IS 2190 : 1992
(Reaffirmed 2002)
Edition 4.1
(2005-05)

भारतीय मानक

प्राथमिक सहायता अग्नि शामकों का चुनाव,संस्थापन एवं रख रखाव की रीति संहिता

(तीसरा पुनरीक्षण)

Indian Standard

SELECTION, INSTALLATION AND MAINTENANCE OF FIRST-AID FIRE EXTINGUISHERS — CODE OF PRACTICE

(Third Revision)

(Incorporating Amendment No. 1)

UDC 614.845.004.5

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FOREWORD

The Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Fire Pighting Sectional Committee had been approved by the Civil Engineering Division Council.

Portable fire extinguishers are not expected to deal with large fires since they are essentially first-aid fire fighting equipment. Nevertheless, they are very valuable in the early stages of a fire when used promptly and effectively. Provision of unsuitable types, incorrect operation, or improper maintenance of the extinguishers have, at times, led to failure in tackling the fire effectively in the early stages, thus involving greater loss of life and property. This standard has, therefore, been prepared for giving guidance regarding proper selection, installation and maintenance of portable first-aid fire extinguishers so that such extinguishers will function at all time as intended throughout their useful life. This standard does not cover the requirements applicable to permanently installed systems for extinguishing fire even though portions of such systems may be portable.

This standard was first published in 1962 and subsequently revised in 1970 and 1979. In the past 10 years, additional types of fire extinguishers both portable as well as wheeled/trolley-mounted type and chemical fire engines have been developed and taken into use. It is, therefore, necessary to enlarge the coverage of this standard so as to include the provision of all types of fire extinguishers and fire engines for which Indian Standards have been formulated till date. While doing so, opportunity has also been taken to update the maintenance requirements based on current international practices.

As was done in 1979 version, in this version also provision of fire buckets has not been mentioned. However, users may provide fire buckets (*see* IS 2546 : 1974) over and above the requirements given in this standard. The use of fire buckets, however, in lieu of fire extinguisher, is not recommended.

In order that fire extinguishers are effective, they should:

a) be portable/light weight,

b) operate instantly,

c) have adequate throw,

d) have adequate quantity of extinguishant, and

e) have long shelf-life.

All these characteristics are incorporated in portable extinguishers and are manufactured to deal with different types of fires. In order that these could be effective, these should conform to relevant Indian standards.

As decided in the thirtieth meeting of the Fire-Fighting Committee (CED 22), soda acid extinguishers are being phased out and will be replaced by water type (gas pressure and stored pressure) extinguishers.

As soon as the test data relating to rating of fire extinguishers are available, the clauses in respect of fire extinguishing performance ratings for fire extinguishers suitable for Class A and or Class B fires will be added. The halons shall be restricted for essential use only.

This edition 4.1 incorporates Amendment No. 1 (May 2005). Side bar indicates modification of the text as the result of incorporation of the amendment.

Indian Standard

SELECTION, INSTALLATION AND MAINTENANCE OF FIRST-AID FIRE EXTINGUISHERS — CODE OF PRACTICE

(Third Revision)

1 SCOPE

This standard lays down recommendations for selection, installation, maintenance and testing of first-aid fire extinguishers.

NOTE — For the purpose of this standard these as well as all other types of trolley mounted extinguishers will be treated under general classification of fire extinguishers.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 7673 : 1975 shall apply.

4 GENERAL

4.1 None of the extinguishers covered in this standard is expected to deal with a large fire as all these are essentially first-aid fire-fighting appliances. Nevertheless, these are very valuable if used promptly and efficiently in the early stages of a fire. In addition to the value of their portability and mobility, the most important feature of these extinguishers is their immediate availability so that each extinguisher can be used by one/two persons. The usefulness of these extinguishers is limited, as it is entirely dependent upon the presence of persons having knowledge to operate them. Furthermore, their capacity is also limited and their operational value largely depend upon the initial charge being sufficient to overcome and extinguish the fire. The capacity of such extinguishers should commensurate with the risk these are intended to cover.

4.2 Since a variety of shapes or methods of operation of fire extinguishers have at times led to confusion and failure to quench the fire, it is recommended that extinguishers installed in any one building or single occupancy shall be similar in shape and appearance and should have the same methods of operation, as far as possible. This will also simplify the training of the large number of employees in the effective and efficient use of extinguishers.

4.3 Where employees have not been trained, operation of extinguishers may be seriously delayed, the extinguishing material may be wasted, and more extinguishers may have to be used, or the fire may not be extinguished.

5 NUMBER AND SIZE OF FIRE EXTINGUISHERS

5.1 Fire extinguishers should be provided both for protecting building structure as well as occupancy hazard contained therein.

5.2 The number and size of fire extinguishers required for any particular premises shall be determined by the appropriate authority taking into consideration the severity of incipient fire anticipated, rapidity with which a fire may spread, intensity of heat that may be developed, accessibility to fire, type of extinguisher, the smoke contributed by the burning material, special features of building construction and nature of occupancy (single or mixed) and electrical fitting, equipment, etc, installed therein.

5.3 The required number of fire extinguishers may be determined by considering any single extinguisher of suitable type or a combination of two or more types. Recommendations made in Annex B may be taken as a guide.

6 SELECTION OF LOCATION

6.1 When selecting locations for fire extinguishers, due consideration should be given to the nature of risk to be covered. The extinguishers should be placed in conspicuous positions and shall be readily accessible for immediate use in all parts of the occupancy. It should always be borne in mind while selecting locations that fire extinguishers are intended only for the use on incipient fires and they will be of little value if the fire is not extinguished or brought under control, in the early stages.

6.2 Generally, fire extinguishers should be placed as near as possible to exits or stair lands without hindering the escape routes. Wherever possible, advantage should be taken of normal routes of escape by placing these in positions where these shall readily be seen by persons following the natural impulse to get out of danger.

6.3 The extinguishers should be available for immediate use at all times. Extinguishers should be sited in such a way that it is not necessary to travel more than 15 metres from the site of the fire to reach the extinguishers. Similar positions on each floor are advisable.

