

**British Automatic Sprinkler Association
Zurich Muncipal
Royal & SunAlliance
National Fire Sprinkler Network**

Joint Code of Practice
for the Installation of Automatic Sprinkler Systems in Schools

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A. Introduction

This Code of Practice has been drawn up by the British Automatic Sprinkler Association, Zurich Municipal Insurance and Royal & SunAlliance in association with the National Fire Sprinkler Network in the wider public interest. It is intended to ensure that where sprinkler systems are designed and installed in schools and related occupancies these systems will provide an optimum level of protection should a fire occur. The Code of Practice specifically takes into account the higher risks of and from deliberate fires in such premises.

Definitions included in the Code in relation to the supply of water have been amended to conform to the terminology now in use by the water industry.

B. Definitions Used in the Document

alarm test valve valve through which water may be drawn to test the operation of the water motor fire alarm and/or of any associated electric fire alarm

alarm valve non-return valve, of the wet, dry or composite type that also initiates the water motor fire alarm when the sprinkler installation operates

AMAO assumed maximum area of operation; the maximum area, over which it is assumed, for design purposes, that sprinklers will operate in a fire

authority/authorities having jurisdiction organisations responsible for approving sprinkler systems, equipment and procedures, e.g. the fire authorities, building control departments, the fire insurers, the water supplier or other appropriate public authorities

automatic transmission of an alarm the remote alarm signalling of the operation of the sprinkler system by use of the installation control valve pressure switch linked to a listed central alarm receiving station or other central alarm receiving station approved by the Insurers. The signalling to be by RedCARE or other approved method which is acceptable to the insurers

booster pump automatic pump supplying water to a sprinkler system from a gravity cistern or service main

cistern water storage vessel (formerly: tank) with a water surface exposed to atmospheric pressure

client the school, local education authority, organisation, company or other person(s) upon whose instructions the sprinkler system is being installed, including contract administrator, individual, company or department responsible for letting the sprinkler contract and ensuring that its requirements are complied with.

control valve set assembly comprising an alarm valve, a stop valve and all the associated valves and accessories for the control of one sprinkler installation

design density the minimum density of discharge, in millimetres per minute of water, for which a sprinkler installation is designed, determined from the discharge of a specified group of sprinklers, in litres per minute, divided by the area covered, in square metres

distribution pipe pipe feeding either a range pipe directly or a single sprinkler on a non-terminal range pipe more than 300 mm long

distribution pipe spur distribution pipe from a main distribution pipe, to a terminal branched pipe array

drop vertical distribution pipe feeding a distribution or range pipe below

fire (resistant) compartment enclosed volume capable of maintaining its fire integrity for a minimum specified time

fully calculated term applied to an installation in which all the pipework is sized by hydraulic calculation

hanger assembly for suspending pipework from elements of building structure

hazard classification as defined in the LPC Sprinkler Rules

inexhaustible sources natural and artificial water sources such as rivers, canals and lakes which are virtually inexhaustible for reasons of capacity and climate etc.

installation (sprinkler installation) part of sprinkler system comprising a control valve set, the associated downstream pipes and sprinklers

installation, wet (pipe) installation in which the pipework is always charged with water

jockey pump small pump used to replenish minor water loss, to avoid starting an automatic suction or booster pump unnecessarily (sometimes known as a jacking pump)

life safety term applied to sprinkler systems forming an integral part of measures required for the protection of life

listed means equipment, components or services included in a list published by a recognised certification or testing service. Such bodies include (but are not restricted to) the LPCB and Underwriters' Laboratories.

looped configuration pipe array in which there is more than one distribution pipe route along which water may flow to a range pipe

LPC Loss Prevention Council (now part of BRE Risk Sciences Ltd)

LPC Sprinkler Rules the document which comprises British Standard 5306: Part 2 (1990) and the LPC's series of Technical Bulletins

LPCB Loss Prevention Certification Board (now part of BRE Certification Ltd)

maximum flow demand (Q_{max}) the flow at the point of intersection of the pressure-flow demand characteristic of the most favourable area of operation and the water supply pressure-flow characteristic with the suction source at its lowest level

