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मानक

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IS 15496 (2004): Inspection and Maintenance of Gaseous Fire Extinguishing Systems - Code of Practice [CED 22: Fire Fighting]



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भारतीय मानक
गैसीय अग्नि-शमन पद्धतियों का
निरीक्षण और रख-रखाव — रीति संहिता

Indian Standard

INSPECTION AND MAINTENANCE OF GASEOUS
FIRE EXTINGUISHING SYSTEMS —
CODE OF PRACTICE

ICS 13.220.10

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

This standard sets out requirements for the regular Inspection and Maintenance of Gaseous Fire Extinguishing Systems designed and installed in accordance with the appropriate standards for the installation of respective extinguishing systems. Regular maintenance includes inspection, testing and training procedures also.

The purpose of the maintenance is to maintain the system in full operating condition at all times and also to ensure that the system would operate to the expected level of efficiency at any given time. Actuation, impairment and restoration of the protection shall be promptly recorded and also reported to the concerned authorities.

Any troubles or impairments shall be rectified in a timely manner consistent with the hazard protected.

Enclosure penetrations caused after the installations of the gaseous systems shall be efficiently sealed back. Unless this is attended to, the integrity of the enclosure will change, resulting in inadequate protection.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INSPECTION AND MAINTENANCE OF GASEOUS FIRE EXTINGUISHING SYSTEMS — CODE OF PRACTICE

1 SCOPE

This standard lays down recommendations for inspection and maintenance of gaseous fire extinguishing systems like HFC227ea, HCFC Blend A, IG 01, IG 55, IG100, IG 541.

2 REFERENCES

The standards given below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
2189:1999	Code of practice for selection, installation and maintenance of automatic fire detection and alarm system (<i>second revision</i>)
15493:2004	Gaseous fire extinguishing systems — General requirements
15517:2004	Gaseous fire extinguishing systems — HFC 227ea (Hepta Fluoro Propare) extinguishing systems
15505:2004	Gaseous fire extinguishing systems — HCFC blend A extinguishing systems
15506:2004	Gaseous fire extinguishing systems — IG 55 extinguishing systems
15501:2004	Gaseous fire extinguishing systems — IG 541 extinguishing systems
15525:2004	Gaseous fire extinguishing systems — IG 100 extinguishing systems
15497:2004	Gaseous fire extinguishing systems — IG 01 extinguishing systems

IS No.

Title

15528:2004	Gaseous fire extinguishing systems — Carbondioxide total flooding and local application (sub-floor and in-cabinet), high and low pressure (refrigerated) systems
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3 INSPECTION, TESTING AND TRAINING ASPECTS

3.1 Inspection and Tests

A well planned and approved schedule is essential for the inspection and testing of systems, keeping in view the following:

- a) At least once a year, all systems shall be thoroughly inspected and tested for proper operation by competent personnel. Discharge tests are not necessary.
- b) The inspection report along with recommendations shall be filed and always available with the owner and the same shall be produced to the authorities concerned when demanded.
- c) At least once in six months, the agent quantity and pressure of the containers shall be checked and details logged in a register.
- d) For Halocarbon clean agents that are vapourizing liquids, if a container shows a loss in agent quantity of more than 5 percent or a loss in pressure (adjusted for room temperature) of more than 10 percent, it shall be refilled or replaced.
- e) For Inert gas clean agents that are not liquefied, pressure is an indication of agent quantity. If a container shows a loss in pressure (adjusted for room temperature) of more than 5 percent, it shall be refilled or replaced.
- f) In either case above, where container pressure gauges are used for checking pressure, they shall be compared to a separate calibrated device at least once a year.

- g) Where the amount of agent in the container is determined by special measuring devices, these devices shall be approved.
- h) All halocarbon clean agents removed from refillable containers during service or maintenance procedures shall be collected and recycled or disposed of in an environmentally sound manner and in accordance with existing laws and regulations.
- j) Factory-charged, non-refillable containers that do not have a means of pressure indication shall have the agent quantity checked at least semiannually. If a container shows a loss in agent quantity of more than 5 percent, it shall be replaced. All factory-charged, non-refillable containers removed from useful service shall be returned for recycling of the agent or disposed of in an environmentally sound manner and in accordance with existing laws and regulations.
- k) For halocarbon clean agents, the date of inspection, gross weight of cylinder plus agent or net weight of agent, type of agent, person performing the inspection, and, where applicable, the pressure at a recorded temperature shall be recorded on a tag attached to the container. For inert gas clean agents, the date of inspection, type of agent, person performing the inspection, and the pressure at a recorded temperature shall be recorded on a tag attached to the container.

