



BSI Standards Publication

DRAFT FOR DEVELOPMENT

Fixed fire protection systems – Industrial and commercial watermist systems –

Part 4: Tests and requirements for watermist
systems for local applications involving
flammable liquid fires

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 local applications involving flammable liquid fires.

The tests specified in this part of DD 8489 are applicable to the following applications:

- a) flammable liquid pool fires where the liquid release can be confined to a bunded area, where the entire surface of the bunded area is protected by the watermist system;
- b) flammable liquid channel fires in channels not exceeding the watermist system manufacturer's maximum specified width and with no limit to channel length;
- c) partially obstructed flammable liquid pool fires where the percentage of obstructed surface is limited to that tested;
- d) spray fires up to 6 MW fuelled by flammable liquids;
- e) spray and pool fire combinations where confined to a bunded area;
- f) flammable liquid residues (ink and paper dust) on printing presses.

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.

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

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

3 Terms and definitions

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

4 Square pool fire

4.1 Test

4.1.1 Apparatus

NOTE Unless otherwise stated, the following tolerances apply:

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

4.1.1.1 Test hall, greater than 500 m³ in area with a minimum ceiling height of 5 m. Ventilation during testing, between tests, and for cooling of the enclosure, shall be provided by a minimum of

two 0.93 m² louvre vents located on the roof of test hall and a side wall doorway measuring at least (3.66 × 4.26) m, to be left partially open during fire testing for a minimum area of (3.66 × 1.82) m. The vents shall be protected by baffles if necessary to remove the effects of external winds/air movements.

4.1.1.2 *Watermist system* comprising nozzles, piping, control valves and water supplies, configured in accordance with the manufacturer's design manual and with the test conditions specified in 4.1.2.

4.1.1.3 *Three test pools*, of sizes 1 m × 1 m, 2 m × 2 m and 3 m × 3 m, each comprising a square pan or tray, of steel construction, 1.73 mm thick and 100 mm high with no lip, with smooth surfaces and edges that are free from imperfections, containing a water base of 50 mm in height, with a fuel load of at least 20 mm above the water. The pools shall be configured as shown in Figure 1. For hazards with diesel fuels, the pools shall contain diesel. Where it is intended to use flammable liquids with volatilities greater than those of diesel, but not greater than those of heptane, then the tests shall be conducted using heptane. After each pool fire test, the fuel left in the pool or tray shall be reignited to ensure that sufficient fuel remains in the pan.

4.1.1.4 *Thermocouples*, which shall be located (25 ± 2) mm above the initial pool surface and (250 ± 10) mm within the pool rim, capable of registering extinguishment.

NOTE In addition to thermocouples, thermal imaging equipment is recommended.

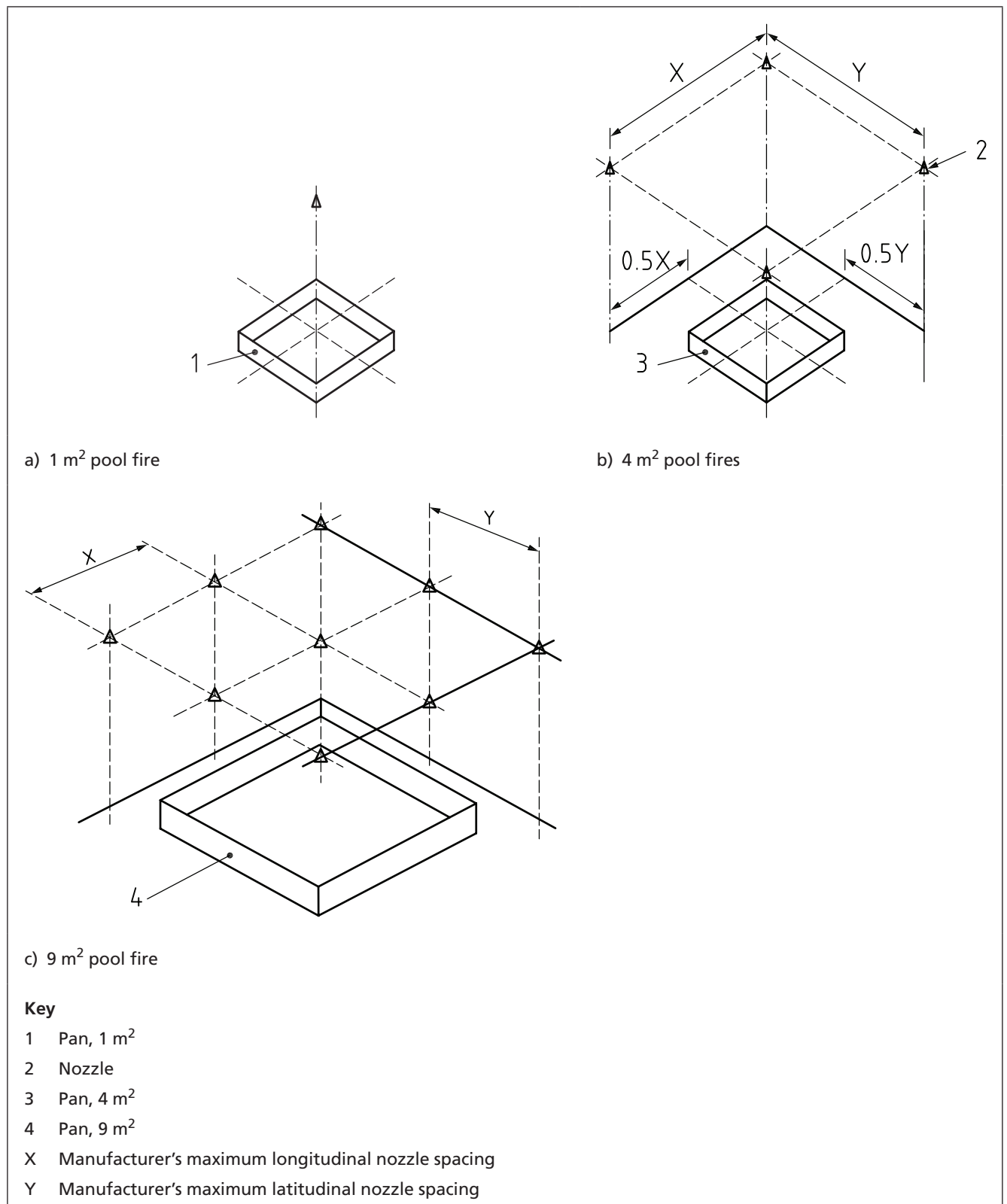
4.1.1.5 *Instrumentation* to measure and record the following parameters:

