

Loss Prevention Standard

LPS 1655 : Issue 1.0

REQUIREMENTS AND TEST METHODS FOR THE
LPCB APPROVAL AND LISTING OF PERSONAL
PROTECTION WATERMIST SYSTEMS

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PARTICIPATING ORGANISATIONS

This standard was approved by the BRE Global Governing Body and the Suppression Industry Liaison Group. The following organisations participated in the preparation of this standard:-

Association for Specialist Fire Protection (ASFP)
 Association of Insurance Surveyors
 Heathrow plc
 British Automatic Fire Sprinkler Association (BAFSA)
 British Property Federation (BPF)
 Chief Fire Officers' Association (CFOA)
 Construction Industry Council (CIC)
 Construction Products Association
 Fire Industry Association (FIA)
 Home Builders Federation (HBF)
 Homes & Communities Agency
 National Fire Sprinkler Network (NFSN)
 NHBC
 RICS
 Risktech Ltd
 Sustainability + Architecture
 Sustainable by Design

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REVISION OF LOSS PREVENTION STANDARDS

Loss Prevention Standards (LPSs) will be revised by issue of revised editions or amendments. Details will be posted on our website at www.RedBookLive.com.

Technical or other changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments.

The issue number will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

Users of LPSs shall ensure that they possess the latest issue and all amendments.

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FOREWORD

This Standard identifies the evaluation and testing practices undertaken by LPCB for the purposes of approval and listing of products and services. LPCB listing and approval of products and services is based on evidence acceptable to LPCB:-

- that the product or service meets the standard;
- that the manufacturer or supplier has staff, processes and systems in place to ensure that the product or service delivered meets the standard

and on:-

- periodic audits of the manufacturer or supplier including testing as appropriate;
- compliance with the contract for LPCB listing and approval including agreement to rectify faults as appropriate;

The responsibility for ensuring compliance with the technical and managerial process and requirements for the product or service lies with the manufacturer and/or supplier.

NOTES

Compliance with this LPS does not of itself confer immunity from legal obligations. The manufacturer and/or supplier is responsible for ensuring that all regulatory requirements are met. Users of LPSs shall ensure that they possess the latest issue and all amendments.

LPCB welcomes comments of a technical or editorial nature and these should be addressed to “the Technical Director” at enquiries@breglobal.co.uk.

The BRE Trust, a registered charity, owns BRE and BRE Global. BRE Global and LPCB (part of BRE Global) test, assess, certificate and list products and services within the fire and security sectors. For further information on our services please contact BRE Global, Watford, Herts. WD25 9XX or e-mail to enquiries@breglobal.co.uk

Listed products and services appear in the LPCB “List of Approved Products and Services” which may be viewed on our website: www.redbooklive.com, App Store (for iPhone and iPad), from Google Play (for Android devices) or from the Windows Store (for Windows 8 Phones).

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1 SCOPE

This document specifies the requirements and test methods for LPCB approval and listing of local application watermist systems for use as Personal Protection Systems (PPS) in residential and domestic occupancies within buildings.

PPS are local application watermist systems designed to protect a specific area within an enclosed volumetric space (i.e. a room) from fire. Because PPS are designed for local area application i.e. to suppress a fire within a specific discharge area, care must be taken to ensure that the risk profile is appropriate. The risk assessment needs to indicate that the principal fire hazard is within the discharge area, of one or more PPS. If the fire hazard is not localised then a suppression system that covers the whole of the dwelling or risk area should be specified.

PPS covered by this document, are for the protection of persons in specific areas within buildings and are not intended for whole building protection. PPS are not intended as a substitute or replacement for fixed-installation water suppression systems such as automatic fire sprinklers or watermist systems. When the risk assessment indicates that a Personal Protection System is not suitable for the risk an automatic fire sprinkler system specified for whole building or dwelling coverage, designed to a recognized standard and acceptable to the Authority Having Jurisdiction (AHJ) shall be installed.

For the purposes of approval, the PPS comprises a set of components, a set of design parameters, a system manual, and a scope of application.

It is essential that maintenance is carried out in accordance with the manufacturer's instructions. Accordingly any system that is not maintained in accordance with the manufacturer's instructions will be outside the scope of this approval and listing standard.

This LPS approves PPS for use within the heated envelope of domestic or residential situations and will not therefore be subject to temperatures below 4°C.

This LPS assesses the performance of a PPS for use in helping to protect people occupying beds and armchairs from localised fires.