6.4 Extinguishers provided to deal with special risks should be sited near to risk area concerned but not so near as to be inaccessible in case of fire. If the special risk is contained in a confined space, it is generally advisable to position the extinguisher outside that space.

6.5 Wall mounted fire extinguishers should be placed on the supporting wall or in wooden, metal or plastic cabinets in such a way that their 1 000 mm bottom is above ground level. When installed in the open, fire extinguishers should be placed on masonry platforms or in wooden/metal/plastic cabinets in such a way that their bottom is 1 000 mm above ground level.

6.6 It may be necessary to construct suitable shades or covers to protect the extinguishers in the open from excessive heat and cold as well as from corrosive environment. Where such shades or covers are provided to house the extinguishers in the open, these should be designed so that the removal of the extinguishers are not hampered in emergency.

6.7 While selecting the location for higher capacity wheeled/trolley mounted extinguishers, consideration should be given to the mobility of the extinguisher within the area in which it will be used and, if indoors, the size of the doorways and passages which should allow easy movement of the extinguisher.

6.8 When installed in a building, the extinguisher should not be placed in a position where it is likely to gain heat from the surrounding equipment or process.

6.9 A framed plane showing the location of fire/extinguishers, means of access and other useful information should be displayed at suitable places, but should be available near to the entrance to the premises preferably at the security gate or the reception office.

7 INITIAL INSPECTION

7.1 Each new extinguisher received at site should be inspected for its completeness of supply and checked with the packing and despatch documents of the manufacturer before installation. Check that there is no damage to the extinguisher in transit. In case of extinguishers covered by Gas Cylinders Rules, check the stamp of approval embossed on the neck of the cylinder.

7.2 On initial procurement, water type gas pressure and foam extinguishers are normally supplied in unfilled state and are charged at site. Dry powder extinguishers may be supplied duly filled and, if not, the same have to be filled at site. Carbon dioxide and halon type fire extinguishers are supplied duly charged. Water type gas pressure, foam and dry powder extinguishers are to be charged with the refills separately provided by the extinguisher manufacturer as per the instructions given on the refill container. The refills used shall conform to relevant Indian Standard specifications as given in Annex A.

7.3 If the components of the fire extinguishers like container, cap assembly, hose assembly, nozzle, etc, are despatched separately by the manufacturer, assemble the components in the first instance before refilling as per the instructions given by the manufacturer.

7.4 After assembling and refilling, ensure that all joints are fully tightened and the nozzle vent holes are free of dust/dirt.

7.5 Immediately after refilling either stencil or paste the inspection card to the body of the extinguisher indicating the serial numbers of the extinguishers, date of initial charging and also the next due date for refilling. Record of the date of inspection, initial charging, etc, should be maintained in the register for first aid fire appliances.

8 INSTALLATION

8.1 General

Although fire extinguishers are not permanent and immovable fittings in a structure, these form a part of the whole system of fire protection and should receive consideration for provision at the design stage. In some cases, it may be necessary for the extinguishers to be housed in readily accessible and unlocked receptacles, where although clearly visible, these should be unobtrusive.

8.2 Excepting particular cases where, as stated in **7.1**, it may be necessary for the extinguisher

to be housed in specially prepared positions, no structural work is generally involved in the installations of the extinguishers dealt with in this standard as this normally takes place upon the completion of the construction. The general sequence of the building construction operation is not, therefore, usually affected. Where a special recess is to be formed in a wall, provision should be made as the work progress.

9 SELECTION OF FIRE EXTINGUISHERS

9.1 Various types of fire extinguishers specified in this standard are of value but all are not equally effective on all types of fire. For this reason, the nature of contents of a building, the processes carried out therein and the types of fire which may occur shall be taken into consideration while selecting fire extinguishers. For all practical purposes, the basic types of fires can be grouped into following four classes:

a) *Class A Fires* — Fires involving solid combustible materials of organic nature such as wood, paper, rubber, plastics, etc, where the cooling effect of water is essential for extinction of fires.

b) *Class B Fires* — Fires involving flammable liquids or liquefiable solids or the like where a blanketing effect is essential.

c) *Class C Fires* — Fires involving flammable gases under pressure including liquified gases, where it is necessary to inhibit the burning gas at fast rate with an inert gas, powder or vaporizing liquid for extinguishment.

d) *Class D Fires* — Fires involving combustible metals, such as magnesium, aluminium, zinc, sodium, potassium, etc, when the burning metals are reactive to water and water containing agents and in certain cases carbon dioxide, halogenated hydrocarbons and ordinary dry powders. These fires require special media and techniques to extinguish.

10 SUITABILITY OF PORTABLE FIRE EXTINGUISHERS

10.1 The types of extinguishers mentioned below against each class of fire are generally most suited. Details of suitability as a guide of each type of extinguisher is shown in Table 1. It may, however, be noted that this is only for guidance and does not cover special cases.

a) *Class A Fires* — Water expelling type extinguishers.

b) *Class B Fires* — Foam, dry powder, vaporizing liquid and carbon dioxide extinguishers.

c) *Class C Fires* — Dry powder, vaporizing liquid and carbon dioxide extinguishers.

d) *Class D Fires* — Extinguishers with special dry powder for metal fires.

10.2 Where energised electrical equipment is involved in a fire, non-conductivity of the extinguishing media is of utmost importance, and only extinguishers expelling dry powder, carbon dioxide (without metal horn) or vaporizing liquids should be used. Once the electrical equipment is de-energized, extinguishers suitable for the class of fire risk involved can be used safely.

10.3 Where cleanliness and contamination of sensitive electrical equipment are of importance or where the sensitivity of the control instruments or electronic equipment and systems are likely to be affected, only carbon dioxide or vaporizing liquid type extinguisher should be used.

10.4 For fires involving polar solvents and other water miscible flammable liquids, dry powder type or mechanical foam extinguisher with alcohol-resistant foam should be used.

