BRITISH STANDARD

BS 7273 :
Part 2 : 1992

Code of practice for

The operation of fire protection measures

Part 2. Mechanical actuation of gaseous total flooding and local application extinguishing systems

STANDARDS

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Fire Standards Policy Committee (FSM/-) to Technical Committee FSM/12, upon which the following bodies were represented:

British Cable Makers' Confederation
British Fire Protection Systems Association Ltd.
British Fire Services' Association
British Telecommunications plc
Chartered Institution of Building Services Engineers
Chief and Assistant Chief Fire Officers' Association
Department of Health
Department of the Environment (Building Research Establishment)
Department of the Environment (Central (DCSS Fire Branch))
Department of Transport (Marine Directorate)
Electrical Contractors' Association
Electrical Installation Equipment Manufacturers' Association (BEAMA Ltd.)
Home Office
Institution of Electrical Engineers
Institution of Fire Engineers
London Fire and Civil Defence Authority
Loss Prevention Council
Ministry of Defence
National Association of Fire Officers
National Caravan Council Limited
National Inspection Council for Electrical Installation Contracting
National Inspection Council (Quality Assurance Ltd.)
Society of Fire Protection Engineers
Trades Union Congress

The following body was also represented in the drafting of the standard, through subcommittees and panels:

British Computer Society

This British Standard, having been prepared under the direction of the Fire Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 1 May 1992

The following BSI references relate to the work on this standard:
Committee reference FSM/12
Draft for comment 90/44410 DC

ISBN 0 580 20657 2

Amendments issued since publication

Amd. No.	Date	Text affected

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Foreword

This British Standard code of practice has been prepared under the direction of the Fire Standards Policy Committee. It should be read in conjunction with British Standards concerned with fire extinguishing systems (see BS 5306) and should also be used in conjunction with other Parts of this standard.

Mechanical actuations are widely used in specific applications, e.g. process hazards, due to their inherent simplicity and reliability. Their use can be advantageous where electrically activated systems are considered less desirable. Such systems can be used in conjunction with, or supplement, other types of detection systems.

Since mechanical systems do not necessarily have an electrical power source available, electrical monitoring is not always possible. In certain applications the absence of electrical monitoring of the system may make such a mechanical system unacceptable.

Attention is drawn to appendix A which gives a simple diagrammatic representation of a typical sequence of actions leading to the release of fire extinguishing medium.

Compliance with a British Standard does not of itself confer immunity from legal obligations. .

Code of practice

1 Scope

This Part of BS 7273 gives recommendations for the planning, installation and servicing of mechanical equipment for the actuation of gaseous fire extinguishing systems. It applies only to mechanically actuated total flooding and local application gaseous fire extinguishing systems.

NOTE 1. Mechanical detection devices are not suitable where the fire is likely to be of a smouldering or primarily smoke producing type.

NOTE 2. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard, the definitions given in BS 5306, BS 5839 and BS 7273 : Part 1 apply, together with the following.

thermal links

Point type, fixed temperature detectors.

NOTE. Examples of these are frangible bulbs or soldered metal links.

3 System design

3.1 General

The system design should comply with the appropriate requirements and recommendations of BS 5306 : Parts 4 and 5, Health and Safety Executive publication GS16, and be in accordance with the manufacturer's recommendations.

System actuation should initiate the required indications and controls as given in BS 5306.

3.2 System specification

The requirements for the protected space(s) should be ascertained by consultation between the client and, as appropriate, the architect, the consultant, the fire detection and alarm system contractor, the fire extinguishing contractor(s), the fire authority, the fire insurer, the Health and Safety Executive, and any public authority concerned.

It is essential that in the event of fire a pre-planned and practised course of action should be taken to ensure the safety of occupants and the effective operation of the extinguishing system. Such necessary actions should be discussed at the design stage and incorporated within the proposed system.

3.3 Types of system actuators

Mechanical actuators used for initiating the automatic release of fire extinguishing systems should be one of the following types:

(a) thermal links (see clause **4**);

(b) pneumatic heat actuated devices (see clause **5**);

(c) manual release devices (see clause **6**).

NOTE. Rate of rise systems should incorporate fixed temperature elements.

