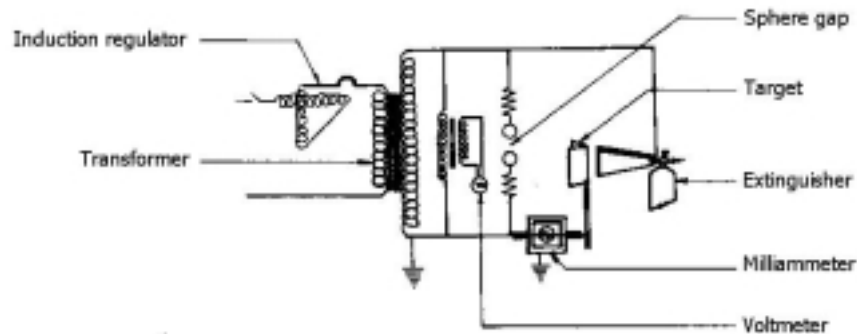


Figure H.3 Test diagram
(clause H.4.2)

H.4.3 A thermocouple millimeter calibrated to an accuracy of 0.5% with the thermocouple elements of 10-, 3- and 1.5- mA is to be employed to measure the current flow between the extinguisher and the target. A capacitor rated $0.005 \mu\text{F}$ is to be connected across the meter terminals to shunt our radio frequency currents. The meter is to be installed in two box-like enclosures made of copper screen wire separated from each other by insulators. The outer screen enclosure is to be connected to the shield of the meter leads and to ground. The meter is to be connected at all time in the grounded leg of the transformer which is to be tested.

H.4.4 The reading indicating passage of current across the gap between the extinguisher and the target when no extinguishing medium is being discharged is to be called the meter-tare.

H.4.5 The value of current shunted around the meter through the capacitor is considered to be negligible as compared with the current flow recorded by the meter.

H.5 Test procedure

If more than one type of horn or nozzle is used on the extinguisher under test, the test is to be conducted using each type.

H.5.1 The target is to be adjusted for the height of the horn or nozzle; a gap of 250 mm is generally found to be sufficient. A potential of 100 000 V is to be maintained between the horn or nozzle and the target.

H.5.2 The extinguisher is to be operated for 20 s. Observations are to be made and recorded including:

- (1) Whether extinguished area reignites;
- (2) Whether the current value changes

H.5.3 The test is to be repeated using the target plate heated to an initial temperature of 370°C prior to the discharge of the extinguisher.

- H.6 Provided that neither the extinguished area reignites nor the current value changes, the extinguisher shall be considered as meeting the performance requirement of class C fires test.
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