MJC multiple jet control

multi-storey building building comprising two or more storeys, above or below ground

NSI National Security Inspectorate

pre-calculated term applied to an installation in which the pipes downstream of the design point(s) have been previously sized by hydraulic calculation. Tables of diameters are given

range pipe pipe feeding sprinklers either directly or via arm pipes

riser vertical distribution pipe feeding a distribution or range pipe above

service mains connection (formerly towns mains) a water supply taken directly from public water distribution system (the 'service pipe' or water main) either to feed directly into a sprinkler system or to fill a sprinkler system cistern

sprinkler, ceiling or flush pendant sprinkler for fitting partly above, but with the temperature sensitive element below, the lower plane of the ceiling

sprinkler, concealed recessed sprinkler with a cover plate that disengages when heat is applied

sprinkler, fusible link sprinkler which opens when a component provided for the purpose melts

sprinkler, recessed a sprinkler with all or part of the heat sensing element is above the lower plane of the ceiling

sprinkler rosette plate covering the gap between the shank or body of a sprinkler projecting through a suspended ceiling, and the ceiling

sprinkler/sprinkler head a device which, when fitted to a water distribution network, will operate at a pre-determine temperature spraying water directly on to a fire

sprinkler, sidewall pattern sprinkler that gives an outward half-paraboloid pattern discharge

sprinkler system the entire means of providing sprinkler protection in the premises comprising one or more sprinkler installations, the pipework to the installations and the water supply/supplies

suitable for sprinkler use term applied to equipment or components accepted by the authorities as suitable for a particular application in a sprinkler system, either by conforming to EN product standards where available or if not by compliance with specified criteria

supply pipe pipe connecting a water supply to the service main or the installation control valve set(s); or a pipe supplying water to a private reservoir or storage cistern

suspended open cell ceiling ceiling of regular open cell construction through which water from sprinklers can be discharged freely – See drawing 1

towns main connection see service mains connection

water main pipe belonging to the water undertaker (water company) installed for the purpose of providing a general supply of water

zone sub-division of an installation with a specific flow alarm and fitted with a monitored subsidiary stop

C. Design Standard

All systems installed in compliance with this Code of Practice shall comply with British Standard 5306: Part 2 and the series of Technical Bulletins published by the Loss Prevention Council (hereinafter the LPC Sprinkler Rules) and its successor bodies so long as these documents are current and valid. From a date to be agreed, systems will comply with prEN12845 and any new Technical Bulletins which may be published.

D. Equipment Standards

All components used in systems installed in accordance with this Code of Practice must also be LPCB-listed and where necessary, covered by an Attestation of Fitness under the Construction Products Directive. From a date or dates to be specified all components shall comply with the appropriate part of EN 12259:1999 (Fixed fire fighting systems - Components for sprinkler and water spray systems).

E. Installation

The company undertaking the installation must be listed by the LPCB in the appropriate category of its list of Certificated and Registered installers. A full list of the LPCB inspected companies can be found in: the LPCB/BRE Certifications annual publication: List of Approved Fire and Security Products and Services; the Sprinkler Rules and on the web at <http://www.brecertification.co.uk>.

F. Design Criteria

1. Systems shall be designed having regard to a properly undertaken fire risk assessment which shall be used to inform all decisions regarding the hazard classification for the risk. While for many schools, the requirements of Ordinary Hazard Group I may be adequate, higher levels may be specified by the insurers or the authority having jurisdiction. No systems in premises covered by this standard shall be installed to Light Hazard.

2. All systems can either be to tables or be fully hydraulically calculated. Evidence of the calculations shall be submitted on request to the authorities having jurisdiction and/or the insurer.

3. The following specific system requirements should be noted and must be complied with:

(i) Sprinkler head's operating temperature shall be 68°C unless otherwise agreed by the relevant insurance company or the authority having jurisdiction.

(ii) Listed concealed type sprinkler heads using a 15mm orifice may be utilised.

