



BSI Standards Publication

DRAFT FOR DEVELOPMENT

Fixed fire protection systems – Industrial and commercial watermist systems –

Part 7: Tests and requirements for
watermist systems for the protection of
low hazard occupancies

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

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Summary of pages

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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.

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.

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 of this standard are presented in roman (i.e. upright) type. Its methods are expressed as a set of instructions, a description, or in sentences in which the principal auxiliary verb is "shall". Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

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.

1 Scope

This part of DD 8489 describes tests and specifies requirements for industrial and commercial watermist systems for the protection of low hazard occupancies.

This part of DD 8489 covers low hazard occupancy rooms or spaces within buildings such as churches, clubs, educational facilities, hospitals, institutional facilities, museums, offices, data processing areas without open storage of information media, restaurant seating areas. It also covers corridors able to be protected with a single row of nozzles.

This part of DD 8489 also covers apartments, nursing or convalescent homes and residential facilities with room sizes in excess of those covered by DD 8458-1.

This part of DD 8489 does not cover rooms or spaces within buildings containing flammable or combustible liquids in any amount. It also does not cover rooms or spaces containing storage exceeding the fuel loads specified in 4.7 to 4.10. Examples include but are not limited to libraries, maintenance areas, workshop areas, machinery areas, laboratories, kitchen areas in restaurants, theatres and auditoria.

This part of DD 8489 is applicable to ceiling heights up to 5 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 476-7:1997, *Fire tests on building materials and structures – Part 7: Method of test to determine the classification of the surface spread of flame of products*

DD 8458-1, *Fixed fire protection systems – Residential and domestic watermist systems – Part 1: Code of practice for design and installation*

DD 8489-1, *Fixed fire protection systems – Industrial and commercial watermist systems – Part 1: Code of practice for design and installation*

BS EN 12259-1, *Fixed firefighting systems – Components for sprinkler and water spray systems – Part 1: Sprinklers*

BS EN ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories*

ISO 5660-1:2002, *Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method)*

3 Terms and definitions

For the purposes of this part of DD 8489, the terms and definitions given in DD 8489-1 apply.

3.1 category I system

system that covers rooms up to 37 m² containing low hazard fire loads

3.2 category II system

system that covers rooms above 37 m² containing low hazard fire loads

3.3 category III system

system that covers rooms containing obstructed low hazard fire loads

3.4 low hazard occupancy

non-storage, non-manufacturing occupancy where the quantity and/or combustibility of the content is low and fires with relatively low rates of heat release are expected, with maximum fuel loads as specified in 4.7 to 4.10

4 Apparatus

NOTE Unless otherwise stated, the following tolerances apply:

- *length: $\pm 2\%$;*
- *volume: $\pm 5\%$;*
- *pressure: $\pm 3\%$;*
- *temperature: $\pm 5\%$.*

4.1 Test hall of appropriate size to accommodate the largest test room (4.5), with natural or minimal ventilation that will not interfere with the fire testing within the enclosure or test rig.

4.2 Watermist system comprising nozzles, piping, control valves and water supplies. The individual nozzles shall be automatic and shall include either a fusible or a glass bulb assembly which meets BS EN 12259-1 quick response criteria. The nominal operating temperature of the nozzle shall not exceed 107 °C. The system shall be configured in accordance with the manufacturer's design manual and the test conditions specified in Clause 5.

4.3 Test room A (small compartment), as specified in Annex A.

4.4 Test room B (large compartment), as specified in Annex A.

4.5 Test room C (open space), as specified in Annex A.

4.6 Test room D (simulated work station), as specified in Annex A.

4.7 Fuel package 1 (bunk beds), as specified in Annex B.

4.8 Fuel package 2 (corner crib and simulated furniture), as specified in Annex B.

4.9 Fuel package 3 (sofas), as specified in Annex B.

4.10 Fuel package 4 (simulated work station), as specified in Annex B.

4.11 Igniter, consisting of porous material (e.g. pieces of insulating fibreboard), 75 mm in length, and either oblong with a depth and height of 60 mm or cylindrical with a diameter of 75 mm.

4.12 Heptane.

4.13 White spirit.

4.14 Thermocouples, suitable for measuring ceiling surface temperatures, which shall be fabricated from Chromel-alumel (Type K) thermocouple wires not exceeding 0.5 mm diameter welded together. In each test room, one thermocouple shall be embedded within the ceiling tiles, such that the thermocouple bead is located 6.5 mm above the bottom surface of the ceiling, and a second thermocouple shall be located 76 mm below the ceiling surface. To prevent water impingement from affecting thermocouple measurements, thermocouples subject to watermist shall be protected with a shield which is large enough to cover the thermocouple ends. The shield shall be made from metallic tape which is formed into an umbrella shape and attached to the wire above each thermocouple end.

4.15 Instrumentation to measure and record the following parameters, as appropriate to the type of test:

- test enclosure temperatures;
- extinguishing agent flow and pressure in the extinguishing system;
- water supply pressure (including tank pressure if applicable) and nozzle discharge pressures;
- extinguishing agent pressure at the most remote nozzle branch line;
- gas pressure at its storage outlet and distribution sources;
- oxygen, carbon monoxide, and carbon dioxide concentrations;
- consumption of foam concentrate or other additive, recorded by means of a load cell on which the concentrate/additive tank is placed during the tests;
- gas consumption, measured by means of pressure or load cell on which the gas tank is placed during the tests, or mass flow measurement.

4.16 Additional baffles or obstructions, if needed, to prevent the direct impact of mist on the fire.

4.17 Stopwatch.

5 Test conditions

5.1 The maximum nozzle spacing (as specified by the manufacturer) shall be used for all tests except the bunk bed test (see 6.2). This includes utilizing the maximum ceiling spacing of nozzles from walls.