10.5 Dry powder extinguishers, when used in confined areas may reduce visibility for a few minutes, which may temporarily jeopardize escape, rescue or other emergency action.

10.6 Mass for mass, dry powder extinguishers are probably the most effective medium against class B fires, but where the fuel surface is shielded from the powder discharge, they are not effective. Further, as the discharge ceases, there is a danger of re-ignition which has to be countered either by continued powder discharge for some more time, or by covering the surface by foam. Dry powder, bring a quick knock-down agent, is ideal for tackling 'running' or 'three-dimensional' fires involving flammable liquids.

10.7 Consideration should be given for providing special protection or treatment for extinguishers located in places exposed to unduly corrosive atmospheres or to splashing by corrosive fluids.

Table 1 Suitability of Different Types of Fire Extinguishers for Different Classes of Fires

(*Clause* 10.1)

Sl No.	Type of Extinguisher	Type of Fires			
		A	B	C	D
(1)	(2)	(3)	(4)	(5)	(6)
1	Fire extinguisher, water type (gas cartridge), IS 940	S	NS	NS	NS
2	Fire extinguisher, water type (stored pressure), IS 6234	S	NS	NS	NS
3	Fire extinguisher, mechanical foam type, IS 10204	NS	S	NS	NS
4	Fire extinguisher, dry powder type, IS 2171, IS 10658	NS	S	NS	NS
5	Fire extinguisher, dry powder type, IS 11833	NS	NS	NS	S
6	Fire extinguisher, carbon dioxide type, IS 2878, IS 8149	NS	S	S	NS
7	Fire extinguisher, halon 1211, IS 11108	NS	S	S	NS

NOTES

1 S — Suitable, NS — Not Suitable,

2 *See* Annex A for list of Indian Standards.

10.8 Appropriate size of extinguishers, including wheeled/trolley mounted type should be provided for use depending on the possible size and intensity of the initial fire.

10.9 Although Halon type extinguishers have a low toxicity in the free state, when used on fires, they are liable to produce toxic decomposition products. Hence, when used in extinguishing fires in confined unventilated rooms, closets, etc, the occupants should immediately vacate such spaces. It will be advisable to take the same precaution when carbon dioxide extinguishers are used under similar circumstances.

10.10 The fire extinguishers, extinguishing media, and the charges/refills used should conform in all respects to the relevant Indian Standard specifications given in Annex A.

10.11 While replacing component parts, it should be ensured that only the correct components specified by the manufacturer, or equivalents are used.

11 INSPECTION AND MAINTENANCE OF FIRE EXTINGUISHERS

11.1 A well-planned and approved maintenance schedule is essential to ensure that an extinguisher:

a) will operate properly between the time intervals stipulated in the maintenance programme for periodical inspection/ maintenance;

b) will not constitute a potential hazard to persons in its vicinity or to those who operate or recharge the extinguishers.

11.2 General Safety Precautions for Maintenance

11.2.1 The maintenance of the fire extinguishers shall be done by the manufacturers or their authorized agent or qualified fire professionals.

11.2.2 While opening any extinguisher:

a) ensure that there is no residual pressure in any hose and/or nozzle assembly;

b) unscrew the cap or valve assembly slowly for two or three turns only, to allow any residual pressure to escape via the vent holes and do not unscrew it further until all pressure is released;

c) do not depend on pressure indicating devices like gauges (in the cases of stored pressure type extinguishers) to verify whether the container is under pressure or not, as they could malfunction;

d) if pressure is not being released after unscrewing the cap or valve assembly two or three turns, then do not unscrew it further without taking appropriate safety measures; sudden release of pressure may eject parts, cap assembly, or the contents of the extinguisher. The use of suitable clamping arrangements and appropriate personal protection is advisable;

e) under no circumstances should the valves of carbon dioxide or halon extinguishers or gas cartidges/containers be attempted to be removed under field conditions; and

f) at all times when attempting to remove parts from extinguishers at the time of inspection/maintenance, persons, should ensure that they are clear of any parts which may be ejected.

11.2.3 *Other Safety Guidelines*

a) Dry powder extinguishers should be opened only in the driest available conditions and for the minimum time, necessary for examination, to minimize the effect of atmospheric moisture on the powder. Moisture causes caking of the powder.

b) It is even more important that mixing or cross-contamination of different types of powder be avoided as it may cause chemical reaction resulting in a dangerous pressure build-up in the container. This reaction may become apparent only after a few weeks.

c) All sealing components should be cleaned and properly lubricated to prevent leakage after recharge.

d) Check pressure indicating devices to ascertain that it gives proper readings.

e) Never connect a stored pressure extinguisher to be charged directly to the high pressure source. Connecting directly to the high pressure source could cause damage, or even rupture of the container and may result in injury.

f) Only those gas cartridges which will suit the particular type and capacity of the extinguisher should be used.

g) Certain recharging materials deteriorate with age, exposure to excessive temperature and moisture — Storage of recharge materials for long periods should be avoided.

h) Normal workshop compressors deliver air with a high moisture content. Moisture traps will only remove the moisture partly, and may lead to caking of powder, hydrolysis of halogenated agents, clogging of pressure gauges and internal corrosion.

j) On all higher capacity dry powder and carbon dioxide extinguisher equipped with a shunt-off nozzle, the hose (without the nozzle) should be removed and tested annually.

k) Any gas cartridge, which has not undergone hydraulic pressure test for over 20 years, should be withdrawn from service and replaced.

11.2.4 *Guidelines for the Evaluation of Damage and Corrosion*

11.2.4.1 It is difficult to precisely define the limits to the extent of damage or corrosion that makes an extinguisher 'unsafe' or 'unfit' for service. Evaluation largly depends on the judgement of the component person based on experience. However, some typical examples are cited below for guidance.

11.2.4.2 *Typical conditions indicating that an extinguisher is unsafe for use*

Potentially the most serious hazard of defective extinguishers is the sudden uncontrolled release of pressure or ejection of parts. It could be caused due to any one of the following causes:

a) Corrosion, wear or damage to threads of any pressure retaining part;

b) Corrosion of welds;

c) Extensive general corrosion or severe pitting.