(iii) All parts of the school must be protected in accordance with 2.4.1 of BS5306: Part 2 and TB5 (2002) and TB 11 (1990) of the LPC Technical Bulletins. (See Part G below.) (With the specific consent of the insurer small outbuildings may be excluded where there is appropriate space separation from protected premises.)

(iv) The installation control valves must be located in a secure area to minimise the risk of tampering and a stop valve indicator switch should monitor whether the main valve is open or closed. The valves must be readily accessible to the fire service from an external door which is provided with an appropriate level of physical security.

(v) Provision should be made for the remote alarm signalling of the operation of the sprinkler system by use of the installation control valve pressure/flow switch or unauthorised closing of the main stop valve monitoring device.

4. Specification for sprinkler heads

(i) Where sprinkler heads could be subject to malicious or accidental damage, the heads are to be listed and of the concealed type where only the cover plate is visible on the underside of the ceiling, with the sprinkler head outlet immediately above. Where applicable, the cover plate shall be arranged to drop down at the pre-determined temperature. If the client wishes to specify coloured cover plates to match ceiling colours only the listed sprinkler head manufacturer may provide such plates. Under no circumstances is any other painted plate to be used.

(ii) In areas where the sprinkler heads are at high level or where only maintenance staff are granted access (utility rooms, boiler rooms, lofts etc.) sprinklers shall be listed and either conventional, pendant or upright.

(iii) Where sprinkler heads are exposed to mechanical damage (e.g. gyms, halls where ball games are permitted, low ceilinged utility spaces, cistern rooms etc) the sprinklers shall be fitted with a wire guard.

- (iv) The operating temperature of the sprinkler heads shall be to suit the application and location. (But see also F.3(i).)
- (v) In electrical equipment rooms containing high voltage equipment and/or transformers, the room is to be separated from the remainder of the building by a construction affording a fire resistance of not less than 60 minutes and an MJC system is to be installed
- (vi) The area to be covered by each sprinkler head (except as specified below) is to be no more than 12m². In areas where there are open cell gridded ceilings, such areas shall be protected by sprinkler heads located so as to cover a maximum of 9m² per head (see Drawing 1). Where possible, sprinkler heads installed in ceiling tiles shall be fitted in the centre of the tile. Sprinklers shall not be installed less than 800mm above open cell ceilings.
- (vii) Where operation of automatic smoke ventilators is based on the use of heat sensitive elements, then such devices will be specified to operate at a higher temperature than that of nearby sprinkler heads.
- (viii) The design of the sprinkler installation is to be co-ordinated with all fixtures and fittings such as. high level shelving, suspended light fittings etc., to ensure correct locations of sprinkler heads in accordance with the LPC Sprinkler Rules.

(5) Frost protection

- (i) Where it can be guaranteed that the premises will be maintained at or above an ambient temperature of 4°C or more then no special precautions need to be taken; however it is the responsibility of the sprinkler installers to confirm this with their client and the authority having jurisdiction and/or insurers.
- (ii) Trace heating and lagging may be required in certain areas where pipework will be exposed to frost. The sprinkler company should clarify this point with the Client. Where trace heating and lagging is required, these will need to conform to BS 6351:1983: Parts 1-3, BS 5422:1977 and BS 5970:1981 respectively. (Note: only non-combustible lagging will be permitted.)
- (iii) Where there is to be a pumphouse, the heating requirements within will be discussed with the client who will be responsible for installing any additional heating required.

G. Extent of Sprinkler Protection

1. The whole of the school buildings are to be provided with and protected by a wet sprinkler system to provide full coverage to all of the building/s including roof voids, plenums etc in accordance with the LPC Sprinkler Rules except as may be specified in this document.
2. The sprinkler installer should provide the client with information detailing the extent of the sprinkler system requirements/interactions in respect of :
 - (i) Ductwork where protection may be required.
 - (ii) Mezzanine floors.
 - (iii) Voids which may need protection.

