



BSI Standards Publication

DRAFT FOR DEVELOPMENT

Fixed fire protection systems – Industrial and commercial watermist systems –

Part 1: Code of practice for design and
installation

This publication is not to be regarded as a British Standard. See Foreword
for further information.

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Foreword

Publishing information

This part of DD 8489 is published by BSI and came into effect on 28 February 2011. It was prepared by Subcommittees FSH/18/2, *Sprinkler systems* and FSH/18/6, *Gaseous extinguishing media and systems*, under the authority of Technical Committee FSH/18, *Fixed fire fighting systems*. A list of organizations represented on these committees can be obtained on request to their secretary.

Relationship with other publications

DD 8489 is published in a series of parts:

- Part 1: *Code of practice for design and installation*;
- Part 4: *Tests and requirements for watermist systems for local applications involving flammable liquid fires*;
- Part 5: *Tests and requirements for watermist systems for the protection of combustion turbines and machinery spaces with volumes up to and including 80 m³*;
- Part 6: *Tests and requirements for watermist systems for the protection of industrial oil cookers*;
- Part 7: *Tests and requirements for watermist systems for the protection of low hazard occupancies*.

Information about this document

Third-party testing/certification. Users of this Draft for Development are advised to consider the desirability of third-party testing/certification of conformity with this Draft for Development. It is usual in European countries, for companies given the responsibility to design, install and maintain watermist systems in accordance with this current Draft for Development, to be certified in this field by an independent certification body. There are a number of independent certification bodies that can attest conformity to this Draft for Development.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because watermist is a new technology, and publication as a Draft for Development will enable the committee to gauge reactions and gather feedback before a full British Standard is produced. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

A review of this Draft for Development will be carried out not later than 2 years after its publication.

Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development, will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received, the responsible BSI Committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

Any observations should be sent to the Secretary of BSI Technical Committee FSH/18 at British Standards House, 389 Chiswick High Road, London W4 4AL, if it is felt that they require attention before the official call for comments.

Use of this document

As a Draft for Development, this document is of a provisional nature. It should not be quoted as if it were a British Standard and particular care should be taken to ensure that claims of compliance are not misleading.

As a code of practice, this Draft for Development takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this Draft for Development is expected to be able to justify any course of action that deviates from its recommendations.

This Draft for Development is intended for use by manufacturers, designers and installers of watermist systems, and for authorities having jurisdiction.

It has been assumed in the preparation of this Draft for Development that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions in this Draft for Development are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a Draft for Development cannot confer immunity from legal obligations.

Introduction

Fixed watermist systems for the fire protection of industrial and commercial hazards comprise specially designed nozzles mounted in pipework, secured within a commercial/industrial building, and connected via control valves to a dedicated water supply.

Both single fluid and twin fluid watermist systems deliver a mist of small droplets which control, suppress or extinguish fire by:

- absorbing heat from the fire and its surroundings;
- smothering the flames by evaporation to steam;
- blocking radiant heat transfer to adjacent combustible materials.

Fires such as those involving flammable liquids (class B fires) can be extinguished using watermist. Fires such as those involving ordinary combustible materials (class A fires) can be controlled and suppressed using watermist. Watermist can also prevent flash-over.

With the high surface area of the droplets produced, watermist is able to absorb relatively large amounts of heat and thus provide efficient cooling.

Currently, the majority of applications for watermist relate to property and asset protection. However, under certain circumstances, watermist can improve tenability within the protected space and thus increase the chances of survival for personnel inside the protected areas. It can also enhance life safety in more general applications by protecting facilities upon which the safety of people depends.

1 Scope

This part of DD 8489 gives recommendations for the design, installation, commissioning and maintenance of fixed watermist systems for the following industrial and commercial hazards:

- local applications involving flammable liquid fires, as detailed in DD 8489-4;
- combustion turbines and machinery spaces with volumes up to and including 80 m³, as detailed in DD 8489-5;
- industrial oil cookers, as detailed in DD 8489-6;
- low hazard occupancies, as detailed in DD 8489-7.