11.2.4.3 *Typical conditions indicating that an extinguisher is unfit for use*

An extinguisher may be considered unfit for use either because it is unlikely to operate correctly or because damage or corrosion is likely to become worse and make the extinguisher unsafe for use. Some of such conditions being:

a) the bubbling or separation from the metal of a plastic lining;

b) corrosion of the metal body under a plastic lining;

c) corrosion of the metal body under a zinc or tin/lead lining;

d) corrosion, wear or damage to any part of the operating or control mechanism.

11.2.4.4 *Typical conditions not affecting function or safety*

An extinguisher shall remain safe and functional under the following typical conditions:

a) Staining or discoloration of lining or dip tubes;

b) External blemishes or slight scratches or dents;

c) Slight rusting of parts not subject to pressure;

d) the presence of corrosion products from any metal lining (typically white salts of zinc, or tin and lead).

11.3 All the extinguishers installed in the premises should be subjected to detailed inspection as per the check list (applicable to

monthly inspection) and after thorough examination and rectification, if found suitable, be re-charged and put in service. If, however, repairs and re-work like welding is involved, then re-charging should be done only after ensuring that the bodies pass hydrostatic pressure test according to the requirements given in this standard.

11.4 The maintenance, inspection and testing of all extinguishers in respect of mechanical parts, extinguishing media and expelling means should be carried out by properly trained and competent personnel at frequent intervals, but at least once a month, to ensure that these are in their proper condition and have not been accidentally discharged or lost pressure or suffered damage. Regular inspection of all extinguishers and their components like spare cartridges and refills kept in the stores should also be done to ensure that these are in proper condition and fit for use.

11.5 The following procedure shall be followed for monthly maintenance:

a) Clean the exterior of the extinguisher, polish the painted portion with wax polish, the brass/gun metal parts with metal polish, chromium plated parts with silver polish and plastic components to be thoroughly washed with soap solution and sun dried.

b) Check the nozzle outlet and vent holes as well as the threaded portion of the cap for clogging, and check that plunger is clean and moving freely.

c) Ensure that the cap washer is intact and also grease the threads of the cap, plunger, etc and wipe clean.

d) Make sure that the extinguisher is in proper condition and is not accidentally discharged. In case of stored pressure extinguisher, pressure gauge is to be checked for correct pressure.

e) Check all the components of the extinguisher as per the maintenance check list given for each type of extinguisher under Annex C.

11.6 Over and above the monthly inspection, all the extinguishers shall be subjected to a more thorough inspection atleast once in a year. Advantage should be taken of this annual inspection to train personnel in the operation of extinguishers. The annual inspection should consist of the following procedure:

a) In the first instance, by rotation if the extinguisher is due for discharge test, after ensuring that the cap and components are fully tightened nozzles and vent holes are free of any dust or dirt, operate the extinguisher for testing the performance.

b) In case the extinguisher is not falling due for discharge test (*see* **12.3**) as per the schedule of records, empty the contents of the extinguishers in clean buckets and remove all the components. In case the extinguisher is operated, after operation clean the extinguisher and remove all components. In case it is failing in discharge test, procedure given in this standard is to be followed.

c) Examine the inside surface of the cylinder as well as the surface of the containers for the condition of plating, for any rust formation, etc.

d) If there are visible rust marks, wash the cylinder thoroughly with clean water, sun dry it and fill it with water for 24 h and observe the surface again. If there are still signs of rust formation and plating thickness is not adequate, the surface should be freshly plated or phosphated as the case may be (*see also* **11.2.3**).

e) The above procedures are for Water type Gas pressure, Foam and Dry power type fire extinguishers. In case of CO_2 and Halon extinguishers if the cylinders are not due for recharging than check the weight of the contents and the pressure of the container with its contents. If the same is in order as per the monthly checklist, then the contents need not be discharged. If, however, these extinguishers are due for an operational test, then after operational test, if facilities are available for pressure testing and recharging, the cylinders can be pressure tested and re-charged at site after checking up the exterior and other components, or alternately should be sent to the manufacturer or other competent agency for pressure testing and re-charging.

f) Examine the external surface of the fire extinguishers in respect of painting and if there is damage to the painting, the surface should be re-painted with one coat of primer and atleast one coat of fire red paints as per the requirements of Indian Standard specification.

g) Check up the condition of the label and if it is not in order ensure to replace with correct label.

h) Examine the cylinder and its components in detail apart from functional point of view for any physical damage, cracks, dents, etc. In case of any doubt, such components, if those are pressure parts, should be subjected to hydraulic pressure test. If the damage is beyond repair, the part should be replaced by a correct component.

j) The annual inspection should be combined with the testing requirements as given under **12** for operational test and hydraulic pressure test.

k) The extinguishers after inspection should be refilled immediately and the date of inspection and refilling should be indelibly marked on the extinguishers and recorded in the register of fire extinguishers.

11.6.1 *Water (Stored Pressure) Extinguisher*

As this type of extinguisher is pressured, it can be opined for inspection/maintenance after discharge only. It should be tested for discharge every two years (*see* Annex D) and maintenance described in (a) to (h) below, carried out:

a) Check the pressure gauge, discharge the extinguisher and check its performance;

b) Check the pressure gauge before and after discharge for its correctness;

c) Open the extinguisher and check the body externally and internally using an illuminating probe; for corrosion or damage take action as per **11.2;**

d) Examine cap assembly, nozzle, strainer, vent holes, siphon tube and clean;

e) Examine sealing washers, siphon tube and hose (if fitted), and replace, if necessary;

f) Check the operating mechanism for free movement and clean, rectify or replace, if necessary;

g) Refill the extinguisher with fresh water, screw cap tightly and pressurise the extinguisher, checking the pressure gauge for correct pressure (*see* **11.2** also); and

h) Replace safety clip/wire seal or equivalent as originally fitted.