5.2 Corridor nozzles for the small compartment test (see 6.2) shall be installed at the maximum spacing as specified by the manufacturer, at an equal distance from the centreline of the small compartment doorway.

5.3 A target, automatic closed nozzle, with a thermosensitive component rating equal to the four nozzles installed in the enclosure, shall be located in the two adjacent exit doorways (see Annex A), to determine potential operation of these nozzles. For upright and pendent nozzles, the target nozzles shall be installed 102 mm inside the doorway, in the pendent position, such that the centre of the heat responsive element is 51 mm below the ceiling. For sidewall nozzles, the target nozzles shall be installed in the most protrusive position possible such that the centre of the heat responsive element is 102 mm below the ceiling.

5.4 The heat responsive element and temperature rating of the nozzles used in all fire tests shall be identical.

5.5 For all fire tests, the system shall be either:

- a) pressurized to the minimum operating pressure specified by the manufacturer. Following activation of the first nozzle, the flowing water pressure shall be maintained at the minimum system operating pressure; or
- b) pressurized to the minimum stand-by pressure specified by the manufacturer. Following activation of the first nozzle, the flowing water pressure shall be gradually increased to the minimum system operating pressure specified by the manufacturer. The delay time

until the minimum system operating pressure is reached shall correspond to the delay time expected in an actual installation.

The delay time recorded during the tests shall be documented and included in the system specifications.

5.6 The air in the test enclosure shall be conditioned to an ambient temperature of (15 ± 10) °C, measured with the thermocouple located 76 mm below the ceiling.

5.7 The fuel load materials for the category III test shall be conditioned at normal room temperature (20 ± 10) °C for a period of seven days prior to testing commencing. The wood crib sticks shall have a moisture content between 9% and 13%.

6 Procedure

6.1 General

6.1.1 The following individual tests shall be conducted:

- a) for category I systems:
 - 1) small compartment with bunk beds (6.2);
 - 2) large compartment with corner crib and simulated furniture up to 37 m² compartment size (6.3);
- b) for category II systems:
 - 1) large compartment with corner crib and simulated furniture up to maximum coverage of four nozzles (6.3);
 - 2) open space with sofas under one nozzle (6.4);
 - 3) open space with sofas between two nozzles (6.5);
 - 4) open space with sofas between four nozzles (6.6).
- c) for category III systems:
 - 1) open space with simulated work station under one nozzle (6.7);
 - 2) open space with simulated work station between two nozzles (6.8);
 - 3) open space with simulated work station between four nozzles (6.9).

6.1.2 System components, component locations, operating conditions and test enclosure details shall remain unaltered throughout all of the fire tests for a given application. During each test, all systems shall operate without manual intervention. All tests shall be conducted using the specifications from the manufacturer's design and installation manual with regard to nozzle placement, spray flux, and spray duration.

6.1.3 Prior to the start of each test:

- a) the igniter (4.11) shall be soaked in 120 ml of heptane for the category I and II (see 6.2 to 6.6) and 120 ml of white spirit for the category III (see 6.7 to 6.9);
- b) the room shall be dried and all water from previous testing shall be removed;
- c) there shall be no visible water on the floor, ceiling or walls.

6.1.4 The category I and II tests (see 6.2 to 6.6) shall be conducted for 10 min after the activation of the first nozzle. The category III

tests (see 6.7 to 6.9) shall be conducted for 30 min after the activation of the first nozzle. After this period, any remaining fire shall be extinguished manually.

6.1.5 During each test, the following temperatures shall be measured continuously, at least every 2 s, throughout the tests:

- a) the embedded ceiling surface temperature above the ignition source in the room, with the thermocouple bead flush with the ceiling;
- b) the ceiling gas temperature, with a thermocouple (75 ± 1) mm below the ceiling in the centre of the room;
- c) the ceiling surface temperature in the centre of the corridor, directly opposite the doorway, with a thermocouple embedded in the ceiling material such that the thermocouple bead is flush with the ceiling;
- d) the ceiling gas temperature, with a thermocouple (75 ± 1) mm below the ceiling in the centre of the corridor directly opposite the doorway.
- e) for the category III tests (see 6.7 to 6.9), the gas temperatures:
 - 1) above each wood crib, centrally positioned and approximately 100 mm above the top of the crib;
 - 2) above the box files and foam sheet arrangements, approximately 200 mm above the top of the files and protruding 250 mm away from the plywood walls;
 - 3) at a height of 2.5 m directly above the plywood walls, in the corner of the array and 2 m away on both sides of the fuel load arrangement.

6.1.6 For every 15 temperature measurements, the 15 results shall be added together and the total divided by 15 to obtain the mean value. The highest of the mean values shall then be taken as the maximum temperature recorded during the test.

6.1.7 The results of the tests shall be documented in a test report prepared in accordance with BS EN ISO/IEC 17025:2005, 5.10. The test report shall contain at least the following information:

- a) a title;
- b) the name and address of the laboratory, and the location where the tests were carried out, if different from the address of the laboratory;
- c) unique identification of the test report (such as the serial number), and on each page an identification in order to ensure that the page is recognized as a part of the test report, and a clear identification of the end of the test report;
- d) the name and address of the client;
- e) a description of the method used, including details of the test apparatus and a reference to the standard against which the system was tested, i.e. the relevant part of DD 8489;
- f) a description of, the condition of, and unambiguous identification of the item(s) tested;
- g) the date of receipt of the test item(s) where this is critical to the validity and application of the results, and the date(s) of performance of the test;