4 Thermal link systems

4.1 General

4.1.1 Thermal links are designed to operate when the temperature of the assembly reaches a pre-determined temperature, which is related to their nominal operating temperature and their response characteristics. The heat sensitive element may be a frangible bulb or a soldered metal link.

The raising of the temperature around a thermal link to a point where it reaches or exceeds the link setting will cause the control line to part initiating the release of the extinguishing medium.

Thermal links, with different colour codes, are available for operation at the temperatures given in table 1.

4.1.2 Thermal links will not operate until a suitable temperature build-up has occurred, and may not function as quickly as other detection means such as smoke detectors. This relatively slow response can aid reliability since the links are insensitive to transient conditions.

This system has the following features which can be useful in some site conditions:

(a) simple to operate and maintain;

(b) reliable, i.e. not normally susceptible to false actuations;

(c) suitable in some adverse environments, e.g. high working temperature environments, electromagnetic interference, etc.

The following undesirable features have also been recognized:

(1) generally slow response in comparison with other types of system;

(2) generally unsuitable for very large areas;

(3) not self-resetting after operation;

(4) not automatically supervised.

4.2 Design

4.2.1 The links should be connected in series by a multi-stranded flexible metal cable run in a protective metal conduit with enclosed pulley wheels at all major changes of direction.

One end of the control line, thus formed, is securely anchored and the other end supports an operating weight or spring which keeps the line in tension.

4.2.2 The system should be designed so that cable stretch variations do not hinder the correct operation of the system.

4.2.3 The following factors should be considered when selecting the cable and load rating of the thermal links used in the system:

(a) the operating load required at the point of release to overcome the friction in the system and to provide the necessary force to operate the tripping mechanism;

(b) the number of pulley wheels or cable guides in the system;

(c) environmental conditions, e.g. corrosion.

4.2.4 Thermal links which have an operating temperature at least 30 °C above the maximum expected working temperature should be selected.

4.2.5 The area protected by a thermal link should not exceed 12 m^2. The maximum distance between thermal links should not exceed 3.5 m and the maximum distance between a thermal link and a wall or a ceiling beam should not exceed 2 m.

NOTE. Location and spacing of detectors may be in accordance with the manufacturer's recommendations, which should be based upon test data or field operating experience.

4.2.6 Thermal links should be located in the heat path at a maximum height of 4 m above the risk, and not less than 25 mm and not more than 150 mm below the ceiling. Account should also be taken of obstructions such as beams which may affect the response of the thermal link.

Table 1. Temperature ratings and colour coding of frangible bulb and soldered metal thermal link systems

(a) Soldered type

Temperature rating	Identification colour
°C	
68/74	Natural (uncoloured)
93/100	White
141	Blue
182	Yellow
227	Red

(b) Bulb type

Temperature rating	Colour of bulb liquid
°C	
57	Orange
68	Red
79	Yellow
93	Green
141	Blue
182	Mauve
204/260	Black

NOTE 1. These colours are those currently recommended in BS 5306 : Part 2.

NOTE 2. The ratings/colours in this table may be changed to coincide with future developments.

4.3 Installation

Location should take into consideration such factors as the nature of the hazard being protected, air velocity, temperature variations, shielding, open or closed structures and other variable conditions.

Warning note. Should open conditions exist without the benefit of a suitable ceiling above the risk to trap the heat rise, it is essential that the thermal link is fitted with a heat collecting plate located in the most heat sensitive position.

5 Pneumatic systems

5.1 General

Pneumatic systems incorporate pneumatic heat actuated devices using air (or inert gas) as the signal medium. These may be rate of temperature rise actuated with a fixed temperature element or a fixed temperature element type only.

In conditions where it is known that excessive changes of temperature can occur, such as in the vicinity of ovens, etc., fixed temperature only devices should be used with operating temperatures appropriate to the anticipated temperature fluctuations, e.g. 30 °C above the maximum expected working temperatures.

Frangible bulbs (see clause 4) can be used to retain pneumatic pressure within a detection and control circuit. This pressure can directly open a normally shut extinguishing medium flow control valve, or indirectly open an electrically controlled flow valve via a pressure operated electrical switch. Heat bursting the frangible bulb causes the pneumatic pressure to be lost, and this loss actuates the control valve to initiate extinguishing medium flow.

