

Watermist protection of low hazard occupancies – approvals approach

Louise Jackman

IWMC - 15 November 2012

Part of the BRE Trust

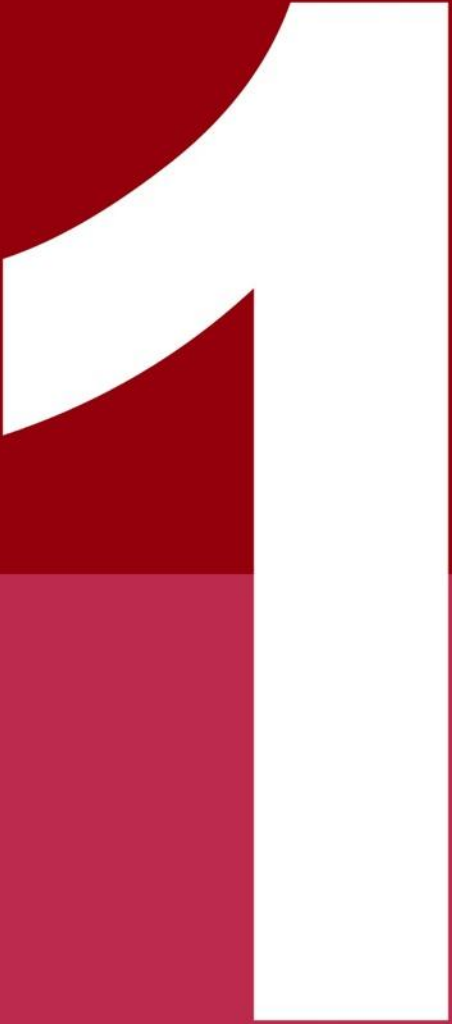
LPCB

Introduction

1. Background
2. Scope of an approval
3. Design and system manual
4. Fire performance tests
5. System verification method
6. Component examination
7. Next steps



Background



Understanding watermist

- Watermist is a complex technology (combination of gas & water system approaches)
- All systems are bespoke, no generic system designs
- Mechanism of fire performance
 - Increased efficiency
 - Increased sensitivity
- There are critical parameters
 - Watermist system
 - Room / fire
- Application specific fire test protocols are employed
- Scopes of application, need to be precise

Specifer/approver requirements

- Understand watermist and understand fire
- Confirm scope of application (room type, floor area, ceiling height, ventilation, equivalent fire load density, fire growth rate and obstructed fire load)
- Inspect fire performance reports
 - Check test house credentials
 - Check test report compliance to scope and standard
 - Check watermist system details
 - NOTE: small differences in parameters (system or test) can make a big difference to the outcome
- Check design against standards and test report
- Check component tests and approvals
- Check installation and maintenance

Scope of an approval



What is approval?

- Approval of products and services is based on evidence
 - Compliance with standard
 - Assessment of staff, processes and systems to ensure that the product or service delivered meets the standard
 - Periodic audits of the manufacturer or service provider including testing as appropriate;
- Listing and approval (requiring compliance and includes an 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 or supplier.

LOSS PREVENTION STANDARD - LPS 1283

- For LPCB approval of fixed watermist systems for use in commercial low hazard occupancies within buildings
 - non-storage, non-manufacturing occupancy where the quantity and/or combustibility of the contents is low and fires with relatively low rates of heat release are expected. This descriptor is different from ‘light’ and ‘ordinary hazard’ as described in International sprinkler standards.
- Underpinned by the requirements of DD 8489 Part 7
 - *Fixed fire protection systems. Industrial and commercial watermist system systems. Code of practice for design and installation.*, DD 8489 Part 7 : 2011. *Fixed fire protection systems. Industrial and commercial watermist system systems. Tests and requirements for watermist systems for the protection of low hazard occupancies.*
- Includes requirements and test methods

LOSS PREVENTION STANDARD - LPS 1283

- Supported by installer scheme, LPS 1284 (draft)
 - End users of watermist systems are responsible for the on-going maintenance of watermist systems and in particular maintenance of the fire load and fire hazard classification in-line with the watermist system design.

