

BS 8489-7:2016



BSI Standards Publication

Fixed fire protection systems – Industrial and commercial watermist systems

Part 7: Fire performance tests and requirements for watermist systems for the protection of low hazard occupancies

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Summary of pages

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Foreword

Publishing information

This part of BS 8489 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 May 2016. It was prepared by Subcommittee FSH/18/5, *Watermist 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.

Supersession

This part of BS 8489 supersedes DD 8489-7:2011, which is withdrawn.

Relationship with other publications

BS 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*.

BS 8489-7 is intended to be read in conjunction with BS 8489-1.

Information about this document

This document converts DD 8489-7 into a full British Standard and incorporates minor technical updates.

Third-party testing/certification. Users of this British Standard are advised to consider the desirability of third-party testing/certification of conformity with this British Standard.

Use of this document

This British Standard 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 British Standard 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.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. "organization" rather than "organisation").

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 British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 8489 describes tests and specifies requirements for industrial and commercial watermist systems for the protection of low hazard occupancies as defined in BS 8489-1.

This part of BS 8489 is applicable to ceiling heights up to 5 m.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

BS 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, *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 BS 8489, the terms and definitions given in BS 8489-1 and the following apply.

3.1 category I system

system that covers rooms up to and including 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 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 and obstructions as indicated 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 area (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 area C (open space)*, as specified in Annex A.

4.6 *Test area 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 small compartment test with bunk beds (see **7.2**). This includes utilizing the maximum ceiling spacing of nozzles from walls.

5.2 Corridor nozzles for the small compartment test with bunk beds (see **7.2**) 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 exit doorways (see **A.2**), 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.

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 Principle

The low hazard occupancy tests comprise small, large and open compartments, plus open plan office simulations. The watermist system needs to pass all the tests for the category(ies) for which it is to be used.

7 Procedure

7.1 General

7.1.1 The following individual tests shall be conducted:

- a) for category I systems:
 - 1) small compartment with bunk beds (7.2);
- b) for category II systems:
 - 1) large compartment with corner crib and simulated furniture up to maximum coverage of four nozzles (7.3);
 - 2) open space with sofas under one nozzle (7.4);
 - 3) open space with sofas between two nozzles (7.5);
 - 4) open space with sofas between four nozzles (7.6);
- c) for category III systems:
 - 1) open space with simulated work station under one nozzle (7.7);
 - 2) open space with simulated work station between two nozzles (7.8);
 - 3) open space with simulated work station between four nozzles (7.9).

7.1.2 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.

7.1.3 Prior to the start of each test:

- a) the igniter (4.11) shall be soaked in 120 mL of heptane (see 4.12) for the category I and II tests (see 7.2 to 7.6) and 120 mL of white spirit (see 4.13) for the category III test (see 7.7 to 7.9);
- 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.

7.1.4 The category I and II tests (see 7.2 to 7.6) shall be conducted for 10 min after the activation of the first nozzle. The category III tests (see 7.7 to 7.9) shall be conducted for 30 min after the activation of the first nozzle. After this period, any remaining fire shall be extinguished manually.

7.1.5 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 6.5 mm above the bottom surface of 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 6.5 mm above the bottom surface of 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;