इंटरनेट मानक

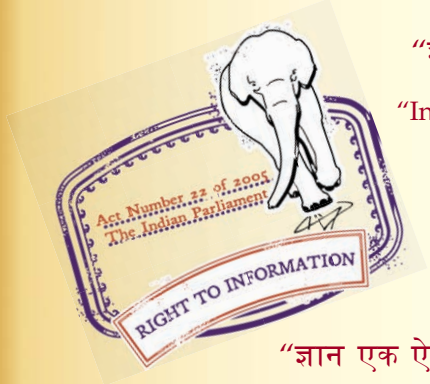
Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 2175 (1988): Specification for heat sensitive fire detectors for use in automatic fire alarm system [CED 22: Fire Fighting]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

IS : 2175 - 1988
(Reaffirmed 2000)

Indian Standard

SPECIFICATION FOR HEAT SENSITIVE FIRE DETECTORS FOR USE IN AUTOMATIC FIRE ALARM SYSTEM

(Second Revision)

First Reprint JANUARY 1999

UDC 614·842·435 : 654·924·54

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

Gr 4

June 1989

Indian Standard

SPECIFICATION FOR HEAT SENSITIVE FIRE DETECTORS FOR USE IN AUTOMATIC FIRE ALARM SYSTEM

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards on 17 November 1988, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Property damage caused by a fire is directly related to the (a) intensity of fire, and (b) duration of fire. The intensity of fire depends upon the time available for its growth, type and geometrical configuration of combustibles, ventilation, etc. The duration of fire depends upon the quantity of combustible and the point at which the extinction process starts.

0.3 Life hazard is predominantly posed by smoke and other toxic products of combustion which travel faster and farther than fire. The amount of combustion products and speed of their travel is directly proportional to the intensity of fire.

0.4 In order to ensure life safety and reduce property loss, there is a need to detect fires in an incipient stage which will provide a reasonable interval of time for inmates to escape to a place of safety and which will give a reasonable chance to fire fighters to control and extinguish the fire with minimum loss.

0.5 Fires are detected by utilizing various physical and chemical changes produced by it. One of the phenomena for detection of fire is heat. The probes which detect the early growth of fire by sensing heat due to temperature rise in the vicinity are called heat sensitive fire detectors. Typical examples are bimetallic, fusible alloy, pneumatic, etc.

0.6 The aim of standardization of any device is to ensure that the quality of material is good and that the equipment performs its task under the conditions it may be subjected to during its use. It is, therefore, necessary to prepare an Indian Standard specification on heat sensitive fire detectors to enable the users to choose a standard device and also to help the indigenous manufacturers to manufacture standard product.

0.7 Heat sensitive detectors can be point (spot) and line type. This standard at present covers point type detectors and the requirements for line type detectors will be added later on. This standard covering point type detectors was first published in 1962 and revised in 1977. The second revision has been prepared so as to bring the requirements in line with the other international standards and update the contents in the light of developments made during the past 11 years in this field. The principal modifications made are:

a) Rate of temperature rise type being replaced by rate of temperature rise-cum-fixed type detector;

b) Covering both resettable and non-resettable type detectors;

c) Making provision for detachability;

d) Keeping the temperature rating to cater to the requirements of normal building ambient temperature and further dividing the range in three grades in order to have the maximum sensitivity;

e) Including requirements and test methods in respect of low/high temperature, voltage variation, humidity; and

f) Including an accelerated ageing test for detectors having fusible alloy link.

0.8 This standard caters to the requirements of room (ceiling) ambient temperature not exceeding 45°C which covers the majority of building situations and for covering higher limit, a separate Indian Standard is being formulated. The details of installation and maintenance of detectors are covered in IS : 2189-1988*.

0.9 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†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Code of practice for selection, installation and maintenance of automatic fire detection and alarm system (*second revision*).

†Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the general requirements, test methods and performance requirements for heat sensitive (point) detectors for use in automatic fire alarm system.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Control and Indicating Equipments — Unit(s) containing the controls, relays, switches and associated circuits necessary to:

a) provide power,

b) receive signals from alarm indicating (activation devices) and transmit them to the fire alarm devices and control for automatic fire protection equipment, and

c) electrically supervise the system circuitry.

2.2 Detachable Detector — A detector designed to be easily removed from its normal operating position for maintenance and servicing purposes.

2.3 Fixed Temperature Heat Sensitive Detector — A detector designed to operate when the temperature of detector exceeds a pre-determined value.