Alternatively, pressurized, heat sensitive, thermoplastics tubing may be used. This will rupture at a fixed temperature when a specified pressure has been reached within the tubing. The tubing should be resistant to ultraviolet light.

Pneumatic heat sensitive systems have the following advantages:

(a) no external moving components so they are particularly suited to dirty and rugged environments;

(b) do not necessarily require an external source of energy;

(c) suitable in potentially explosive areas.

The following disadvantages have also been recognized:

(1)they are not automatically supervised;

(2) if the tubing used is made of thermoplastics material, it will need replacement after operation and as recommended by the manufacturer.

5.2 Design

5.2.1 Devices should be connected together by tubing to form a sealed system. Where these systems could generate unwanted signals, for example, by variations in ambient temperature, they should incorporate a facility to compensate for such pressure fluctuations in the system.

5.2.2 The tubing is usually connected to a release mechanism which incorporates a pressure diaphragm. The pressure rise caused by fire should be sufficient to overcome the compensating facility of the release mechanism.

5.2.3 The operating temperature of the fixed pneumatic devices should be easily identifiable, e.g. by colour coding.

5.2.4 Heat actuated devices should be selected which have an operating temperature of at least 30 °C above the maximum expected working temperature.

5.2.5 The area of coverage by the pneumatic heat actuated devices should be in accordance with the manufacturer's recommendations.

5.3 Installation

5.3.1 Location should take into consideration such factors as the nature of the hazard being protected, air velocity, temperature variations, shielding, open or closed structures, and other variable conditions.

5.3.2 Total flooding systems devices should be sited in accordance with the recommendations for point-type heat detectors of grade 3 for rapid attendance given in clause **12** of BS 5839 : Part 1 : 1988.

5.3.3 For local application systems it is necessary to locate the detector as close as possible to the expected location of the fire source. Under these conditions it is often necessary to locate the detector in open conditions without the benefit of a ceiling above it to trap the heat rise. To assist detection in these conditions the detector should be fitted with a heat collecting plate located directly above it in accordance with the manufacturer's recommendations.

6 Manual release devices

The operation of a manual release device should initiate the discharge procedure without delay and should require two separate actions in order to prevent accidental operation.

The manual release housing should be predominantly yellow in colour and marked with operating instructions. Housings that require the breaking of a glazed cover in order to reach the operating device should be avoided because of the potential hazard to the operator.

Manual release devices should be sited for easy access and the safety of personnel whilst avoiding the possibility of malicious operation, and should be visually differentiated from manual call points provided for operation of the fire alarm system.

NOTE. A time delay between operation of the manual release device and the discharge of extinguishing medium may be incorporated.

7 Auxiliary functions and ancillary controls

The associated release, safety and alarm functions should comply with the relevant sections shown in the applicable Parts of BS 5306. The Health and Safety Guidance Note GS16 should also be consulted.

8 Inspection, initial testing, commissioning and certification of systems

8.1 Record drawings and operating instructions

On completion of the installation, adequate instructions on its use, routine attention and test procedures should be supplied to the person responsible for the use of the premises. The installer should draw the attention of the user to those clauses of this Part of BS 7273 that may reflect on the use of the system.

The installer should supply the user with a log book and a certificate of installation and commissioning.

Drawings should be supplied to the user showing, for maintenance and record purposes, the position of the various items of equipment, junction boxes, etc. and the sizes and routes of all pipes, cables and wires. Particular attention should be paid to the locations of items needing regular attention or replacement. Wiring diagrams of junction boxes and distribution cases should be included. The records should be permanent and suitable for convenient reference. They should be prepared in accordance with BS 1635 and should be updated to include any modifications or additions made to the system.

If the purchasing specification so requires, diagrams of the system and its components should be supplied in sufficient detail for the operation of the system to be understood by the technical staff of the user.

8.2 Inspection of installation

The complete installation should be inspected to ensure that the work has been carried out in a satisfactory manner, that the methods, materials and components used comply with this Part of BS 7273, and that the record drawings and operating instructions called for in **8.1** have been supplied.

8.3 Insulation of electric cables and wires

Insulation testing of installed electric cables and wires should be made at 500 V d.c. The insulation resistance to earth and between conductors of the installed cables and wires should be in accordance with the IEE Wiring Regulations. Tests that might damage items of equipment, especially apparatus incorporating electronic circuits, should be carried out with the cables disconnected from the equipment. If access to the equipment would be difficult after final inspection, then the separate parts of the circuits may be tested during installation, but the complete circuit should then be tested at a voltage recommended by the manufacturer.