12 TESTING OF FIRE EXTINGUISHERS

12.1 The testing of fire extinguishers consists of a hydraulic pressure test and a performance test. These tests shall be carried out as per the norms and frequency given below.

12.2 Hydraulic Pressure Test

12.2.1 The pressure test of all types of extinguishers should be carried out at intervals mentioned against each extinguisher at a pressure and for the period mentioned against them in Annex E. The hydraulic pressure testing should be carried out such that atleast one-third (1/3) of the extinguishers installed in a premises are tested as per Annex E every year. If any of the extinguisher fails in the hydraulic pressure test to meet the requirements given in Annex E then, after repairs, the extinguisher should be subjected to pressure testing. If it passes the test as per the requirements mentioned above, the extinguisher shall be retained and, if it fails, the extinguisher should be rejected and condemned as per the procedure given in **13** after recording the same in the register of fire extinguishers.

12.2.2 *Pressure Test Procedure and Safety Precautions*

a) All valves and internal parts shall be removed and the extinguisher emptied;

b) All traces of extinguishing materials like dry powder should be removed from inside the shell before filling with water;

c) In the case of externally mounted gas cartridges/containers for higher capacity dry powder extinguishers, the cartridge/ container must be removed and shell opening be suitably plugged.

d) The hose of the hydrostatic test pump is then attached to the flexible connection to the discharge nozzle, hose assembly or test fitting, as the case may be;

e) The extinguisher should then be placed in a suitable protective test cage or behind a protective shield/barrier before applying the test pressure;

f) The cap or the test fitting, as the case may be, must be tightened slowly while the water supply remains open. When all the entrapped air within the shell has been bled off, and water emerges the cap/test fitting must be tightened fully;

g) Pressure is then applied slowly so that the test pressure (as given in Annex E) is reached slowly within one minute, and maintained for the duration of 2.5 min. Observations are made about distortion or leakage of the extinguisher body, if any.

h) After hydraulic testing, all traces of water and moisture must be removed from dry powder and halon extinguishers preferably by use of a suitable cylinder dryer taking care that the temperature within the shell does not exceed 65°C.

12.3 Discharge Test

All extinguishers installed in a premises irrespective of being used in a live fire condition shall be subjected to an operational test as per the frequency of testing given in Annex D. The operational test should be carried out in such a frequency, keeping in view the frequency given in Annex D for type of the extinguisher, so that at least 50 percent of the fire extinguishers installed in a premises are subjected to discharge test. If more than 10 percent of the extinguishers, subjected to discharge test fail during the testing, then all the extinguishers installed in the premises shall be subjected to the discharge test.

12.4 Gas Cartridge

In case of gas cartridges, if there is loss of more than 10 percent of original mass, these should be sent for re-charging and replaced with fresh charge. At the time of re-charging the cartridge, the cartridge should be tested for hydrostatic test according to the provisions of the relevant Indian Standards and should be re-used only subject to passing of requirement.

13 MAINTENANCE OF RECORDS

The records of maintenance, inspection and testing of all fire extinguishers including its operational history shall be maintained in a register as per the format given in Annex F.

14 REJECTED EXTINGUISHERS

14.1 The rejected fire extinguishers should be cut centrally across the body and made unusable before disposal so as to prohibit their subsequent use. The date of rejection and the mode disposal should be recorded in the register of fire extinguisher (Annex F).

14.2 As the soda acid extinguishers are being phased out, it is recomommended that as and when this type of extinguisher gets rejected, they should be replaced by water (Gas Cartidge or Stored Pressure) type extinguisher.

15 SPARE REFILLS

It is important that a minimum of 10 percent (of the number of various types of extinguishers on charge) replacement charges/refills should always be available in stock so that discharged extinguishers can be re-charged and brought into use promptly.

ANNEX A

(*Clauses* 2, 7.2 *and* 10.10)

INDIAN STANDARDS ON FIRE EXTINGUISHERS, GAS CARTRIDGES, REFILLS AND EXTINGUISHING CHEMICALS

IS No.	*Title*
940 : 1989	Portable fire extinguisher, water type (gas cartridge) (*third revision)*
1641 : 1988	Code of practice for fire safety of building (general) : General principles of fire grading and classfication (*first revision*)
2171 : 1985	Portable fire extinguisher, dry powder (cartridge type) (*third revision*)
2546 : 1974	Galvanized mild steel fire buckets (*first revision*)
2878 : 1986	Fire extinguisher, carbon dioxide type (portable and trolley mounted) (*second revision*)
4308 : 1982	Dry powder for fire fighting (*first revision*)
4861 : 1984	Dry powder for fighting fires in burning metals (*first revision*)
4862 (Part 1) : 1986	Portable fire extinguishers for aircraft : Part 1 Halon 1211 Type (*first revision*)
4947 : 1985	Gas cartridges for use in fire extinguishers

IS No.	*Title*	*IS No.*	*Title*
6234 : 1986	Portable fire extinguishers, water type (stored pressure) (*first revision*)	10658 : 1983	Higher capacity dry powder fire extinguisher (trolley mounted)
7673 : 1975	Glossary of terms for fire fighting equipment	11070 : 1984	Bromochlorodifluoromethane (Halon-1211) for fire fighting
8149 : 1976	Functional requirements for twin CO_2 fire extinguishers (trolley mounted)	11108 : 1984	Portable fire extinguisher, (Halon-1211) type
10204 : 1982	Portable fire extinguisher, mechanical foam type	11833 : 1186	Dry powder fire extinguisher for metal fires

ANNEX B

(*Clause* 5.3)

RECOMMENDATIONS FOR INSTALLATION OF FIRE EXTINGUISHERS

B-1 Occupancies classified according to IS 1641 : 1989 are given below together with nature of fire hazard and type of fire risk along with typical examples. The classifications, groupings, etc., given in this annexure are only for general guidance for installation of fire extinguishers, and not for other purposes.