NOTE 1 Standardized tests and pass/fail criteria for these applications are given in DD 8489-4, DD 8489-5, DD 8489-6 and DD 8489-7 respectively. It is envisaged that further standardized tests will be added to the DD 8489 series when available, and that DD 8489-1 will be applicable to the applications covered by those tests.

The Draft for Development does not cover watermist systems on ships, in aircraft, on vehicles and mobile fire appliances or for below ground systems in the mining industry. It does not cover the use of watermist for explosion protection.

NOTE 2 DD 8458-1 covers residential and domestic premises with room sizes up to 8 m × 6 m and with building heights up to 20 m.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 5839-1, *Fire detection and fire alarm systems for buildings – Part 1: Code of practice for system design, installation, commissioning and maintenance*

BS 7273-3, *Code of practice for the operation of fire protection measures – Part 3: Electrical actuation of pre-action watermist and sprinkler systems*

BS 7273-5, *Code of practice for the operation of fire protection measures – Part 5: Electrical actuation of watermist systems*

BS 7671, *Requirements for electrical installations – IEE Wiring Regulations – Seventeenth edition*

DD 8489-4, *Fixed fire protection systems – Industrial and commercial watermist systems – Part 4: Tests and requirements for watermist systems for local applications involving flammable liquid fires*

DD 8489-5, *Fixed fire protection systems – Industrial and commercial watermist systems – Part 5: Tests and requirements for watermist systems for the protection of combustion turbines and machinery spaces with volumes up to and including 80 m³*

DD 8489-6, *Fixed fire protection systems – Industrial and commercial watermist systems – Part 6: Tests and requirements for watermist systems for the protection of industrial oil cookers*

DD 8489-7, *Fixed fire protection systems – Industrial and commercial watermist systems – Part 7: Tests and requirements for watermist systems for the protection of low hazard occupancies*

BS EN 1057, *Copper and copper alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications*

BS EN 1968, *Transportable gas cylinders – Periodic inspection and testing of seamless steel gas cylinders*

BS EN 12259 (all parts), *Fixed firefighting systems – Components for sprinkler and water spray systems*

BS EN 12845:2004, *Fixed firefighting systems – Automatic sprinkler systems – Design, installation and maintenance*

BS EN 13445-5, *Unfired pressure vessels – Part 5: Inspection and testing*

BS EN 15004-1:2008, *Fixed firefighting systems – Gas extinguishing systems – Part 1: Design, installation and maintenance*

BS EN 60079 (all parts), *Electrical apparatus for explosive gas atmospheres*

BS EN 60947-1:2004, *Specification for low-voltage switchgear and controlgear – Part 1: General rules*

BS EN 60947-4-1:2001, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*

BS EN ISO 14847, *Rotary positive displacement pumps – Technical requirements*

ISO 6182-11, *Fire protection – Automatic sprinkler systems – Part 11: Requirements and test methods for pipe hangers*

IEC 61241 (all parts), *Electrical apparatus for use in the presence of combustible dust*

3 Terms and definitions

For the purposes of this part of DD 8489, the following terms and definitions apply.

3.1 additive

chemical or mixture of chemicals or gases, intentionally introduced into a watermist system for one or more of the following purposes:

- enhancement of, or compliance with, fire protection requirements;
- corrosion protection;
- frost protection

3.2 authority having jurisdiction

organization, office, or individual responsible for approving equipment, installations, and/or procedures

3.3 automatic nozzle

watermist nozzle (see 3.25) held closed by an integral thermal release element

3.4 competent person

individual or organization that has the requisite training and experience, access to the requisite tools, equipment and information, and is capable of carrying out a defined task

3.5 design pressure

maximum pressure expected to be applied to a system component

3.6 discharge duration

sum of all the times that watermist discharges throughout one fire-fighting event

3.7 dry pipe system

watermist system in which the pipework is charged with air or inert gas under pressure

NOTE The water flows into the piping system and out through any activated nozzles.