2.4 Line Detector — A linear form of detector in which the detection process may take place anywhere along its length.

2.5 Non-Detachable Detector — A detector not designed to be easily removed from its normal operating position for maintenance and servicing purposes.

2.6 Non-Resettable (Non-Restorable) Detector — A detector which after response requires the renewal of component or components to restore it to its normal state of readiness to detect.

2.7 Point (Spot) Type Detector — A detector in which the sensing element is essentially of a compact area.

2.8 Rate of Temperature Rise-cum-Fixed Temperature Heat Sensitive Detector — A detector designed to operate within a given time:

a) when the rate of temperature rise at the detector exceeds a pre-determined value regardless of the actual temperature, and

b) when the temperature at the detector exceeds a pre-determined value.

2.9 Resettable (Restorable) Detector — A detector which after response and on cessation of the conditions that caused the response, may be restored from its alarm state to its normal state of readiness to detect without the renewal of any components.

3. TYPES AND GRADES

3.1 Heat sensitive detectors (both resettable and non-resettable) covered in this standard are of the following types:

a) Fixed temperature detector, and

b) Rate of temperature rise-cum-fixed temperature detector.

3.1.1 Each of the above detectors are subdivided into three grades based on the response time (*see* **5.2**) as Grades 1, 2 and 3.

4. GENERAL REQUIREMENTS

4.1 The detector shall be provided with means for mounting (on ceiling/wall) securely and independent of any support from the attached wiring. The heat sensitive element(s) shall not be closer than 15 mm of the detector.

4.2 Plastic, if used, shall not start softening, deforming or melting at a temperature lower than 95°C.

5. PERFORMANCE TEST AND CRITERIA FOR CONFORMITY

5.1 A sample of required number of detectors (*see* Tables 1 and 2) of each design selected randomly from production of not less than 200 detectors, shall be used for testing and shall be numbered. The test (one or more) shall be carried out in the order given in test schedule by the methods mentioned in Tables 1 and 2 and shall conform to the requirements given in **5.2** to **5.9**. The detectors shall pass all the tests. All the tests are type tests which cover the production up to 10 000 numbers.

5.2 Directional Dependence and Response Time — Detector number mentioned in Table 1 or 2 (as applicable) shall be tested for these properties according to the method given in Appendix A and shall conform to the response time requirements for the three grades as given in Table 3 and in **5.2.1** (as applicable) in all orientations.

5.2.1 In case of 'rate of temperature rise-cum-fixed temperature' type detectors, the following requirement shall also apply additionally.

5.2.1.1 At rates of rise of air temperature less than 1°C/min, the detector when tested according to the method given in Appendix A, shall be required to operate at an air temperature of not less than 58°C, and for Grades 1, 2 and 3 at not more than 65, 73 and 81°C, respectively.

5.3 Vibration — The detectors (*see* Table 1 or 2 as applicable for numbering and rate of temperature rise) shall be tested in the manner described in Appendix B and shall comply with its requirements.

5.4 Corrosion — The detectors (*see* Table 1 or 2 as applicable for numbering and rate of temperature rise) shall be tested in the manner described in Appendix C. They shall be deemed to comply with the test if:

a) *For Four Days Corrosion* — The response time of each detector remains within the

TABLE 1 TESTING SCHEME FOR RESETTABLE DETECTORS

(*Clauses* 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11, A-3.1, B-1.1 *and* D-1.1)

Test Procedure		Detector Number										Rate of Rise (°C/min)							Remarks
Clause	Test	1	2	3	4	5	6	7	8	9	10	1	3	5	10	20	30	0·2	
5.2, A-2	Directional dependence	1													x				8 orientations
5.2, A-3	Time of response	1										x	x	x		x	x	0*	Two tests at each rate : one with most favourable orientation, other with least favourable orientation.
			2									x	x	x	x	x	x	0*	
5.2, A-3	Response before test			3		5		7		9			x						With least favourable orientation
					4		6		8		10					x			
5.3	Vibration			3	4														
5.4	Corrosion, 4 days							7	8										
	Corrosion, 16 days									9	10								
	Corrosion, Salt spray				4														
5.5	Shock					5	6												
5.6	Low temperature	1	2												x				
5.7	High temperature		2											x		x			
5.8	Supply voltage variation		2																
5.9	Insulation resistance	1																	Tests at both rates at upper and lower limits of supply voltage
5.10	Humidity	1																	
5.11	Ageing													x					
	(applicable to fusible link type only)	1																	Measurement of resistance only
A-3	Response after test	1		3		5		7	8	9	10			x					With least favourable orientation
			2		4		6		8		10								

*Only for detectors subject to testing under 5.2.1 and 5.2.2.