Two benchmark fire scenarios have been developed for this approval scheme based on analysis of historic fire incidents and input from our various stakeholder groups. (see section 3.5 for more details).

Fire test scenario A is representative of fires starting in bedding or clothing where a person may be in close proximity to the fire. Fire test scenario B is representative of shielded fire development and considers the potential for control of the fire and the prevention of fire spread beyond the items first ignited.

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2 DEFINITIONS

2.1 Contracted installer

organization whose installation and maintenance personnel have been trained and approved by the PPS manufacturer or Supplier as competent to install and maintain their product.

2.2 Discharge area

area in which the system is expected to suppress a fire (see figure A.3)

2.3 Discharge duration

time that watermist discharges throughout one fire fighting event measured from the operation of the first nozzle

2.4 Fire suppression

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

2.5 Personal Protection System (PPS)

automatic fire suppression system, fitted with one or more watermist nozzles and intended to suppress a fire in a defined area of a dwelling

2.6 Supplier

organisation authorised by the manufacturer for the supply, installation, servicing and maintenance of PPS, whose installation and maintenance personnel have been trained and approved by the PPS manufacturer as competent to install and maintain their product.

2.7 System manual

document containing design, installation and maintenance rules for all details of a Personal Protection System.

2.8 Vulnerable person

person who is at a higher than average risk from fire.

Note: Detailed analysis of the underlying causes of fatal fires in dwellings indicates that a significant percentage of victims are at greater risk because, due to physical and/or mental health impairment they are unable to easily escape without assistance. They may also have a higher than average likelihood of fire in their home.

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3 REQUIREMENTS

3.1 Documentation

Prior to examination and testing of the PPS, an applicant shall provide BRE Global with comprehensive information about the components and system. All documents shall be dated and given a reference number, issue and title. These documents shall include:

- Document Register (containing date, issue and status of all documents)
- Production Drawings (including materials and finish)
- Full material specification of components, manufacturer and designation
- Details of jointing compounds/materials/tools and procedures (including manufacturers of tools, materials and compounds)
- System manual
- Installation and commissioning requirements
- Maintenance requirements
- Full user documentation
- Details of any training which may be available or required

Documents shall be sufficient so that BRE Global can carry out a full review of the system design. If the applicant is not the manufacturer i.e. is a supplier, then an application must be accompanied by written permission for testing from the manufacturer(s).

3.2 Design requirements

3.2.1 Discharge area

The manufacturer shall specify the discharge characteristics including the discharge area. See figure A.3 for indicative layouts of discharge areas.

The minimum discharge area shall be 6 m².

3.2.2 Detection

All detectors shall be LPCB approved and conform to the relevant British Standard. (BS EN 54 series or BS EN 14604 as appropriate).

The system shall have dedicated fire detection and alarm arrangements. The fire detector/s shall form part of the system that is approved. Fire detectors shall

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be designed and installed in accordance with the relevant parts of BS 5839-1 or BS 5839-6 as appropriate.

The detection arrangements may be by a single optical smoke detector or by multi-criteria detector/s. The detection thresholds shall be as recommended by BS EN 54-7 or BS EN 14604 as appropriate.

3.2.3 Remote alarm transmission

The system shall have the facility so that, on actuation of the water suppression system, a signal is generated that can be transmitted to a permanently staffed location so that management action can be initiated and the fire and rescue service alerted.

3.2.4 Actuation

The system shall spray water over the discharge area within 10 seconds of system actuation.

The system may have additional control facilities for remote manual actuation, for example by means of a pendant. Any additional control facilities will be tested as part of the product approval.

3.2.5 Duration of application

The system shall have a minimum duration of application of 10 minutes.

The actual duration of application shall be stated in the system manual.

The system shall suppress a fire in the discharge area for the duration of application.

3.2.6 Extinguishing media

The system shall use water as the principle extinguishing agent.

Any additives shall be subject to a risk assessment that indicates that they are safe for the intended application. The risk assessment shall form a part of the system manual.

Any water quality requirements shall be clearly stated in the system manual.

3.2.7 Water supply

The water supply required to meet clause 3.2.5 shall be stored within the system.

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3.2.8 Power supplies

The system shall be capable of operating independently of mains power for a minimum period of three days (72 hours).

Mains power supplies shall have adequate safeguards against being inadvertently switched off.

Mains power supplies shall be labelled "Fire suppression system do not switch off".

3.2.9 Control and indicating panel

The system shall be capable of being manually shutdown. This shall be by means of a key operated switch that can only be removed when the system is in normal (i.e. "ready for automatic operation") mode.