- (iv) Roof-lights.
- (v) Suspended Ceilings and Lights.
- (vi) Ventilation systems

H. Water Supplies

1. Notwithstanding the water supply requirements as detailed in the LPC Sprinkler Rules the authority having jurisdiction and/or the insurer may, under certain circumstances, permit the installation of a reduced capacity storage cistern:

(i) Where the storage cistern **is not** dependent on infill to achieve the capacity requirements, the storage capacity is to be based on the Q_{max} of the system demand for 30 minutes. Where the AMAO of the protection is less than the nominal designed AMAO (i.e. the physical boundary of the largest area being protected) then the maximum number of sprinklers in this area is to be used for the calculations (subject to a minimum stored water supply of $25m^3$). Facilities for refilling the cistern must be provided to the satisfaction of the insurers.

- (ii) Where the storage cistern **is** dependent on infill :
- a. the inflow shall be from a service main connection and shall be automatic, via at least two mechanical float valves.
 - b. The inflow shall not adversely influence the pump suction;
 - c. The effective capacity of the cistern shall be no less than $10m^3$ for OH1, $20m^3$ for OH2 and $30m^3$ for OH3.
 - d. the cistern capacity plus the inflow shall be sufficient to supply the system at full capacity for a minimum of 30 minutes duration
 - e. it shall be possible to check the capacity of the inflow;
 - f. the inflow arrangement shall be accessible for inspection.

(iii) The use of such reduced capacity cisterns is in all cases wholly dependent upon (1) the sprinkler system activation monitoring device being connected to an NSI approved monitoring Central Alarm Receiving Station via RedCARE or other constantly monitored secure line signalling system approved by the insurers, and (2) that the fire brigade response time and predetermined attendance is appropriate to the level of risk taking into account the reduced water supply.

2. Pumped Systems

(i) Where an electrical pump is proposed, due account should be taken of all likely demands for power to ensure that the available power supply is adequate under all circumstances.

(ii) The electrical connection for power to the electric pump-set needs to be taken from the live side of the premises main breaker. Further, both the main breaker and any isolating switch are to be suitably labelled, as specified in the LPC Sprinkler Rules.

(iii) The use of butterfly valves on the suction branch to a pump is only permitted where this has been agreed by the relevant insurance company and/or the authority having jurisdiction.

(iv) Gauges to be used for carrying out full load tests on the pumps, must be located on the upstream side of the check valve. A compound gauge is to be fitted on the suction pipe.

(v) Loss Calculations (including static elevation changes) must be submitted up to and including the pump delivery flange.

(vi) Only rag bolts and other similar proprietary fixing systems may be used as holding down bolts for pump bed plates. The use of all 'threaded rod' systems or other similar non-proprietary substitutes is not acceptable.

(vii) Contents gauges fitted to pump suction cisterns must be capable of registering the actual contents level, for all levels above the pump suction pipe.

(viii) The pump suction cistern drain valve requires to be trace heated and lagged. In order to reduce the cost of the trace heating, the drain valve should be located as close as practicable to either the cistern infill pipe or the suction pipe.

I. Maintenance

All sprinkler systems installed under this Code of Practice will be subject a maintenance programme which complies with the requirements of Section 7 of BS 5306: Part 2. In addition, the following measures will also be complied with:

(i) In the event of the water pressure recorded during the required weekly check falling below the minimum acceptable pressure as laid down by the installer then the client will advise the Installer and the insurer forthwith.

(ii) Service and maintenance procedures carried out shall only be undertaken by a sprinkler installation company as specified in Section E above.

J. General Requirements

1. The specification used to tender for the supply of sprinkler systems should include the details of the proposed suppliers of major components, i.e. service main connections, pumps, cisterns, alarm valves, flow meters etc where applicable.

2. Full details of the location and type of flow measuring equipment is to be clearly shown. Any direct reading flow meters shall be fitted with upstream and downstream valves to allow for cleaning and maintenance.

3. Sprinkler contractors will submit a full set of design drawings and supporting hydraulic calculations for approval by the authority having jurisdiction and/or the insurers. In addition the following information must be included:

(i) Each drawing shall contain a key plan of the development marked to show the area covered by the drawing.