3.8 enhanced availability watermist system

watermist system with additional measures required for enhanced availability of the system

NOTE For example, for life safety or insurance purposes.

3.9 fire suppression

reduction in the heat release rate and prevention of re-growth of a fire over the discharge duration

3.10 flash-over

simultaneous ignition of all combustible products in an enclosure

3.11 high voltage electrical equipment

equipment with circuits with more than 1 000 V for alternating current and at least 1 500 V for direct current

NOTE See BS 7671 for full definition.

3.12 local application system

watermist system designed to provide object protection where all nozzles operate simultaneously within a larger overall space

3.13 maintenance

combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function

3.14 manufacturer

organization responsible for manufacturing watermist equipment, including nozzles, and for producing the watermist system design manual and the fire test programmes to which it is linked

3.15 manufacturer's design and installation manual

document containing design and installation rules for all details of a watermist system

3.16 monitored watermist system

system where the operational status is electrically monitored

NOTE For example, valve position and liquid level.

3.17 pre-action systems**3.17.1 Type A pre-action system**

otherwise normal dry pipe system in which:

- the air/inert gas pressure in the installation is monitored at all times;
- the control valve set is activated by an automatic fire detection system but not by the operation of the automatic nozzles;
- at least one quick opening manually operated valve is installed in an appropriate position to enable the pre-action valve to be activated in an emergency

3.17.2 Type B pre-action system

otherwise normal dry pipe system in which:

- the control valve set is activated either by an automatic fire detection system or by the operation of the automatic nozzles;
- independently of the response of the detectors, a pressure drop in the pipework causes the opening of the system control valve

NOTE See also BS 7273-3.

3.18 responsible person

person(s) responsible for or having effective control over fire safety provisions adopted in or appropriate to the premises or the building

3.19 single fluid system

system that generates watermist by the passage of water, or water with additive, through a nozzle

3.20 supplier

company fully trained and authorized by a manufacturer for the design, installation, commissioning and maintenance of its fixed watermist systems

3.21 system duration

total of discharge times plus any interspersed non-discharge times

3.22 twin fluid system

system that generates watermist at a nozzle by mixing water with inert gas fed from a separate pipe(s) from the water supply

3.23 user's operation and maintenance manual

document provided by the watermist design and installation company to the user's responsible person which sets out the procedures to be followed to ensure the ongoing satisfactory operation of the watermist system(s), and the frequency of such procedures

3.24 volume protection system

watermist system designed to protect an enclosed volumetric space

3.25 watermist

water spray for which the $D_{v0,90}$ is less than 1 mm measured in a plane 1 m from the nozzle at its minimum operating pressure

NOTE $D_{v0,90}$ is the drop diameter such that the cumulative volume, from zero diameter to the respective diameter, is nine tenths of the corresponding sum of the total distribution.

3.26 watermist nozzle

component, with one or more orifices, which is designed to produce and discharge watermist

3.27 watermist system

distribution system connected to a water supply, with atomizing media where required, that is fitted with one or more nozzles capable of delivering watermist intended to control, suppress or extinguish fire

NOTE Watermist systems can discharge water or a mixture of water and some other agent or agents, i.e. inert gases or additives.

3.28 wet pipe system

watermist system using automatic nozzles in which the pipework is always charged with water

4 General recommendations

4.1 Consultation

Where a watermist system or an extension or alteration to a watermist system is being considered within new or existing buildings, the following parties should be consulted and, where necessary, their approval sought at an early stage:

- a) the water supply authority.

NOTE Attention is drawn to the requirement to gain consent under water regulations [1–3]¹⁾. Further guidance is given in the Water Regulations Guide [4].

- b) the building control body;
- c) the fire authority;
- d) the insurer(s) of the building and building contents.

¹⁾ The Water Supply (Water Fittings) Regulations 1999 [1], the Water Byelaws (Scotland) 2004 [2] and the Water Supply (Water Fittings) Regulations (Northern Ireland) 2009 [3].