The system shall have green light/s to indicate that there are no faults that would prevent system function.

The system shall have amber light/s to indicate fault conditions that would affect the systems function.

Failure of the primary power supplies shall give rise to a fault indication.

3.2.10 Legionella

The manufacturer or supplier of the PPS shall conduct a legionella risk assessment of the system and its intended application.

If a legionella risk is identified, adequate control measures must be introduced to reduce the risk to an acceptable level. *(see section 7 for guidance publications)*

3.2.11 Physical Stability

When deployed the system shall be stable in all operational conditions. i.e. when full of water and also when empty of water. If necessary, a method of fixing in place shall form part of the installation procedure.

3.2.12 Maintenance

Maintenance shall be carried out by a contracted installer. The system shall be subject to inspection and maintenance (including a discharge test) at least every 6 months.

The system shall be designed so that periodic discharge testing by actuating the system for the full duration of application can be carried out. The discharge test shall, as near as possible, simulate a live actuation.

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The fire detection system shall be activated and the system shall then actuate as per the system manual. Periodic discharge testing need not discharge water over the protected area, water may be discharged into suitable containment to avoid un-necessary wetting of accommodation spaces. The system shall be refilled with fresh water after the discharge test.

Batteries shall be tested to ensure that they are still capable of providing sufficient power for a full discharge. Battery charging circuits shall be tested to ensure that the battery is receiving sufficient charge.

The detection arrangements shall be maintained in accordance with BS 5839-1 or BS 5839-6 as appropriate and in accordance with the manufacturer's guidelines. Testing of the fire detection arrangements shall not cause the PPS unit to activate.

3.3 System manual requirements

The system manual shall:

- Reference and employ design criteria specified in LPS 1655.
- Contain full information about the design, and full instructions for installation, commissioning and maintenance of the system.
- Identify all system and component requirements.
- Clearly identify the discharge area and scope of the LPCB approval.

In particular, the system manual shall include the sections and details listed in Certification Document CN 1655.

3.4 Installation and installer requirements

For detailed installation and installer requirements see Scheme Document 1655

3.5 Fire performance and functionality tests

The system performance shall be verified by fire and functionality testing. The parameters verified by testing are: system actuation, discharge area, discharge density, nozzle location in relation to hazard, nozzle height, effective discharge time, system flow rate and discharge duration.

The system shall be verified by a minimum of two fire performance tests.

- A fire test to simulate a fire on top of a bed or chair (test A)
- A fire test to simulate a shielded fire beneath a bed or chair (test B).

And system functionality tests to determine:

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- Minimum discharge duration
- Flow rate
- Discharge density and discharge area
- Operation of manual shutdown
- Operation of any manual actuation facility
- Operation of remote alarm transmission facility
- Battery endurance

All tests shall be undertaken with the system components (e.g. fire detection, nozzle/s, pipe, valves, strainers, pump, and tank) configured exactly as defined in the system manual (which shall use design criteria specified in section 3). Testing shall be undertaken with any additive that forms part of the system, using the test arrangement considered by BRE Global to be the most appropriate.

3.5.1 Fire test scenario A

This fire test simulates a fire starting on top of a bed or chair where the vulnerable person may be in close proximity to the fire.

The fuel package shall be oriented at 90⁰ to the PPS nozzle as shown in figure A.1.

In order to verify the performance of the PPS at the limit of the discharge pattern the fuel package shall be located so that its outside edge is co-incident with the farthest point of the discharge pattern.

The purpose of this test is:

- To demonstrate the PPS is activated by the fire detection arrangements at an early stage of fire development.
- To demonstrate that the PPS is able to control temperatures at the bed head.
- To show that the system is effective at the limit of the discharge pattern.

3.5.2 Fire test scenario B

This fire test simulates a fire starting underneath a bed or chair, for example in a waste paper bin. Because the ignition package is beneath the fuel package it is partly shielded from the water spray.

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The fuel package shall be oriented at 45⁰ to the PPS nozzle so that the fire is partly shielded from the PPS nozzle by the headboard, as shown in figure A.2.

It is expected that the fire will develop quickly and present a significant challenge to the PPS unit.

The fuel package shall be located in the area of highest discharge density of the PPS.

The purpose of this fire test is to demonstrate that the PPS is able to suppress a fast developing shielded fire.