8.4 Earthing

Earth continuity and, where appropriate, earth-loop impedance should be tested to ensure compliance with the IEE Wiring Regulations.

8.5 Commissioning and handover

8.5.1 The system should be checked and tested to ensure that it operates satisfactorily and that it complies with this Part of BS 7273 and with the relevant Parts of BS 5306.

8.5.2 The checks and tests should be such as to demonstrate at least the following:

(a) that the installed system conforms to the relevant drawings and documents as supplied in accordance with **8.1**;

(b) that all components of the system have been installed in the correct manner and all fittings have been correctly tightened;

(c) that any electrical connections are safe and operational;

(d) that all associated safety devices operate correctly;

(e) in thermal link systems, that control cable lines run free and that operating control weights and/or springs are sufficient to operate their associated control mechanisms;

(f) in pneumatic rate of rise systems, that correct breathing rates are achieved, that any capillary lines are free from blockage, and that when heat is applied to detectors they will operate correctly and will satisfactorily operate control mechanisms;

(g) that mechanical manual release devices function correctly;

(h) that alarm sounders and visual indicators operate correctly.

8.5.3 Where the tests are to be witnessed by the purchaser or by a third party, a list of the tests to be carried out should be provided by the designer, installer or supervising supplier.

8.6 Certification

On satisfactory completion of the checks and tests a certificate should be supplied by the installer, certifying that the installation complies with the recommendations of this Part of BS 7273.

8.7 Handover

When commissioning and certification are complete, the system should be formally handed over to the user.

9 Supervision

The owner or other person having control of the premises should appoint a responsible person to supervise the system. This person should be given sufficient authority to ensure the carrying out of any necessary work to maintain the system in correct operation, to maintain the system records and to service the system in accordance with clause **10**.

10 Servicing

10.1 General

To give greater assurance of reliability, correct servicing is essential. Normally an agreement should be made with a manufacturer, supplier or other competent contractor for regular servicing. The agreement should specify the method of liaison to provide access to the premises. The name and telephone number of the servicing organization should be prominently displayed at or near the system controls.

10.2 Routine attention

10.2.1 ***General***

The responsible person should ensure that the routine attention and test procedures given in **8.1** are properly followed.

A general guide to the routine that should be adopted to ensure the continuing good operation of the system is given in **10.2.2** (a) to (g). The routine to be adopted in individual premises may vary with the use of the premises; equipment installed in corrosive or dirty conditions will need to be checked more thoroughly and at more frequent intervals than that in clean and dry situations.

The responsible person should ensure that all equipment is properly reinstated after testing.

10.2.2 *Weekly attention by the user*

Visual checks should be made every week to ensure that:

(a) the readings of all pressure gauges are within specified limits;

(b) all operating controls are properly set and are accessible;

(c) all indicators are functioning;

(d) any pipework is in the designed position and is undamaged;

(e) any nozzles are in the design position, are undamaged and unobstructed;

(f) control lines are free from entanglements;

(g) control weights and/or springs are unobstructed.

Checks with a manometer should be made each week to ensure that pressurized lines and controls are unblocked and are pressurized to the correct level.

NOTE. The person carrying out the checks given above should be adequately trained to be competent to complete the examination.

10.2.3 *Six-monthly examination*

The system should be inspected at not more than six month intervals by a competent engineer, in accordance with a pre-planned inspection schedule. This schedule should include all elements and aspects of the system necessary for its effective operation, e.g. drop flaps, curtains, pneumatic heat actuated devices. Any checks and tests specified by the installer, supplier or manufacturer should be carried out.

On completion of the inspection an inspection report should be made.

NOTE. The six-monthly examination will usually be carried out by an accredited servicing organization under an inspection and servicing contract.