3.2 Container Test

The gaseous agent containers covered under IS 15517 : 2004, IS 15505 : 2004, IS 15506 : 2004, IS 15501 : 2004, IS 15525 : 2004, IS 15497 : 2004 and IS 15528 : 2004 shall be inspected, keeping in view the following:

- a) Clean agent containers as approved by Chief Controller of Explosives, Nagpur shall not be recharged without retesting if more than 5 years have elapsed since the date of the last test and inspection. For halocarbon agent storage containers, the retest shall be permitted to consist of a complete visual inspection.
Transporting charged containers that have not been tested within 5 years shall not be allowed. Guidelines of Chief Controller of Explosives, Nagpur shall be followed in this regard.
- b) Cylinders continuously in service without

discharging shall be given a complete external visual inspection every 5 years or more frequently if required. The visual inspection shall be in accordance with the guidelines of Chief Controller of Explosives, Nagpur except that the cylinders need not be emptied or stamped while under pressure. Inspections shall be made only by competent personnel and the results recorded on both of the following:

- 1) A record tag permanently attached to each cylinder, and
- 2) A suitable inspection report.
- c) A completed copy of the inspection report shall be furnished to the owner of the system or an authorized representative. These records shall be retained by the owner for the life of the system.
- d) Potentially the most serious hazard of defective container is the sudden uncontrolled release of pressure or ejection of parts. It could be caused due to any one of the following causes:
 - 1) Corrosion, wear or damage to threads of any pressure retaining parts; and
 - 2) Extensive general corrosion or severe pitting.

Where external visual inspection indicates that the container has been damaged, the same shall be sent for hydraulic testing. However, hydraulic test shall be carried out after five years or after discharge by the authorized agency.

3.3 Hose Test

3.3.1 All system hose shall be examined annually for damage. If visual examination shows any deficiency, the hose shall be immediately replaced or tested as specified in 3.3.2 below.

3.3.2 Testing

- a) All hoses shall be tested every 5 years.
- b) All hoses shall be tested at 1½ times the maximum container pressure at 54.4°C. The testing procedure shall be as follows:
 - 1) The hose is removed from any attachment.
 - 2) The hose assembly is then placed in a protective enclosure designed to permit visual observation of the test.
 - 3) The hose must be completely filled with water before testing.
 - 4) Pressure then is applied at a rate-of-pressure rise to reach the test pressure

within a minimum of 1 min. The test pressure is maintained for 1 full min. Observations are then made to note any distortion or leakage.

- 5) If the test pressure has not dropped or if the couplings have not moved, the pressure is released. The hose assembly is then considered to have passed the hydrostatic test if no permanent distortion has taken place.
- 6) Hose assembly passing the test must be completely dried internally. If heat is used for drying, the temperature must not exceed the manufacturer's specifications.
- 7) Hose assemblies failing a hydrostatic test must be marked and destroyed and be replaced with new assemblies.
- 8) Each hose assembly passing the hydrostatic test is marked to show the date of test.

3.4 Enclosure Inspection

At least every 12 months, the enclosure protected by these agents shall be thoroughly inspected to determine if penetrations or other changes have occurred that could adversely affect agent leakage or change volume of hazard or both. Where the inspection indicates conditions that could result in inability to maintain the clean agent concentration, they shall be corrected. If uncertainty still exists, the enclosures shall be retested for integrity.

3.5 Training

All persons who could be expected to inspect, test, maintain, or operate fire extinguishing systems shall be thoroughly trained and kept thoroughly trained in the functions they are expected to perform.

Personnel working in an enclosure protected by these agents shall receive training regarding agent safety issues.

4 MAINTENANCE OF INSTALLED SYSTEMS

4.1 Maintenance of Installation

4.1.1 It is essential that regular maintenance of gaseous systems is undertaken to ensure an operational condition and to prevent leakage or inadvertent discharge.

4.1.2 Calibrated test equipment and recognized procedures shall be used.

4.1.3 Regular maintenance is classified into four levels which shall be performed as follows:

- a) Weekly, only where the appropriate authority deems it necessary;
- b) Monthly on complete systems;
- c) Six-monthly on complete systems that do not incorporate means to determine container contents;
- d) Yearly on complete systems; and
- e) Container test after 5 years.

NOTES

1 Maintenance should be carried out only by persons having qualifications and experience suitable for the particular work in which they are engaged.