3.6 System verification method

For confirmation of real application design methodologies and practices, a complete system, including the fire detection and any manual control elements shall be installed with the following attributes:

- Designed in accordance with the system manual
- Installed with components in accordance with the system manual

3.7 Test apparatus

3.7.1 Test room

The system shall be installed within a test room of dimensions:

- length: (8.1 +/- 0.10) m;
- width: (4.1 m +/- 0.10)m;
- ceiling height: (3.6 +/- 0.10) m;
- doorway height: (2.0 +/- 0.10) m.
- doorway width: (0.9 +/- 0.20) m.

The test room ceiling and walls shall be covered by calcium silicate board.

3.7.2 Ignition packages

For fire test A the ignition package shall be a standard tea light, placed within the fuel package between the duvet and the pillow.

For fire test B the ignition package shall be a tray containing 100ml of heptane and a No. 7 wood crib, placed beneath the fuel package.

3.7.3 Fuel Package

The fuel package is designed to simulate a bed or chair fire. It comprises:

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- A metal frame with a plywood headboard
- Timber slats
- A mattress (polyether foam)
- A single duvet (polyester/polypropylene)
- A pillow (polyester/polypropylene)
- A single sheet and pillow case (polyester/cotton)

3.8 Environmental conditions

Before the start of each test the room temperature shall be 15 °C +/- 10 °C.

3.9 Test method

The system shall be set up in accordance with the design manual. The exact location of the PPS unit shall be based on the discharge area and be determined by discussion and agreement between the manufacturer or supplier and BRE Global.

The system fire detector/s shall detect the fire and initiate automatic actuation of the system. The following measurements shall be made:

3.10 Measurements

Measurements shall be made of the following times: Ignition, fire detection, system actuation, water delivery over the full discharge area and end of water delivery.

Three thermocouples placed in the headboard shall record temperatures for the duration of each fire test.

3.11 Fire test pass/fail criteria

All system components shall operate to their specified design criteria.

The system delay time before attainment of water delivery over the full discharge area shall be less than 10s.

When tested in accordance with the two fire test protocols the system shall be capable of suppressing the fire for the discharge duration.

4 COMPONENT EXAMINATION AND TEST METHODS

Set out below are the outline requirements, assessments and test methods which BRE Global will consider when assessing the performance of the major components in a system. The assessment will be defined by BRE Global, in

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consultation with the applicant, based on both BRE Global's experience and changes in standards currently under development from bodies such as BS, CEN and ISO.

Examples of components required to be assessed by BRE Global for LPCB approval include:

- Water distribution nozzle/s
- Water control valves
- Solenoid valves
- Water pumps
- Water pipe, fittings and couplings
- Water strainers and filters
- Water flow switches
- Water tank
- Water ball valves and drain valves
- Water sight glass
- Water flexible connectors
- Water pressure switches
- Water additive
- Fire detectors
- Pressurised cylinders
- Battery endurance
- Control and indicating equipment
- Alarm transmission arrangements

All components shall be reviewed and tested against a schedule of requirements, developed with the manufacturer or supplier, to cover elements such as:

- Examination
- Marking
- Leakage test
- Function/operation tests
- Fire tests
- Long term ageing tests

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- Cyclic function tests

The test programme required for a particular system will depend on its design and method of operation as described in the system manual. The test programme shall be defined by BRE Global.

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5 MARKING, LABELLING AND PACKAGING

The manufacturer or supplier shall provide appropriate marking, labelling and packaging for the safe transport and subsequent use of the components and system as well as clear details of the manufacturer or supplier, their contact address, the components and system model identifications and any other safety requirements. Requirements for LPCB approval are described in the Scheme Document (SD 1655) and PN103 “*Rules and Guidance for use of the LPCB Certification Marks*” and not in this standard.

6 END USER INSTRUCTIONS

Approved systems require end user instructions including:

- System features and benefits
- System operation
- System shutdown
- User welfare
- System checks and maintenance

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7 ADDITIONAL GUIDANCE DOCUMENTATION

BRE report, 204505 *'Effectiveness of sprinklers in residential premises – Experimental programme'*, C Williams & S Campbell.

BRE report, BD2546 *'Sprinkler effectiveness in Care Homes'*, M Shipp & P Clark.

BS 8580: 2010 *'Water quality – Risk assessments for Legionella control – Code of practice'*, published by British Standards Institution.

CN 1655 *"Personal Protection Systems"* published by BRE Global Ltd.

DD 8458-1:2010 *'Fixed fire protection systems. Residential and domestic watermist systems. Code of practice for design and installation'*, published by British Standards Institution.