TABLE 2 TESTING SCHEME FOR NON-RESETTABLE DETECTORS

(Each detector or element for one of the test only)

(*Clauses* 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11, A-3.1, B-1.1 *and* D-1.1)

Test Procedure		Element or Detectors Number	Rate of Rise (°C/min)							Remarks
Clause	Test	1 to 8	1	3	5	10	20	30	<0·2	
5.2, A-2	Directional dependence	1 to 8				x				8 orientations
5.2, A-3	Time of response	9 to 22	x	x	x	x	x	x	0*	Two tests at each rate : one with most favourable orientation, other with least favourable orientation
		23 to 36	x	x	x	x	x	x	0*	
5.3	Vibration	37 to 38								
5.4	Corrosion, 4 days	39 to 40								
	Corrosion, 16 days	41 to 42								
	Corrosion, Salt spray	38								
5.5	Shock	43 to 44								
5.6	Low temperature	45 to 46								
5.7	High temperature	47			x					
5.8	Supply voltage variation	48 to 51		x		x				
5.9	Insulation resistance	52								Measurement of resistance only
5.10	Humidity	53		x						
5.11	Ageing (applicable to fusible link detectors only)	54		x						
A-3	Response after test	37, 39, 41, 43, 45		x						With least favourable orientation
		38, 40, 42, 44, 46		x						

*Only for detectors subject to testing under **5.2.1** and **5.2.2**.

TABLE 3 ACCEPTANCE LIMITS FOR RESPONSE TIME

(*Clause* 5.2)

Rate of Rise of Air Temperature	Lower Limit of Response Time for All Response Grades		Upper Limit of Response Time for					
			Response Grade 1		Response Grade 2		Response Grade 3	
D°C/min	min	s	min	s	min	s	min	s
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	30	0	37	20	45	40	54	0
3	08	13	12	40	15	40	18	40
5	04	09	7	44	9	40	11	36
10		30	4	02	5	10	6	18
20		22·5	2	11	2	55	3	37
30		15	1	34	2	8	2	42

limits of its grade with an additional tolerance of ± 15 percent or 10 whichever is greater.

b) *For Sixteen Days Corrosion* — (Sulphur dioxide and salt spray)

1) Each detector gives an immediate continuous fault signal on connection to its C & I equipment, or

2) Each detector gives an alarm signal in time which does not exceed the upper limits of response grade 3.

5.5 Shock — The detector (*see* Table 1 and 2, as applicable for number and rate of temperature rise) shall be tested in the manner described in Appendix D. They shall be deemed to comply with the test if:

a) no alarm is given when they are subjected to the specified shock; and

b) any change in response time of the detectors after the test when compared with the response time obtained before the test does not exceed 15 percent or 10 s, whichever is greater.

5.6 Low Temperature — Response time of detectors (*see* Table 1 or 2, as applicable for numbering) shall be put inside a suitable chamber/tunnel/enclosure and connected to its control and indicating equipment. Air temperature in the chamber shall then be reduced to a minimum of 0 ± 1°C at a rate not exceeding 1°C/min. The detector shall be kept in the condition of minimum temperature for 1 h to allow its temperature to stabilize. After 1 h stabilization, the detector shall be taken out and kept at a temperature of 27 ± 3°C for 5 to 6 h and then response times measured (*see* Appendix A), one at 3°C/min rate of temperature rise and the other at 20°C/min rate of temperature rise using least favourable orientation. Detectors shall be deemed to comply with this test if:

a) no alarm is initiated during the test, and

b) any change in response time of the detectors measured after the test when compared with the response time obtained before the test does not exceed 15 percent or 10 s, whichever is greater.

5.7 High Temperature — The detector (*see* Table 1 or 2, as applicable for numbering/rate of temperature rise) shall be mounted in the tunnel in its normal operating condition with its normal fastenings. Keeping the detector energized and disconnected from control and indicating equipment, temperature of air flow in the tunnel shall be raised to 50°C at a rate not exceeding 1°C/min. The temperature at this level shall be maintained for 1 h. The detector shall then be energized and the response time shall be measured (*see* Appendix A) at 5°C/min rate of temperature rise using the least favourable orientation. The detector shall respond within a timenot exceeding 11 min and 36 s for Grade 3, 9 min and 40 s for Grade 2, and 7 min and 44 s for Grade 1.