2 The manufacturer may have additional requirements beyond that specified in this standard.

3 The arrangements for maintenance should ensure that a person is available on call at all times to provide service in the event of any fault developing at the installation.

4.2 Records

All system attendances, for example, inspection, testing, service and maintenance procedures, shall be systematically recorded by date with signed entries in the logbook maintained on the site (*see 6.2*). In addition, a copy of all attendance records should be forwarded to the owner. The property owner or occupier shall maintain a record of maintenance carried out on the gaseous systems. The maintenance record system shall contain the classification (weekly, monthly, six-monthly or yearly) and date of maintenance, any defects and any consequent remedial action or advice given by the service person, with any additional action or advice by the service person.

The maintenance record system shall be available for the property at all times and produced to the authorities concerned when demanded.

NOTE — The maintenance record system may be in the form of a logbook or a computer based record system or other appropriate permanent record system.

4.3 Precautions

Prior to commencing any inspection, testing or maintenance procedures, the service person shall carry out the following precautionary procedures as applicable:

- a) Inform the building owner that maintenance is to be carried out.
- b) Inform the fire control station, where testing will transmit a fire alarm signal (where fire stations are hooked with the control panel).

- c) Where fitted, close lock-off valve and in addition ensure that all extinguishant actuating circuits are isolated or firing mechanisms are removed to ensure that testing or that other maintenance procedures cannot cause discharge of any extinguishant.
- d) Set the detection and alarm system in the appropriate test mode and ensure that ancillary facilities, systems and air-handling plant (including smoke exhaust and stairwell pressurization systems, evacuation warning systems, and the like), where they are not to be tested, are isolated to a void inadvertent operation.
- e) On completion of any inspection, testing or maintenance procedure, the service person shall ensure that all controls are returned to the normal condition and re-establish the systems integrity.

NOTE — The action to be taken when any function is isolated should be covered by the maintenance contract. When any section of an installation is to be isolated, the owner should be notified and in turn should advise the appropriate authority.

5 MAINTENANCE PROCEDURES

5.1 Weekly

Where required, the weekly maintenance shall be performed as follows:

- a) Isolate extinguishant supply and ancillaries in accordance with 4.3.
- b) Check the proper operation of all associated visual alarm indicators by initiating a simulated fire alarm on an alarm zone facility.
The above test shall be carried out in a manner acceptable to the fire control station if connected.
- c) Check the satisfactory operation of the fire alarm bell.
- d) Reset alarm zone facility.
- e) On completion of testing, to re-establish the system's integrity, ensure that all switches are in the correct operating position. Inform the building owner or agent of any items requiring corrective action.
- f) Record the results of weekly maintenance procedures in the log, including whether the fire alarm signal from the alarm zone facility was received at the fire control station (see 6.2).

5.2 Monthly

The monthly maintenance procedure shall be performed as follows:

- a) Isolate extinguishant supply and ancillaries in accordance with 4.3.
- b) Initiate a simulated fire alarm on an alarm zone facility so as to transmit an alarm to the fire control station. Check the proper operation of all associated visual alarm indicators. Check that the alarm was correctly received at the fire control station.
- c) This test shall be carried out in a manner acceptable to the fire control station.
- d) Check the satisfactory operation of the fire alarm bell.
- e) Reset alarm zone facility to normal.
- f) Test each alarm zone facility to confirm its ability to operate the master alarm facility.
- g) Check that all visual and audible indicators are operating correctly.
- h) Check that all control and indicating equipment is in a clean and operational condition, and effectively dust sealed.
- h) Ensure that all fire indicator panels, extinguishant local control stations (LCS), repeater panels and mimic panel are clearly visible and readily accessible.
- j) Simulate fault conditions on all alarm zones to ensure that fault indicators, both audible and visual, where applicable, are operating correctly from each alarm zone facility.
- k) Check the battery condition by operating the battery test facility for 1 min, and record the battery condition in the log.
- m) Inspect all extinguishant containers, manual mechanical release mechanisms and all other ancillary equipment to ensure they are secure, undamaged and unobstructed.
- n) Where applicable, check and record the container gauge pressures. Any container showing a loss in pressure exceeding 10 percent of the nominal filling pressure, adjusted for temperature change from initial fill at the applicable reference temperature, shall be reported to the owner or agent for corrective action.
- p) Check the function of all extinguishant manual initiate switches and the extinguishant inhibit switch on each LCS.