FB 29:2011 *'Design fires for use in fire safety engineering'* C. Mayfield and D Hopkins, published by IHS BRE Press.

"Guidance on Legionella in Fire Fighting Systems and Equipment", published by the Fire Industry Association.

HSG274 part 3: Legionnaires disease: Technical guidance *'The control of legionella bacteria in other risk systems'*, published by HSE.

LPS 1284 *'Watermist installers' scheme'*, in preparation, to be issued by BRE Global.

PD 7974-1:2003 *'Application of fire safety engineering principles to the design of buildings'*, published by British Standards Institution.

PN103 *"Rules and Guidance for use of the LPCB Certification Marks"* available from www.redbooklive.com

SD1655 *"Requirements And Test Methods For The Approval Of Personal Protection Watermist Systems"* published by BRE Global Ltd

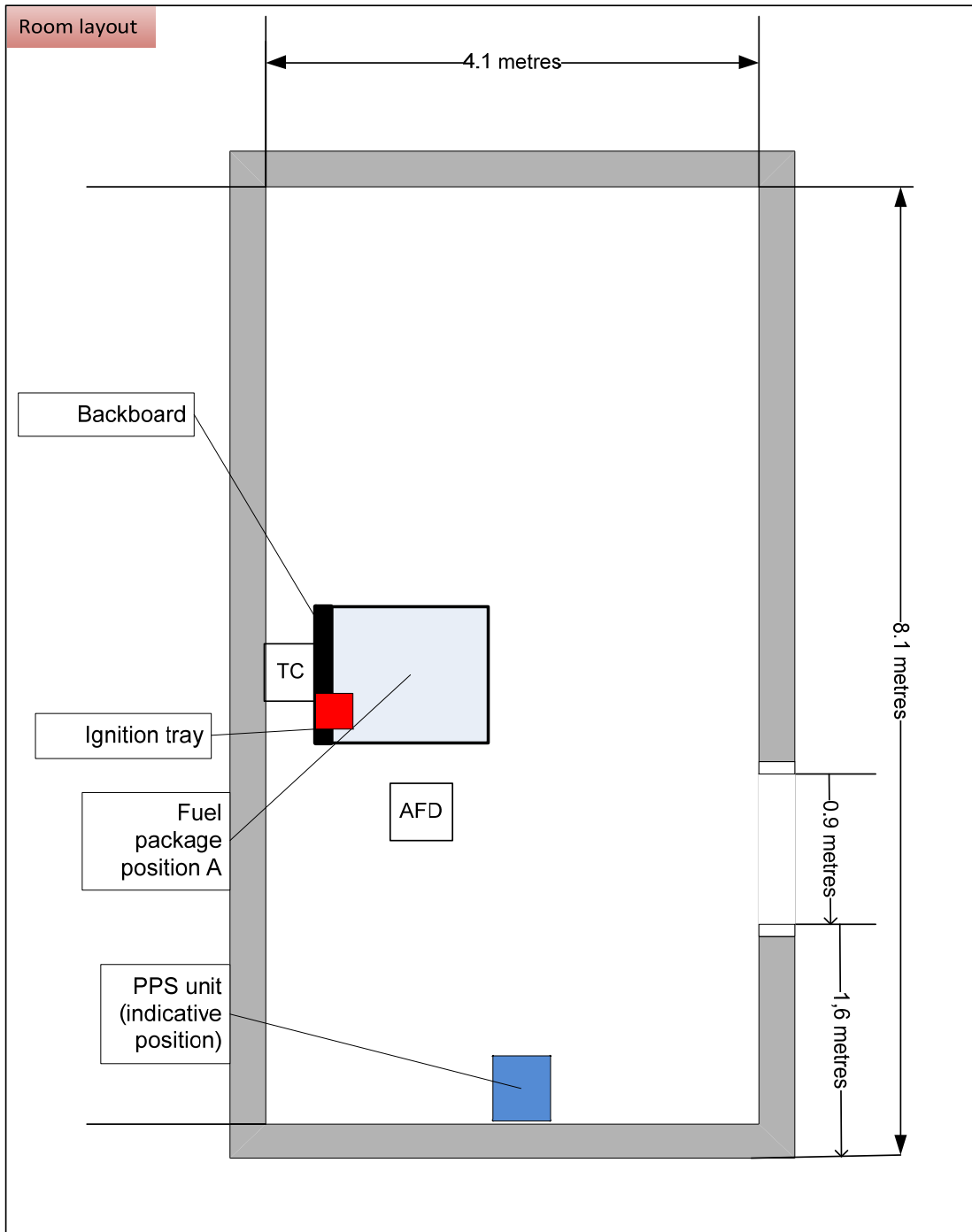
TBN 14 May 1999 *'Legionella and fire fighting systems'*, published by the Loss Prevention Council.