LPS 1283 - scope

- Fixed watermist system, comprising; a set of components, a set of design parameters, a system manual, a design software/calculation method and a scope of application.
- Fire suppression system designed to protect an enclosed volumetric space.
- For the protection of specific areas within buildings and are not intended for whole building protection.
 - Some areas found in buildings can not be protected by the watermist systems covered by this standard and will require other solutions.

LPCB

Application scope

- Certificates detail:
 1. Types of area or space
 2. Limitations related to the dimensional configurations and the hazard posed
- Types of areas or spaces included:
 - **Seating areas**
 - **Classrooms and office areas**
 - **Entrances foyers and display areas**
 - **Bedrooms and sleeping areas**
 - **Common rooms in apartments, nursing or convalescent homes and residential facilities**
 - **Corridors**
 - **Data processing areas**

Application scope - exclusions

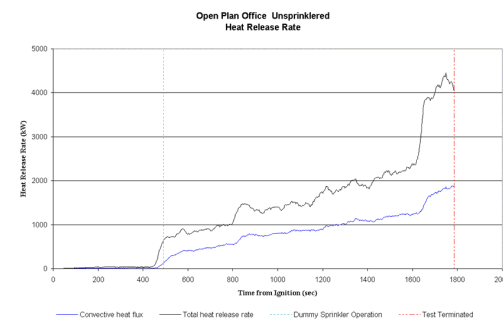
- *Additional configurations can be considered subject to additional and suitable fire performance testing and limitations, as defined and agreed with LPCB.*
- *Storage areas*
- *Bin stores, recycling areas and facilities*
- *Void areas, e.g. floor and ceiling*
- *Libraries*
- *Maintenance areas, service areas*
- *Workshop areas*
- *Machinery areas*
- *Laboratories*
- *Areas containing flammable or combustible liquids*
- *Kitchen areas, e.g. commercial restaurants*
- *Theatres and auditoria*
- *Atria*
- *Garages, parking areas, car parks, vehicle sheds and appliance bays*

Limits of a watermist system arrangement

Area type	Parameter	Limits
	Floor area of compartment	No limit
	Ceiling height	Tested height up to 5 m
	Ventilation	$\leq 1 \text{ m}^3/\text{s}$ total, from any source
	Equivalent fire load density	$\leq 29 \text{ kg}/\text{m}^2$
	Fire growth rate	\leq medium
	Height of combustibles	$\leq 2.4 \text{ m}$
	Obstructed fire load	“Normal” layouts covered

Fire Load

- The limit for the fire growth rate is based on design fire experience
- The limit for the equivalent fire load density is based on the fuel packages used in the fire tests
- Further information regarding fire descriptors for different occupancies and commodities are given in FB 29 and PD 7974-1.
 - *FB 29:2011 'Design fires for use in fire safety engineering' C. Mayfield and D Hopkins, IHS BRE Press*
 - *PD 7974-1:2003 'Application of fire safety engineering principles to the design of buildings', British Standards Institution.*



Equivalent fire load densities

Occupancy	Equivalent fire load density, average (kg/m ³)
Hospital	13
Hotel bedroom	17
Office	23
School	16

Calculated assuming that wood based fire loads will have a calorific value of 18 MJ/kg

- Based on British Standard PD 7974-1 Table A.19, indicative fire load density data for different occupancies

A.8 Fire load densities in different occupancies

Table A.19 shows the fire load densities in various occupancies.

Table A.19 — Fire load densities

Occupancy	Fire load density ²			
	Average MJ/m ²	Fractile ^b MJ/m ²		
		80 %	90 %	95 %
Dwelling	780	870	920	970
Hospital	230	350	440	520
Hospital Storage	2 000	3 000	3 700	4 400
Hotel bedroom	310	400	460	510
Offices	420	570	670	760
Shops	600	900	1 100	1 300
Manufacturing	300	470	590	720
Manufacturing and storage ^c	1 180	1 800	2 240	2 690
Libraries	1 500	2 250	2 550	—
Schools	285	360	410	450

NOTE 1 *Limits.* The fire load densities given in this table assume perfect combustion, but in real fires, the heat of combustion is usually considerably less.