- q) Ensure that all discharge nozzles are not obstructed and are correctly aligned. Carry out a visual inspection on all exposed pipe work, support and mechanical controls.
 - r) Ensure that all warning and instruction signs, as required, are correctly displayed and unobstructed and that all controls, valves, switches, and the like, are properly identified.
 - s) On completion of testing, to re-establish the system's integrity, ensure that all controls are returned to the normal condition.
 - t) Record the results of monthly maintenance procedures in the log, including all items requiring corrective action, adjustment and the like (*see* 6.2).
 - u) Check that items previously recorded as requiring attention have been attended to, or record the reasons why corrective actions have not been completed.
 - v) Inform the building owner or agent that maintenance is completed and of any items requiring corrective action, obtain all necessary signatures in the logbook.
- d) Remove at least one detector on each alarm zone circuit and confirm that the fault signal is registered at the appropriate alarm zone facility.
 - e) Determine the sensitivity of all detectors. This may take the form of either:
 - 1) testing of a detector *in-situ*; or
 - 2) removal of a detector and its replacement by a detector which has been checked and calibrated by the supplier.
 - f) Check that an alarm on each detector registers on the correct alarm zone facility.

NOTE — This may require the owner or agent to provide other personnel to reset or restart ancillary facilities.
 - g) Measure and record the time delay between any detector circuit's initiation of extinguishant release and receipt of the operation signal at the actuators.
 - h) Check the operation of all remote ancillary control facilities, including door closers, evacuation warning systems, air-handling systems and the like, and ensure that each controlled device can be correctly activated.
 - j) Check the operation of all mechanical release devices.
 - k) Check the operation of all illuminated signs and audible indicators.
 - m) Check the correct operation of the power supply supervision alarm, if applicable, by disconnecting all power supplies to the fire indicator panel.
 - n) Inspect control and indicating equipment component for evidence of deterioration.
 - p) Check and record all container details for compliance with requirements for periodic inspection and pressure testing in accordance with the standard appropriate to the container used.
 - q) Ensure that all discharge nozzles are not obstructed and are correctly aligned. Carry out a visual inspection on all accessible pipe work, supports and mechanical controls.
 - r) Non-electrical detection devices and manually operated devices shall be verified in accordance with the manufacturer's

5.3 Six-Monthly

The six-monthly maintenance procedure shall be performed as follows:

- a) Isolate extinguishant supply and ancillaries in accordance with 4.3.
- b) Check and record the amount of extinguishant in each container by weight or liquid level.

NOTE — Pressures and liquid levels in extinguishant container can vary considerably with temperature change. There may be a considerable time delay between changes in ambient temperature and the corresponding changes in the extinguishant container pressure or level. Any liquid level measurement should be reference to a datum, established at a known temperature.
- c) Perform monthly maintenance procedures in accordance with 5.2, items (b) to (v) inclusive.

5.4 Yearly

The yearly maintenance procedure shall be performed as follows:

- a) Isolate extinguishant supply and ancillaries in accordance with 4.3.
- b) Perform monthly maintenance procedures in accordance with 5.2(b) to 5.2(r), inclusive.
- c) Inspect all detectors as per IS 2189 and

procedure.

- s) Where applicable, check the electrical resistance of actuators and insulation of actuators to earth and replace them where appropriate. Pyrotechnic actuators shall be replaced in accordance with the manufacturer's specifications.
- t) Check for correct operation of directional valves.
- u) Perform a full system function check by initiating detector alarms and checking the response of container valve actuating circuits at the extinguishant containers.
This check shall include the operation of the valve actuators, where this can be done without discharging extinguishant or damaging the actuator in which case the test shall be carried out using a device to simulate actuation. Where various combinations of detector circuits can initiate an extinguishant discharge, each combination shall be checked.
- v) Verify enclosure volume.
- w) Check for building alterations, changes in the environment, openings or other factors that could:
 - 1) cause inadvertent discharge of extinguishant,
 - 2) allow leakage of extinguishant from the protected area, and
 - 3) require modification to the system.

Where the building has been altered, conduct an additional check for compliance with design concentration and, if necessary, conduct a full discharge test.

NOTE — Leakage rate may be obtained by the fan pressurization technique.

- y) On completion of testing to re-establish the systems integrity ensure all controls are returned to the normal condition.
- z) Record the results of yearly maintenance procedures in the log, including details for all equipment that does not pass visual inspection or fails to operate satisfactorily. Notify the owner or agent of any deficiencies within the installation and obtain all necessary signatures in the logbook.