10.3 Non-routine attention

Occasions on which attention may be required beyond that of routine servicing include the following:

(a) extensions or alterations to the premises;

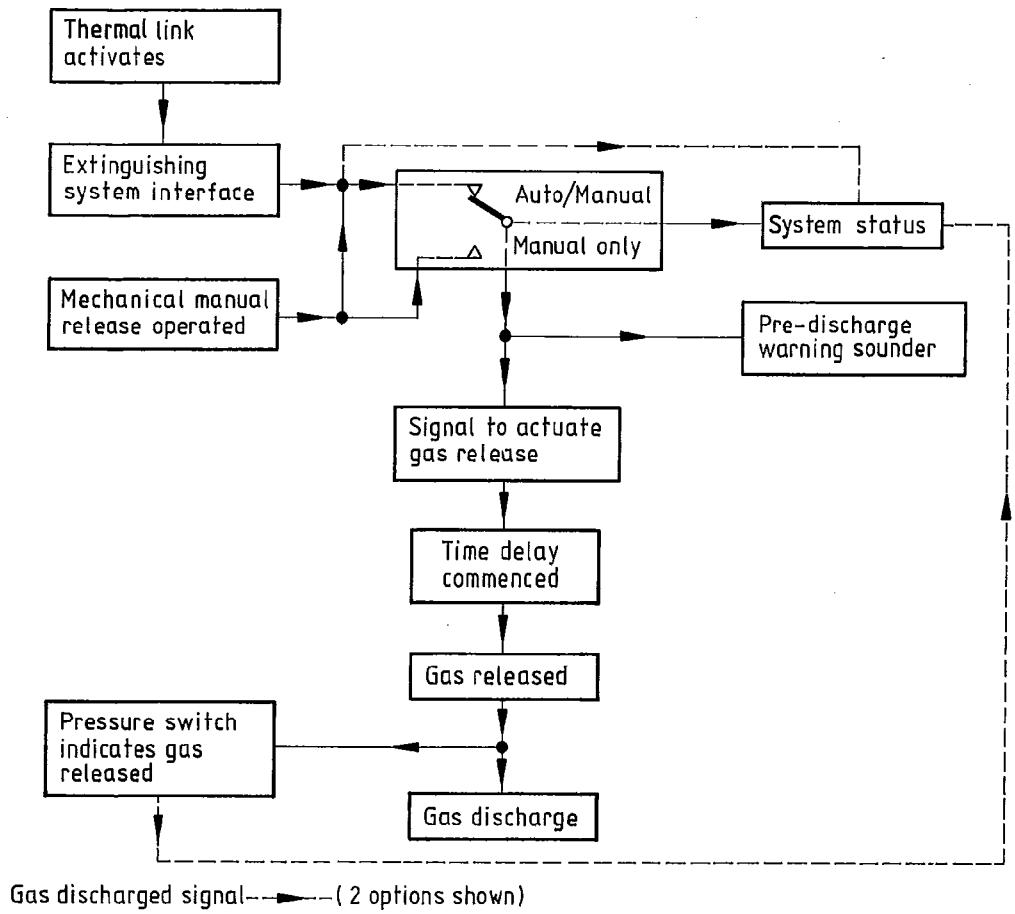
(b) changes in occupancy or activities in the area covered by the system;

(c) damage to the installation, even though no fault may be immediately apparent.

Changes such as those of (a) or (b) above should be notified to the appropriate interested parties of **3.2.**

Appendix

Appendix A. Example of a simple diagrammatic representation of a typical sequence of actions leading to the release of fire extinguishing medium



Publication(s) referred to

BS 1635	Recommendations for graphic symbols and abbreviations for fire protection drawings
BS 4547	Classification of fires
BS 5306	Fire extinguishing installations and equipment on premises Part 2 Specification for sprinkler systems Part 4 Specification for carbon dioxide systems Part 5 Halon systems Section 5.1 Halon 1301 total flooding systems Section 5.2 Halon 1211 total flooding systems
BS 5839	Fire detection and alarm systems for buildings Part 1 Code of practice for system design, installation and servicing
BS 7273	Code of practice for the operation of fire protection measures Part 1 Electrical actuation of gaseous total flooding extinguishing systems

[1] Guidance Note GS16, Gaseous fire extinguishing systems: precautions for toxic and asphyxiating hazards

[2] IEE Wiring Regulations, Regulation for electrical installations.

[1] Available from the Health and Safety Executive through any of its offices.

[2] Obtainable from the Institute of Electrical Engineers, P O Box 8, Hitchin, Hertfordshire, SG5 1RS.

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Milton Keynes
MK14 6LE