4.2 Situations where contact with water might cause a hazard

Watermist systems should be designed and installed to ensure that contact between water and the following materials or substances is avoided.

a) **Materials which react with water**

Watermist systems should not be used for direct application to materials that react with water to produce violent reactions or significant amounts of hazardous products. These materials include:

- 1) reactive metals, such as lithium, sodium, potassium, magnesium, titanium, zirconium, uranium and plutonium;
- 2) metal alkoxides, such as sodium methoxide;
- 3) metal amides, such as sodium amide;
- 4) carbides, such as calcium carbide;
- 5) halides, such as benzoyl chloride and aluminium chloride;
- 6) hydrides, such as lithium aluminium hydride;
- 7) oxyhalides, such as phosphorus oxybromide;
- 8) silanes, such as trichloromethylsilane;
- 9) sulfides, such as phosphorus pentasulfide;
- 10) cyanates, such as methylisocyanate.

b) **Liquefied gases**

Watermist systems should not be used for direct application to liquefied gases at cryogenic temperatures (such as liquefied natural gas), which boil violently when heated by water.

c) **High-voltage live electrical equipment**

Watermist systems should not be installed in the presence of high-voltage live electrical equipment, except where a risk assessment and testing has been carried out and has determined that it is safe to do so.

NOTE It is preferable that high-voltage electrical equipment be de-energized prior to discharge of the watermist.

4.3 Local application

Local application systems should be designed and installed for the object being protected, together with its associated hazards, in accordance with the design parameters established through representative fire tests (see 6.1).

Where a risk assessment shows that the spread of fire could involve two or more objects of local application, the watermist system should be designed for the combined hazard.

4.4 Volume protection

Volume protection systems are either open nozzle systems, where all nozzles discharge throughout the entire enclosure, or automatic nozzles, where only the nozzles in the immediate vicinity of the fire are expected to operate.

Volume protection systems should be designed and installed for the hazards to be protected within the volume, in accordance with the design parameters established through representative fire tests (see 6.1).

Where the spread of fire is likely to involve two or more enclosed volumetric spaces, account should be taken of adjacent fire hazards, and the watermist system should be designed for the combined hazard.

NOTE The installation of an automatic door closing mechanism is expected to improve the effectiveness of the system by ensuring that any doors to the volume being protected are kept shut.

4.5 Oxygen depletion

Systems using an inert gas as a form of propellant for the watermist should conform to the safety requirements specified in BS EN 15004-1:2008, Clause 5.

4.6 Foam additives

The extinguishing properties of foam, including the ability to spread readily over pool fires, can contribute to the effectiveness of a watermist system. The use of water/foam mixtures can improve the effectiveness of the system and minimize re-ignition potential.

Foam may be used in applications where:

- there are obstructions between the watermist source and the fire (e.g. pool fires under open floors); and/or
- the system is required to extinguish rather than suppress the fire.

If a system is designed to be used with a foam additive, any testing should be carried out in combination with this additive.

NOTE 1 Foam extinguishing media are specified in BS EN 1568.

NOTE 2 See also 8.3.

5 Detection, actuation and control

5.1 Detection

The detection system is of paramount importance for correct and efficient system functioning. Only detection systems should be used which ensure response characteristics similar to the conditions under which the watermist system was tested (see 6.1).

Where electrical detection systems are used, they should conform to BS 5839-1.

Automatic nozzles have their own thermally activated actuation element.

5.2 Actuation and control

5.2.1 General

System actuation can be mechanical, hydraulic, pneumatic or electrical, initiated by smoke, flame or heat.

NOTE 1 Requirements for pneumatic heat actuated systems are specified in DD CEN/TS 14816.²⁾

²⁾ In preparation.

Alarms or indicators or both should be used to indicate the operation of the watermist system or failure of any supervised device. The type (audible/visual), number, and location of the devices should be in accordance with BS 5839-1. It should be possible for the fire and rescue service to be able to determine that the system has operated and, if the system is zoned, in which zone the fire has occurred.