NOTE — Prior to yearly maintenance procedures, the maintenance provider should give the owner or agent sufficient notice of testing to allow time for witnessing to be arranged.

6 MAINTENANCE DOCUMENTATION

6.1 General

Maintenance documentation shall be provided for each gaseous system and shall include the following:

- a) Installer's report as specified in the appropriate installation standard.
- b) Installer's statement, as-installed diagrams, and commissioning test report as specified in IS 15493 : 2004 for the control and indicating equipment.

The installer's statement, as-installed diagrams, and commissioning test report shall be prepared on durable, good quality paper, clearly legible and contained in a plastic cover or, alternatively, bound into the operator's manual.

- c) *Log* — The maintenance documentation given above shall be housed in a secure location at the fire indicator panel, or as otherwise approved by the appropriate authority.

The documentation shall describe the state of the installation, as it currently exists. If any changes are made to the installation, the relevant records shall be updated, that is, installer's statement, as-installed diagrams, operator's manual, and the like.

6.2 Record System

A maintenance record system shall be provided to sequentially register all known alarms, faults, disconnections, discharges and all maintenance and inspection procedures carried out so that there is a composite record of all events related to the installation. It shall include the following:

- a) Name of owner;
- b) Name of maintenance organization (if hired);
- c) Identification of the system;
- d) Details of weekly, monthly, six-monthly and yearly maintenance procedures (*see Annex A*);
- e) Container pressure report; and
- f) A report section for attendances apart from maintenance procedures.

Where a logbook is used it shall be substantially bound (not in loose-leaf format) and shall have numbered pages in triplicate. The logbook shall include the signatures of the owner and service person. A required distribution of copies printed on each page shall be as follows:

- a) Original Owner/occupier the property at all times.
- b) Duplicate Service person
- c) Triplicate Retain in book

NOTE — The maintenance record system may be in the form of a logbook or a computer-based record system or other appropriate permanent record system.

The maintenance record system shall be available for

ANNEX A

(Clause 6.2)

SYSTEM — LOGBOOK REPORT

Month.....

Inspection, Testing, and Maintenance Procedures

Maintenance Organization Premises

Address.....

NOTES

- 1 Give details of all unsatisfactory items in report section. Refer to operations manual for commissioning test report.
- 2 Place a (✓) in box where item is satisfactory.
- 3 Place a (×) in box where item is unsatisfactory.
- 4 Tests not applicable where shaded.

Sl No.	Item	Periodical Check			
		Weekly	Monthly	Six-monthly	Yearly
(1)	(2)	(3)	(4)	(5)	(6)
1)	Fully isolate extinguishant supply				
2)	Fire alarm signal simulation				
3)	Fire alarm bell or warning device operation				
4)	Fire alarm signal received at fire control station (if applicable)				
5)	Alarm zone facility operation				
6)	Indicate lights correct operation				
7)	All alarm bells and signalling devices operation				
8)	Battery condition				
9)	CIE operational and clean				
10)	All FIP, LCS and other panels clearly visible and readily accessible				
11)	Fault conditions simulation on all alarm zones and ensure:				
	i) fault annunciators operative, and				
	ii) audible/visual indication operative.				

Sl No.	Item	Periodical Check			
		Weekly	Monthly	Six-monthly	Yearly
(1)	(2)	(3)	(4)	(5)	(6)
12)	Extinguishant containers, other equipment secure, undamaged				
13)	Container gauge pressures recorded (Refer report)				
14)	Discharge nozzles				
15)	LCS unit operational				
16)	Signs and controls checked				
17)	Check and record amount of extinguishant in each container by weight or liquid level				
18)	Inspect all detectors and sampling points (fault signal registration for each alarm zone)				
19)	Detector and sampling point testing, as appropriate				
20)	Correct operation of all ancillary control facilities				
21)	Operation of all manual release points				
22)	Check operation of signs				
23)	Power supply supervision alarm				
24)	Control and indicating equipment component inspection for deterioration				
25)	Container compliance with Chief Controller of Explosives, Nagpur				
26)	Actuators checked				
27)	Non-electrical and manually operated detection devices				
28)	Directional valves operational				
29)	Full function test				
30)	All controls returned to normal, extinguishant supply reconnected				
31)	Building modifications, opening identified				
32)	Leakage test conducted				
33)	Correction of items (Refer report)				
34)	Building owner informed, corrective action identified				
35)	Time delay recorded				

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. CED 22 (7087).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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