LH — Low Hazard

OH — Ordinary Hazard

HH — High Hazard

SH — Special Hazard

Class of Occupancy	*Type of Occupancy*	*Nature of Occupancy*	*Class of Fire Risk*	*Typical Examples*
Group A	Residential buildings	LH	Class A	Lodging houses, private dwellings, dormitories, apartment houses, flats, hotels, etc.
		LH	Class C	Small kitchens having LPG connection, electrical heaters, etc.
		OH	Class A	Multistoreyed buildings, multi-risk buildings, five star hotels, etc.
Group B	Educational buildings	LH	Class A	Tutorials, vocational training institutes, evening colleges, commercial institutes.
		OH	Class A	Schools, colleges, etc.
Group C	Institutional buildings	OH	Class A	Hospitals, sanatoria, homes for aged, orphanage jails, etc.

Class of Occupancy	*Type of Occupancy*	*Nature of Occupancy*	*Class of Fire Risk*	*Typical Examples*
Group D	Assembly buildings D-1	HH	Class A	Theatres, assembly halls, exhibition halls, museums, restaurants, places of worship, club rooms, dance halls, etc. having seating capacity of over 1 000 persons.
	D-2	OH	Class A	Theatres, assembly halls, exhibition halls, museums, restaurants, places of worship, club rooms, dance halls, etc, having seating capacity less than 100 persons.
	D-3	OH	Class A	Theatres, assembly halls, exhibition halls, museums, restaurants, places of worship, club rooms, dance halls, etc, but having accommodation for more than 300 persons, but less than 1000 persons, with no permanent seating arrangement.
	D-4 D-5	LH	Class A	Theatres, assembly halls, exhibition halls, museums, restaurants, places of worship, club rooms, dance halls, etc, but having accommodation less than 300 and those not covered under D-1 to D-3.
Group E	Business buildings E-1	SH	Class A	Offices, banks, record rooms, archives, libraries, data processing centres, etc.
	E-2	OH	Class B	Laboratories, research establishments, test houses, etc.
	E-3	SH	Class A	Computer installations.
Group F	Mercantile buildings	OH	Class A	Shops, stores, markets, departmental stores, underground shopping centres, etc.
Group G	Industrial buildings	LH	Class A	Small industrial units.
		OH	Class A	Corrugated carton manufacturing units, paper cane units, packing case manufacturing units, cotton waste manufacturing units.
		HH	Class A	Large number yards, saw mills, godowns and warehouses storing combustible materials, cold storages, freight depots, etc.
		LH	Class B	Demonstration chemical plants, small chemical processing plants, pilot plants, etc.
		OH	Class B	Workshops, painting shops, large kitchens, industrial canteens, generator rooms, heat treatment shops, tread rubber manufacturing units, petrol bunks, tubes & flaps units, etc.
		HH	Class B	Petroleumm processing units, chemical plants, Industrial alcohol plants, effluent treatment plants, etc.
		LH	Class C	

Class of Occupancy	Type of Occupancy	*Nature of Occupancy*	*Class of Fire Risk*	*Typical Examples*
		OH	Class C	
		HH	Class C	Fertilizer plants, petrochemical plants, LPG bottling plants, etc.
		HH	Class D	All processes involving use of combustible highly flammable materials, reactive metals & alloys, including their storage.
Group H	Storage buildings	OH	Class B	Flammable liquid stores, storage in drums and cans in open, paints and varnishes godown.
		HH	Class B	Tank farms, chemical and petroleum bulk storage depots, large service stations, truck and marine terminals, underground LDO/ Furnace oil storage yards etc.
		OH	Class C	LPG distribution godowns/offices, distribution storage godowns/offices of D, N, H, Argon and other industrial gases.
		IH	Class C	Storage and handling of gas cylinders in bulk, gas plant, gas holders, (horton) spheres, etc.
Group I	Hazardous	—	—	Buildings used for storage, handling, manufacture and processing of highly combustible explosive materials. (Risks involved in terms of class of fire and intensity of fire has to be assessed on case to case basis and statutory authorities to be consulted, environmental factors and mutual aid facilities to be taken into account before deciding on the fire extinguisher requirements).

B-2 RECOMMENDED SCALE OF EQUIPMENT TO BE INSTALLED

Class A

LH Occupancy — One 9-1 water expelling extinguisher for every 600 m^2 of floor area or part thereof with minimum of two extinguishers per compartment or floor of the building. The extinguishers should be so located as to be available within 25 m radius.

OH Occupancy — Two 9-1 water expelling extinguishers for every 600 m^2 with minimum of 4 extinguishers per compartment/floor. The extinguishers should be so located as to be available within 25 radius.

HH Occupancy — Provision as per OH occupancy; in addition dry powder extinguisher for every 100 m^2 of floor area or part thereof.

Special Hazard — One 4.5 kg capacity carbon dioxide or one 2.5 kg capacity Clean Agent extinguisher for every 100 m^2 of floor area or part thereof with minimum of two extinguishers so located as to be available within 10 m radius.

Class B

LH Occupancy — One 9-1 foam extinguisher, mechanical for every 600 m^2 of floor area or part thereof with minimum of two extinguishers per compartment or floor. The extinguishers should be so located as to be available within 25 m radius.

OH Occupancy — Two 9-1 foam extinguisher, mechanical type, or 5 kg capacity dry powder extinguisher (or one of each type) for every 600 m^2 area with minimum of four extinguishers per compartment. Extinguishers should be available within 15 m radius.

HH Occupancy	Provisions as per OH, and in addition one 50-1 dry powder extinguisher for every 100 m^2 or part thereof one 150-1 dry powder extinguisher for every 300 m^2 of floor area or part thereof.