- a) temperature of fuel in pools;
- b) pool fire temperatures;
- c) test enclosure temperatures;
- d) extinguishing agent flow and pressure in the extinguishing system;
- e) water supply pressure (including tank pressure if applicable) and nozzle discharge pressures;
- f) extinguishing agent pressure at the most remote nozzle branch line;
- g) gas pressure at its storage outlet and distribution sources;
- h) oxygen, carbon monoxide, and carbon dioxide concentrations;
- i) 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;
- j) gas consumption, measured by means of pressure or load cell on which the gas tank is placed during the tests, or mass flow measurement.

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

4.1.1.7 *Stopwatch*.

Figure 1 Configuration for square diesel pool



4.1.2 Test conditions

4.1.2.1 The minimum operating nozzle pressure (as specified by the manufacturer) shall be used for all tests. System operating pressures shall be maintained to within $\pm 5\%$. For decaying pressure systems, the starting pressure shall be within $\pm 5\%$ of the manufacturer's designated starting pressure. For systems designed to cycle between two pressure limits, both the higher and lower pressures shall be within $\pm 5\%$ of the manufacturer's designated pressures, and the periods pertaining to the higher and lower pressure in each cycle shall be within ± 3 s of the manufacturer's designated duration.

4.1.2.2 The maximum ceiling height, maximum nozzle height and maximum nozzle spacing (as specified by the manufacturer) shall be used for all tests. This includes utilizing the maximum ceiling spacing of nozzles from walls.

4.1.2.3 The nozzle arrangement shall have uniform spacing. The nozzle spacing from the wall shall be uniform, preferably one half the main spacing.

4.1.2.4 For all fire tests, the ceiling, floor and walls shall be dry. The relative humidity in the test enclosure prior to the start of the test shall not differ from that of the ambient relative humidity by more than 20%.

4.1.2.5 All fuels shall be at an ambient temperature of $(20 \pm 10)^\circ\text{C}$, measured with the thermocouple located in the approximate centre of the initial fuel layer.

4.1.2.6 The test hall shall have an ambient temperature of $(20 \pm 10)^\circ\text{C}$ prior to the start of the test, measured in the central area of the test hall at one-third, two-thirds and ceiling heights. The test hall shall be at as uniform an ambient temperature as reasonably practicable, with no localized hot or cold spots. All non-fire-induced drafts shall be eliminated.

4.1.2.7 The extinguishing agent flow and pressure in the extinguishing system shall be measured continuously on the high pressure side of the pump, cylinder or equivalent equipment.

4.1.2.8 The water supply and nozzle discharge pressures shall be monitored at the source (pump and/or cylinder) and at the distribution piping manifold.

4.1.2.9 Test rig temperatures shall be measured away from the direct flame impingement with bare bead thermocouples welded from 28 gauge Chromel-alumel wire (Type K).

4.1.2.10 Oxygen shall be measured 2 m to 3 m from, and at the elevation of, the rim of the pool fires, and away from any open doorways or ventilation sources. Ventilation rates shall be monitored and recorded if constantly provided for the enclosure.

4.1.2.11 The ratio of total number of nozzles in the grid versus the pool area shall remain constant (i.e. two nozzles for 1 m² pool, four nozzles for 2 m² pool, eight nozzles for 4 m² pool).

4.1.2.12 The nozzle grid elevation above the pool shall remain constant for all pool sizes.

4.1.2.13 Where nozzle protection caps are used to prevent or reduce the amount of nozzle contamination, the use of such caps shall be included in the test.