For undated references please refer to the latest published issue.

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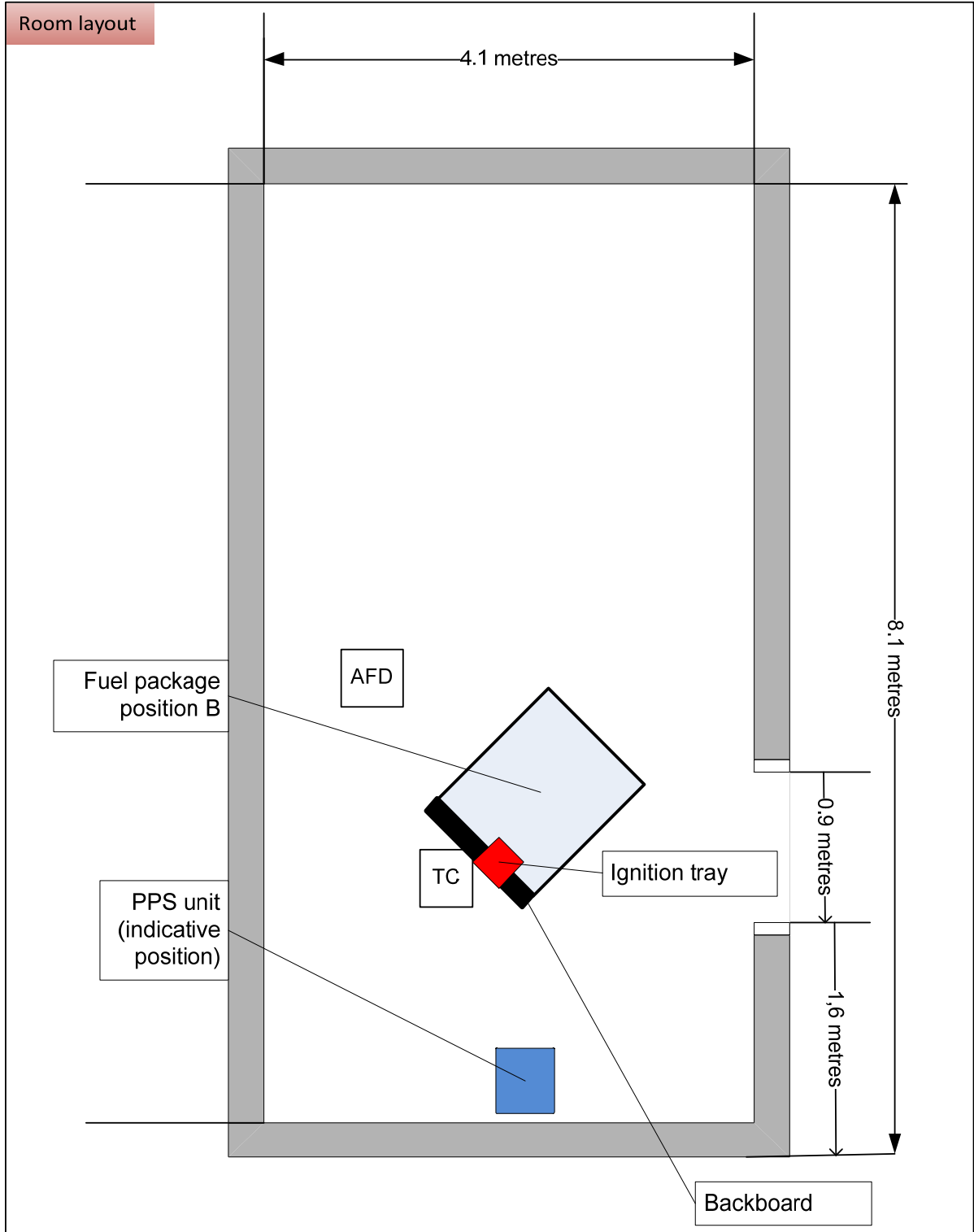
APPENDIX A:

Figure A 1: Indicative room layout for fire test A



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Figure A 2: Indicative room layout for fire test B



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Figure A 3: Indicative layout showing PPS unit and Discharge area