Class C

LH Occupancy	One 2 kg dry powder or 2 kgCO_2 squeeze grip type or 2.5 kg Halo-Carbon Clean Agent extinguisher for every 20 m^2 of floor area or part thereof; extinguisher available within 15 m radius.
OH Occupancy	One 10 kg dry powder extinguisher or 6.8 kg carbon dioxide extinguisher or 2.5 kg Clean Agent extinguisher for 100 m^2 of floor area or part thereof, with minimum of one extinguishers of the same type for every compartment; extinguisher should be available within a radius of 15 m.
HH Occupancy	Dry powder extinguisher of 10 kg or 6.8 kg CO_2 extinguishers, or 5 kg Clean Agent extinguishers for every 100 m^2 of floor area or part thereof, subject to a minimum of two extinguishers of same type per room or compartment. Extinguishers should be available within a radius of 10 m.

Class D

HH Occupancy	One 10 kg dry powder extinguisher with special dry powder for metal fires for every 100 m^2 of floor area or part thereof with minimum of two extinguishers per compartment/room. Extinguishers should be available within a radius of 10 m.

NOTES

1 The recommendations are minimum for a specific area. In case, the area is more than specified, high capacity extinguishers may be used based on these minimum requirements, that is proportionately higher capacity can be used.

2. In case of dry powder/CO_2/Halo-Carbon Clean Agent types, equivalent lower capacities may also be used.

3. The halons shall be restricted for essential use only.

ANNEX C

[*Clause* 11.5 (*e*)]

MAINTENANCE CHECK LIST FOR FIRE EXTINGUISHERS

(For routine check and monthly maintenance)

NOTE — During inspection/maintenance of extinguishers the general safety precautions prescribed under **11.2** should be complied with.

C-1 SODA ACID FIRE EXTINGUISHER (IS 934, IS 5506)

a) Open the extinguisher, withdraw the case and remove the acid bottle and examine it for cracks. Check the main liquid level and empty main liquid charge into a clean container.

b) Remove acid bottle if cracked and replace with a new one. Renew the main liquid charge if level is appreciably reduced.

c) Examine the extinguisher body externally and internally using illuminating probe.

d) Examine nozzle, strainer, vent holes, internal discharge tube, snifter valve and clean them properly. Examine hose assembly; wheel carriage in case of 50 litre soda acid extinguishers.

e) Check the operating mechanism for free movements and sealing washers for correctness and replace, if necessary.

f) Check the nozzle and see that it is not clogged and clean it.

g) Clean the extinguisher externally and internally and return the original charge to the extinguisher and make up the level with water if slightly less. Otherwise use a new charge.

C-2 FIRE EXTINGUISHER, WATER TYPE GAS CARTRIDGE (IS 940)

a) Open the extinguisher, see the water level, throw away the water charge.

b) Examine the extinguisher body internally and externally for corrosion and damaged

conditions with illuminating probe. Damaged and corroded extinguishers should be removed from service. Corroded gas cartridge should also be replaced.

c) Examine the gas cartridge for mass. If there is loss of more than 10 percent of original mass, the cartridge should be sent for re-charging after being replaced by a charged one. For re-charging, procedure given in **12.4** should be followed.

d) Examine nozzle, strainer, vent holes, internal discharge tube, sealing washer, replace them if not in good condition. Otherwise clean them thoroughly.

e) Check the operating mechanism for free movement and piercing mechanism if working properly.

f) Refill the fire extinguisher with clean water.

C-3 FIRE EXTINGUISHER, WATER TYPE STORED PRESSURE (IS 6234)

a) Examine and verify that the pressure gauge or any other pressure indicating device fitted in is indicating the internal pressure correctly, if the extinguisher shows a loss of pressure of more than 10 percent, refer to the manufacturer's instructions for appropriate action.

b) Examine the extinguisher body externally for corrosion or damage (*see* **11.2**).

c) Weigh the extinguisher (with or without the operating mechanism according to the manufacturer's instructions) or use suitable alternate means to check that it contains the correct mass of liquid. Check the mass against the mass recorded when it was first put into service.

d) Examine the nozzle and hose and clean if necessary.

e) Examine the hose for wear and replace if not in good condition.

f) Where the extinguishers are designed to have the operating mechanism removed, check the operating mechanism and discharge control (where fitted) for free movement, clean, rectify or replace, if necessary.

g) Replace safety clip/wire seal or equivalent device as originally fitted.

h) Refill the fire extinguisher with clean water.

NOTE — As this type of extinguisher is pressurised, it can be opened for inspection only after discharge of the extinguisher. It should be subjected to discharge/ performance test every two years.

C-4 *Clause deleted*

C-5 FIRE EXTINGUISHER, FOAM TYPE MECHANICAL (IS 10204)

a) Open the extinguisher, check the liquid level. Pour liquid in separate clean receptacle to see if there is any sediment at the bottom of the cylinder. Reject the charge if there is sufficient sludge formation.

b) Examine the extinguisher externally and internally for any corrosion or damage. Damaged and corroded extinguisher should be removed from service. Corroded gas cartridge should also be replaced.

c) Examine the gas cartridge of mass. If there is loss of more than 10 percent of original mass, replace it with fully charged one.

d) Examine the foam generating nozzle, strainer, vent holes, internal discharge tube ceilng washer, etc. Replace them, if not in good condition. Otherwise clean them thoroughly.

e) Check the operating mechanism for free movement and piercing mechanism for proper working.

f) Clean the hose assembly and check it for any dust/sediment at either shank ends.

C-6 FIRE EXTINGUISHER, DRY POWDER TYPE GAS CARTRIDGE (IS 2171, IS 10658, IS 11833)

All dry powder extinguishers should be inspected and maintained in accordance with the following. The dry powder extinguishers should be opened in a dry room and for a minimum possible time to avoid effect to atmospheric moisture on powder.

a) Dry powder extinguisher, where discharge control is fitted on the nozzle, should be operated before opening the extinguisher to ensure that there is no pressure in the extinguisher.

b) Weigh the extinguisher to check the correct mass of powder filled in it which should be marked on the body of extinguisher and record book when it was first put into service.

c) Open the extinguisher and remove gas cartridge and see that sealing disc is intact. Weigh and compare its mass with full mass of cartridge marked on it. In case, loss of mass is more than 10 percent, it should be replaced by new cartridge.