NOTE 2 The values given in this table included only the variable fire loads (i.e. building contents). If significant quantities of combustible materials are used in the building construction, this should be added to the variable fire load to give the total fire load.

^a Derived from surveys: see CIB W14 Workshop Report, 1983 [1].

^b The 80 % fractile is the value that is not exceeded in 80 % of the rooms or occupancies.

^c Storage of combustible materials at less than 150 kg/m².

Design and system manual



LPCB

Design requirements

- Designed in accordance with DD 8489-1
- Pumped system
- Designed so that it is possible for periodic testing and inspection of a nozzle, strainers, filters and pumps
- **System manual**
- Contain full instructions for the design, installation, commissioning operation and maintenance of the system
- Identify all system and component requirements specific to low hazard occupancies and sub-categories
- Contain the scope of the LPCB approval

System Manual

Section	Details
Scope	
Definitions	
Roles and Responsibilities	
Approvals	
Standards	
Legislation	
General information	
Components	
Design	
Installation and commissioning	
Handover	
Maintenance	

Fire performance tests



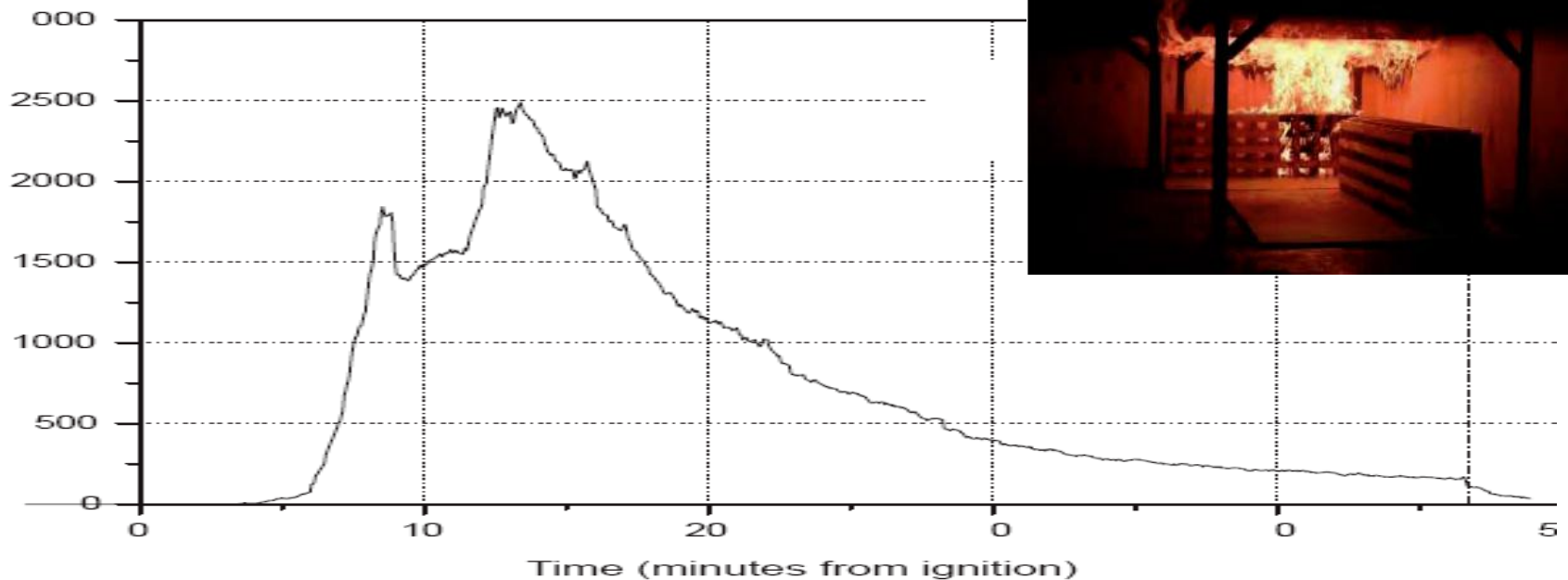
Fire performance tests

- Watermist system design criteria shall be verified by fire testing
- Category 3 simulated work station fire test protocol shall be undertaken to verify the fire performance of the watermist system design
- Additional testing can be undertaken to Category 1 and Category 2
- All tests shall be undertaken with the watermist system components