(ii) The issue reference number/letter must be clearly shown on each drawing.

- (iii) 'Match' lines to be identified and the continuation drawing number marked alongside each 'match' line.
- (iv) Hydraulic calculations to be submitted with relevant drawings. All pipework covered by the calculation must be detailed on the drawings. Non-receipt of calculations or drawings could delay approval of the design.
- (v) Any drawing or hydraulic calculation returned but not approved by the client, the authorities or insurer to be modified and re-submitted for approval.

4. Where it is necessary to install pipework in advance of drawing approval, the installation company should state this and provide a written undertaking to modify such work if required.

5. If a hose reel system is to be installed in the sprinkler-protected building then care should be taken to ensure that both the pumping and water supply requirements for the hose reel have been taken into account. If the supply for the hose reel system is to be taken from the sprinkler system water supply then the sprinkler water storage and pump capacities must be increased above the nominal duty required for the sprinkler system to reflect the anticipated demand from the hose reels. No hose reel system supplied from a sprinkler cistern and/or pump(s) shall be permitted to be used for any purpose other than fire fighting.

6. Unless otherwise specified or agreed with the fire authority all sprinkler systems in schools should be provided with a fire brigade breeching/pumping-in point to permit the brigade to supplement the system's water supply. The fire authority and water supplier should be consulted as to the location and type of equipment to be provided which shall be clearly labeled or signed as such on the exterior of the installation. (Some water companies may require additional back flow prevention devices in respect of sprinkler systems with direct service main connections connections.) The maximum pressure which can be delivered to the system should be clearly and permanently indicated directly above the breeching/pumping-in point.

7. Given that the majority of sprinkler systems in schools are specified as a measure to protect the premises against arson attack, consideration should be given to the need for protection of valve sets, pumps and other equipment. It may be considered appropriate to consult with the authority having jurisdiction on the advisability of omitting signs normally required under 30.1 and 30.2 of BS 5306: Part 2. See also F.3(iv) above.

K. Testing and Commissioning

1. Testing and commissioning shall be carried out in accordance with requirements of the Section 3.10 of BS 5306: Part 2 and TB16: 1992 of the LPC Sprinkler Rules
2. Not less than fourteen days notice of all site tests shall be given to the contract administrator in order that the insurer's representative may be present.

3. When the entire system has been completed, tested and commissioned, the contract administrator, insurer and client shall jointly carry out a full test prior to acceptance of the system.
4. After completion, an LPCB Certificate of Conformity shall be issued listing any deviations or non-compliances. Sufficient copies of all tests and completion certificates shall be provided to the contract administrator for distribution to the insurer, client and any other specified party. A copy of the certificate shall be included with the instruction manual and handed to the client.
5. Where a Certificate of Conformity cannot be issued, in respect of systems installed in accordance with this Code of Practice to insurers' requirements then a System Report will be issued in conjunction with copies of the relevant documentation including approvals provided by the authority having jurisdiction and insurers¹.

L. Refurbishments

1. This Code of Practice should be applied to systems being installed in existing schools as a retrofit.

Appendix A Suggested Contractual Procedures Prior to Installation of a Sprinkler System

It is suggested that many problems can be eliminated by the client following the procedures described below:

1. Consult your insurers/brokers and other interested parties (e.g. fire authority, water undertaking, building control department etc) Obtain your insurers' assistance in preparing a tender specification if necessary.
2. Issue tender documents only to LPCB-listed companies. BASA maintains a list of its members who are active in school sprinkler installation.
3. Check returned tenders against the specification in consultation with your insurance company.
4. Enter into a contract with the successful bidder.
5. Verify that all drawings and hydraulic calculations have been approved by your insurers before installation work commences.
6. Commence installation work.

7. Following installation, invite the insurers to carry out an inspection and witness the commissioning/acceptance tests. (Most insurers will also wish carry out intermediate visits during the installation.)

Note:

Drawing 1 not available in this draft