5.8 Supply Voltage Variation — The detector (*see* Table 1 or 2, as applicable for numbering/ rate of temperature rise) shall be tested and response times measured as described in Appendix E. They shall be deemed to comply with this test if, as a result of supply variation, when compared with the response time obtained before and after the test does not exceed 15 percent or 10 s, whichever is greater and shall not give false alarm during the test.

5.9 Insulation Resistance — The detector (*see* Table 1 or 2, as applicable) shall be mounted in its normal operating condition with its normal area fastening on a metal plate of at least 2 mm thickness and having surface area at least 5 times the mounting surface of the detector. With the plate shorted to ground terminal of the voltage source, voltage shall be applied between the plate and the terminals of the detector which are inter-connected. In 5 s, voltage shall be applied to a maximum of 500 ± 10 volts DC. The maximum voltage shall remain applied for one minute. Insulation resistance shall then be determined. Thereafter, it shall be subjected to a temperature of 43 ± 2°C and relative humidity of 90 ± 3 percent for 10 days. After conditioning, the detector shall be kept at room condition for one hour. The insulation resistance shall be measured again. The detector shall be deemed to comply with the test if the resistance in first measurement before the exposure is not less than 10 MΩ and in second measurement after the exposure is not less than

1 MΩ, and the detector shall not give a false alarm during the test.

5.10 Humidity — The detector (*see* Table 1 or 2, as applicable) shall be kept inside a suitable humidity climatic chamber and connected to its control and indicating equipment. Following climatic conditions shall be created inside the test chambers:

Temperature	:	30 ± 2°C
RH	:	80 ± 5 percent
Duration of exposure	:	7 days

The detector shall be transferred to tunnel within 1 hour of removal from the chamber and its response time measured according to Appendix A. The time measured after the exposure and before shall not differ by a factor greater than 1·6 and the detector shall not give false alarm during the test.

5.11 Ageing (Applicable to Fusible Alloy Link Type) — The detector (*see* Table 1 or 2, as applicable) shall be placed in a suitable temperature oven and exposed for a period of 90 days to an ambient air temperature which is 15°C below the rated operating temperature of the detector but not less than 50°C. Following the exposure, the detector shall be allowed to cool for not less than 5 hours. After cooling, the detector operating temperature shall be ascertained according to Appendix A. The detector shall operate within a temperature range $T \pm (0{\cdot}035\ T + 0{\cdot}62)$°C.

NOTE — T°C is rated operating temperature.

6. INFORMATION

6.1 Sufficient information shall be given with the detectors to facilitate their correct application. Such information shall include broad details of general and technical features of the detector, correct monitoring position, reference to owner's manual, operation of test feature (if provided), maintenance instructions, required electrical interface with the control and indicating equipment which may take the form either of the values of current, voltage, etc, and their allowable tolerances or a restriction of the detector to be used only in conjunction with specified control and indicating equipment, etc.

7. MARKING

7.1 Each detector shall be legibly and indelibly marked with the following:

a) Manufacturer's name or trade-mark;
b) Type and description of detector and number;
c) Year of manufacture;
d) Grading of detector which shall be clearly indicated either by the colours as mentioned below, or by other suitable means;
   1) Grade 1 : green
   2) Grade 2 : yellow
   3) Grade 3 : red; and
e) Whether provided with fusible link.

7.2 Each detector may also be marked with the Standard Mark.

NOTE — 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.

APPENDIX A

(*Clauses* 5.2, 5.2. 1.1, 5.6, 5.7, 5.10, 5.11 and *Tables* 1 *and* 2)

METHOD OF TEST FOR TIME OF RESPONSE AND DIRECTIONAL DEPENDENCE

A-1. APPARATUS

A-1.1 The response time and directional dependence shall be measured in a wind tunnel specified in Fig. 6 of IS : 9972-1981*. The air velocity in the tunnel shall be 0·8 ± 0·1 m/s and the air temperature shall be 28°C.