NOTE 2 The nature and extent of audible and/or visual alarms will be determined by the particular application.

5.2.2 Electrical actuation

Electrical actuation should be in accordance with BS 7273-3 or BS 7273-5 as appropriate.

5.2.3 Non-electrical actuation

Where pneumatic, hydraulic or mechanic control equipment is used, the lines should be protected against crimping and other possible damage. Where installations could be exposed to adverse conditions that could affect the integrity of the installation (electrical cable, pipework, key parts, etc.), appropriate precautions should be taken to counteract such occurrence.

5.2.4 Manual actuation

If a watermist system is equipped with a manual triggering device, the device should actuate in accordance with BS 7273-3 and BS 7273-5. The device should be situated outside the protected space or adjacent to the main exit from the space.

6 Design and installation

COMMENTARY ON CLAUSE 6

Watermist is a relatively new technology, and systems are still under development. At present watermist systems can vary considerably between manufacturers, and each system works in a different way, but a limited number of standardized tests and pass/fail criteria for a complete system are provided in subsequent parts of DD 8489; further standardized tests will be added to the DD 8489 series when available.

Watermist systems are designed to either control, suppress or extinguish fire, and each system is designed for a specific set of fire scenarios. The watermist system design parameters are established by testing with the appropriate ventilation conditions and fire load. The tests are used to establish for each manufacturer's equipment the necessary type and number of nozzles and their flows, operating pressures and spacing.

There are many alternative or innovative fire suppression systems available. Where these are used it is necessary to ensure that such systems have been designed and tested for use in buildings and are fit for their intended purpose. Where a watermist system is specifically recommended within this Draft for Development, it needs to be provided throughout the building or separated part, and to be designed and installed in accordance with the recommendations of DD 8489-1.

6.1 General

Before designing a watermist system, the volume or object to be protected should be identified and a risk assessment carried out to establish the exact nature of the potential fire hazard(s) affecting that volume or object. If enhanced availability is required for volume protection systems (e.g. for life safety or insurance purposes, or where the evacuation of a building depends on the performance of the system), the recommendations in Annex A should be followed in addition to those in 6.1 to 6.5.

Tests should then be carried out, simulating the volume or object to be protected in conjunction with the identified hazard. If tests have already been carried out for this application, and verified as being reliable, then those tests should be used. For local applications involving flammable liquid fires, combustion turbines up to and including 80 m³, industrial oil cookers, and low hazard occupancies, tests should be carried out in accordance with DD 8489-4, DD 8489-5, DD 8489-6 and DD 8489-7 respectively.

System testing. *Users of this Draft for Development are advised to consider the desirability of using a test facility that operates a quality system and has watermist testing in the scope of its accreditation. General requirements for the competence of testing and calibration laboratories are described in ISO/IEC 17025. Of particular importance with respect to testing of watermist fire suppression systems are:*

- *comprehensive understanding of watermist technology;*
- *ability to properly condition and characterize the fuels;*
- *the use of appropriate instrumentation and methodology to verify the compliance or non-compliance with the pass/fail criteria (as specified in the relevant part of DD 8489) and repeatability.*

When a successful set of test results is obtained (see 6.2.1 and DD 8489-4 to -7), the components and parameters used in that test, as set out in the test reports (see the relevant clauses in DD 8489-4 to -7) should be incorporated into the manufacturer's design and installation manual, together with any other system constraints crucial to the operation.

Sufficient and relevant design and installation information should be provided to enable the replication of the system as tested.

The manufacturer should describe and/or specify the procedure for the installation of the system.

The minimum flow and pressure required for a successful fire test should be met or exceeded by all the nozzles in any area of operation, e.g. if the fire test is passed using a constant pressure source then the use of a decaying pressure source is not permissible.

Unless otherwise established by testing, ventilation and power/fuel supplies to equipment in watermist-protected enclosures should be shut down upon activation of the watermist system.