d) Check the operating mechanism, discharge control for free movement and closing. Examine nozzle, hose, vent holes, piercing mechanism of cap cartridge holder, grease and wipe clean.

e) Remove the inner shell (if any) and clean port holes.

f) Empty the dry powder in a dry container and examine for caking, lumps and foreign matter, in which case replace it with new dry powder charge.

g) Examine the extinguisher body internally for any damage or corrosion and replace corroded or damaged extinguisher.

h) Clean the extinguisher using dry air.

j) Return the original charge to the exitinguisher and fit the cartridge and other fittings.

k) In case of higher capacity dry powder fire extinguisher as per IS 10658, remove the carbon dioxide cylinder and check the weight marked on the cylinder to ensure that the size conforms to that stipulated in the specification. On weighing, if the loss of mass is more than 10 percent it should be sent for recharging. Also examine the wheel carriage and discharge hose assembly with control nozzle for free flow and test it with dry air.

m) In case of dry powder extinguisher for metal fires as per IS 11833, in addition to item 10 above, examine the applicator pipe and the discharge shower head for freedom from clogging and clean it with dry air. Sample of the dry powder for metal fire may be tested on a small fire of magnesium turning or chips to ensure that the powder is suitable for metallic fire risks.

n) The safety valves and pressure gauges fitted on higher capacity extinguishers should be calibrated once in 3 years and recorded in the register.

C-7 FIRE EXTINGUISHER, CARBON DIOXIDE TYPE (IS 2878)

a) Examine extinguisher body externally. Damaged or corroded extinguisher should be replaced.

b) Weigh the extinguisher, compare mass against the mass marked on it for fully, charged extinguisher. It should be sent for refilling if the loss is more than 10 percent of mass. Clean and polish externally.

c) Examine hose, horn and assembly and clean. In case of trolley mounted extinguisher, examine the wheel carriage for free movement.

C-8 FIRE EXTINGUISHER, HALON 1211 TYPE (IS 11108)

a) Examine extinguisher body externally. Damage or corroded extinguisher should be replaced.

b) Check the pressure gauge to see that extinguisher is pressurised correctly. Extinguisher showing loss in pressure should be sent to manufacturer for pressurization.

c) Weigh the extinguisher to check its contents of the extinguishing media and compare it with mass recorded on the cylinder. In case of loss of more than 10 percent, the man extinguisher should be sent for recharging.

ANNEX D

(*Clauses* 4.6.1 *and* 12.3)

REFILLING SCHEDULE FOR FIRE EXTINGUISHERS AND SCHEDULE FOR OPERATIONAL TEST ON FIRE EXTINGUISHERS

D-1 EXTINGUISHERS TO BE REFILLED/ OPERATED FOR PERFORMANCE TEST

D-1.1 Once in Two Years

a) Portable fire extinguisher, water type stored pressure.

b) Portable fire extinguisher, mechanical foam type.

D-1.2 Once in Five Years

a) Portable fire extinguisher, water type (gas cartridge)

b) Fire extinguisher, carbon dioxide type (portable and trolley mounted)

c) Dry powder fire extinguishers for metal fires.

NOTES

1 In corrosive environments, it is desirable to have the discharge test carried out at half the frequency mentioned.

2 As for the restriction on release of Halon in atmosphere, it need not be necessary to refill/operate Halon 1211 type portable fire extinguisher within any stipulated period. However as regards the pressure of injections gas, i.e., dry N_2 it should be checked up for the adequate pressure on the press are gauge/indicating gauge and the contents by weighing the fire extinguisher.

D-1.3 Once in 3 years — BC and ABC dry powder conforming to IS 4308 and IS 14609.

ANNEX E

(*Clauses* 12.2.1 *and* 12.2.2)

SCHEDULE FOR HYDRAULIC PRESSURE TESTING OF FIRE EXTINGUISHERS

E-1 Every extinguisher installed in premises shall be hydraulically pressure tested as per the schedule given below. There shall not be any leakage or visible distortion. Extinguisher which fails in this requirements shall be replaced.

E-2 The carbon dioxide type and Halon 1211 type fire extinguishers shall be pressure tested every time the cylinders are sent for recharging (after periodic discharge test or otherwise) to the pressure specified in the relevant Indian Standard specifications.

Sl No.	*Type of Extinguisher*	*Test Interval*	*Test Pressure*	*Pressure Maintained for*
1	Water type (gas cartridge) (IS 940)	3 yr	1.75 MPa (17.5 kg/cm^2)	2.5 min
2	Water type (stored pressure) (IS 6234)	2 yr	2.5 MPa/ (25 kg/cm^2)	2.5 min
3	Mechanical foam (IS 10204)	3 yr	1.75 MPa (17.5 kg/cm^2)	2.5 min
4	Dry powder type (IS 2171, IS 10658, IS 11833)	3 yr	2.5 MPa (25 kg/cm^2)	2.5 min

ANNEX F

(*Clauses* 13 *and* 14.1)

REGISTER OF FIRE EXTINGUISHER

F-1 Record of fire extinguishers installed in a premises, its inspection, maintenance and operational history shall be maintained as per the format below:

Sl No.	*Type*	*Capa-city*	*Year of manu-facture*	*Make*	*Location*	*Monthly Inspec-tion Dates*	*Annual Inspec-tion Dates*	*Pressure Tested on*	*Date of Dis-charge*	*Refilled on*	*Due for Refilling*	*Remarks*
1	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—
6	—	—	—	—	—	—	—	—	—	—	—	—

NOTES

1 In remarks column fill details of date of operation as per annual maintenance date, date of rejection and disposal with details of observations and date of calibration of safety valves and pressure gauges in case of high capacity extinguishers.

2 Each extinguisher should be allotted one full page and the particulars of a permanent nature like Sl No., Type, Capacity, Year of Manufacture, Make and Location can be transferred to the top portion of the Register.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the 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 BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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This Indian Standard has been developed from Doc : No. CED 22 (4774)

Amendments Issued Since Publication

Amend No.	Date of Issue
Amd. No. 1	May 2005

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