A-1.2 The detector shall be mounted in its normal operating position on a board forming part of the ceiling of the working section of the tunnel so that it is symmetrically disposed with respect to the side walls of the tunnel, possibly in least favourable mounting position. The air temperature shall be measured by suitable thermocouple (copper-constantan wire not exceeding 0·25 mm in diameter, junction consisting of a half twist with tightly tinned joint). The temperature measuring device shall be approximate, at the same distance from the ceiling of the wind tunnel as the sensitive element of the detector and approximately 230 mm from the sensitive element against the flow of air in a horizontal direction. Before the test, the temperature of the air stream and the detector shall stabilized at 28°C. The temperature control of the tunnel shall be such that the temperature may be varied at 1, 3, 5, 10, 20 and 30°C/min with air temperature within the tunnel being at all times within ± 3°C of that required by the set rate of change of temperature, and also such

*Specification for automatic sprinkler heads.

that the temperature can be raised from 52°C at a rate not exceeding 0·2°C/min to a temperature of 83°C.

A-2. DETERMINATION OF DIRECTIONAL DEPENDENCE

A-2.1 The detector(s) shall be connected to its control and indicating equipment and tested in an air stream having a constant mass flow, equivalent to a velocity of 0·8 ± 0·1 m/s at 28°C and with a uniform rate of rise of air temperature of 10°C/min. Eight such tests shall be made, the detector being rotated about a vertical axis by 45° between successive tests so that the tests are made with eight different orientations.

A-2.2 The least favourable and most favourable orientations giving the greatest and the least time delays, respectively, between the initiation of the temperature rise and the operation of the detector shall be recorded.

A-3. TIME OF RESPONSE MEASUREMENT

A-3.1 The detectors, the response times of which are to be measured as mentioned in Tables 1 and 2, shall be connected to the indicating equipment and shall be tested in an air stream having a constant mass flow equivalent to a velocity of 0·8 ± 0·1 m/s at 28°C and having uniform rates of rise of air temperature 1, 3, 5, 10, 20 and 30°C/min (as applicable). The scheme of tests for various detectors is given in Tables 1 and 2. The time interval between the initiation of temperature rise and the operation of detector shall be recorded to an accuracy of 0·5 s and shall be designated as the time of response.

A-4. FIXED TEMPERATURE OPERATION

A-4.1 Two detectors shall be tested as in **A-3** with a rate of rise of air temperature not exceeding 1°C/min until the air temperature reaches 50°C and thereafter with a rate of rise of air temperature not exceeding 0·2°C/min. One of the detectors shall be in less favourable and the other in most favourable orientation. The air temperature at the operation of the detectors shall be recorded.

APPENDIX B

(*Clause* 5.3 and *Tables* 1 *and* 2)

VIBRATION TEST

B-1. PROCEDURE

B-1.1 The detector (*see* Table 1 or 2, as applicable for numbering/rate of temperature rise), connected to its indicating equipment, shall be mounted in its correct operating position and response time (*see* Appendix A) shall be noted and then the detector shall be put on a vibration table. The test shall then be subjected to a vertical vibration of amplitude 0·1 mm for a period of 5 minutes at each of the following frequencies:

10, 15, 20, 25, 30, 35, 40, 45, and 50 c/s.

B-1.2 The operation of the detector or resonance of any component shall be noted. If resonance occurs, the detector shall be vibrated at the resonant frequency for a period of one hour. If no resonance occurs, the detector shall be vibrated at 50 c/s for one hour.

B-1.3 No fault or alarm warning shall be indicated and no mechanical defect (including the breakage/displacement of sensitivity seal, if provided) shall be visible during or after the tests as in **B-1.1** and **B-1.2**. The time of response of two detectors shall be determined after the test. The change in response, before and after the test shall not exceed 15 percent or 10 s, whichever is greater.

APPENDIX C

(*Clause* 5.4 and *Tables* 1 *and* 2)

CORROSION TEST

C-1. PROCEDURE

C-1.1 At least 15 cm of connection wires/cables prescribed by the manufacturer shall be connected to each detector or socket. When specific types of wires/cables are not prescribed for connection, a 1·38 mm diameter (or nearest equivalent) single copper wire, untinned, shall be used for connection leads in this test. The lowest point of the detector shall be between 25 and 50 mm above the liquid surface. A guard shall be provided to prevent drops of liquid from falling into the upper surface of the detector.

C-1.2 The detector (*see* Table 1 or 2 as applicable for numbering) shall be subjected to a corrosion atmosphere of sulphur dioxide saturated with water vapour and maintained at temperature of 45 ± 3°C. The apparatus shall consist of a 5 litre glass beaker fitted with a cover, an electric heater, and a thermostat which can be set at 45 ± 3°C and copper tubing for flow of cool water round the beaker.

The thermostat shall be placed 140 mm above the bottom of the beaker. A hole is to be provided in the lid for the insertion of the thermometer. The corrosion atmosphere shall be produced

by placing in beaker, a solution containing 20 g of sodium thiosulphate ($Na_2S_2O_3.5H_2O$) in 500 ml of water. The detector shall then be suspended in beaker and 10 ml of acid consisting of 156 ml of normal sulphuric acid (H_2SO_4) per litre of aqueous solution shall be added twice daily. During the test, the temperature near the detector shall be maintained at 45 ± 3°C by the heater and the thermostat and water flow in cooling coil shall be so regulated that the temperature at the outlet does not exceed 30°C. Where a test is intended to last for more than 8 days, the detector shall be removed after 8 days and the beaker emptied and cleared. A further 20 g of sodium thiosulphate in 500 ml of water shall be put in the beaker, the detector replaced and the corrosive atmosphere produced and maintained as before for a period of 8 days again.

C-1.2.1 The first pair of detectors shall be mounted in the beaker and exposed to corrosive atmosphere for a period of four days. Sixteen days' exposure shall be given to the third detector. After prescribed exposures, the detectors shall be removed and allowed to dry for seven days, in normal room environment without disturbing the connections and the response time of detectors shall be measured as in Appendix A.

C-1.3 Salt Droplet Test — This test shall be conducted on the fourth detector. The detector shall be suspended with its lower edge 5 to 7·5 cm above the surface of water in a large dish and the whole shall be enclosed by a box-like cover. Once daily for a total period of 16 days the detector shall be removed, sprayed over its whole surface by a spray of sea water of the following composition and replaced under this cover;

Sodium chloride, g/l	23
Sodium sulphate, g/l	8·9
Magnesium chloride, g/l	9·8
Calcium chloride, g/l	1·2

The temperature throughout the test shall be maintained at 27 ± 2°C. After 16 days, the detector shall be removed and allowed to dry. It shall then be connected to its normal indicating equipment using the corroded lead and the response time shall be measured as in Appendix A.

APPENDIX D

(*Clause* 5.5)

SHOCK TEST

D-1. PROCEDURE

D-1.1 The response time of the detector (*see* Table 1 or 2, as applicable for numbering/rate of temperature rise for test) shall be determined. A detector incorporating electrical contacts shall be mounted on a piece of 10 × 5 cm hardwood resting on edge on solid supports spaced 1 m apart. The test shall be made with the detector in the following two positions:

a) At the midpoint on the horizontal underside, and

b) At the midpoint on the vertical side.

D-1.2 A metal block of 3·5 kg mass shall be dropped on to the midpoint of the 10 × 5 cm timber from a height of 30 cm above the top horizontal surface of the timber. The detector shall be connected in circuit corresponding to its normal operation during the test and shall not operate as a result of shock.

D-1.3 After the test, the time of response of the detectors shall be determined (*see* Appendix A).

APPENDIX E

(*Clause* 5.8)

SUPPLY VOLTAGE VARIATION TEST

E-1. PROCEDURE

E-1.1 When upper and lower limits of supply voltage are prescribed, detector(s) shall be tested at both the limits. At upper limit, two tests shall be carried out and similarly two tests shall be conducted at the lower limit. When one nominal value of supply voltage is prescribed, two tests shall be carried out with voltage to control and indicating equipment reduced as 85 percent of nominal value (to be treated to lower limit) and further two tests with voltage increased to 110 percent of the nominal value and the response time measured (*see* Appendix A). In each pair of tests, one test shall consist of the measurement of response time with a rate of rise of 3°C/min and the other with a rate of rise of 20°C/min. The response times shall be recorded. For resettable detectors, the same detector shall be used for all the tests of **E-1.1**. For non-resettable detectors, a separate detector or detector element shall be used for each of the tests of **E-1.1**.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

Review of Indian Standards

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 Handbook' and 'Standards Monthly Additions'.

This Indian Standard has been developed from Doc: No.

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 323 01 31, 323 33 75, 323 94 02

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:		Telephone
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	323 76 17, 323 38 41
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi CALCUTTA 700054	337 84 99, 337 85 61 337 86 26, 337 91 20
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43 60 20 25
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	235 02 16, 235 04 42 235 15 19, 235 23 15
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	832 92 95, 832 78 58 832 78 91, 832 78 92
Branches	: AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM.	

Printed at : Prabhat Offset Press, New Delhi-2