LPCB

Category 3

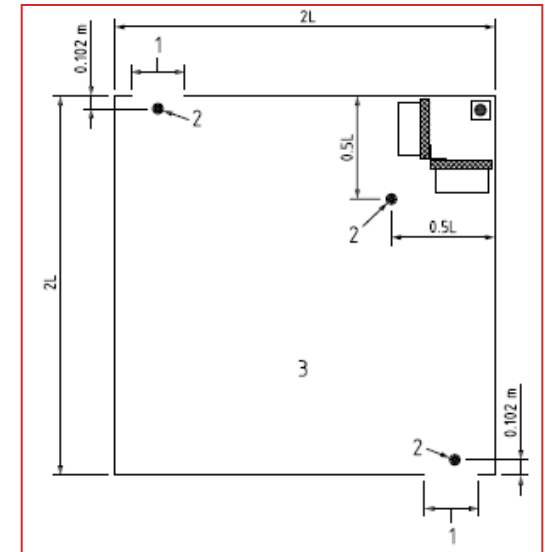
- Stylised, repeatable fire
- Progressive ignition & spread
- Medium growth, 2500 kW peak
- Pass/fail by temperature and damage



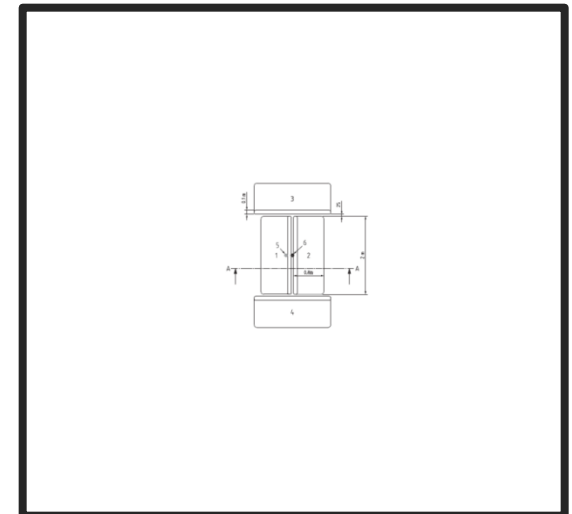
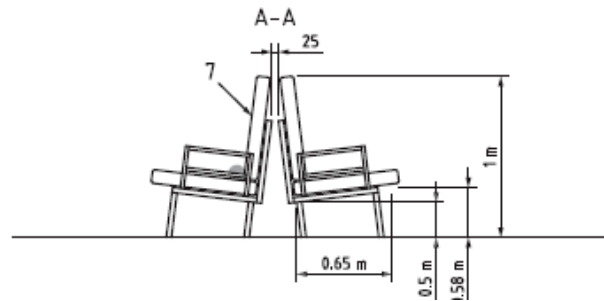
LPCB

Category 2

- large compartment, furniture
- DD 8489-7
- and tests for ventilation, fuel placement, maximum flow



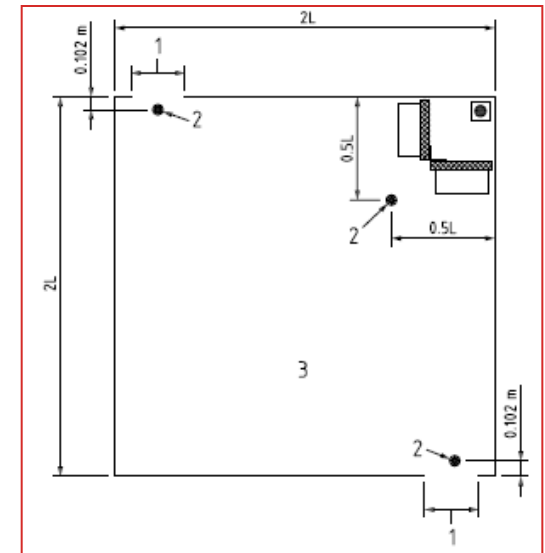
- Open space sofas
- 8489-7
- and tests for maximum flow



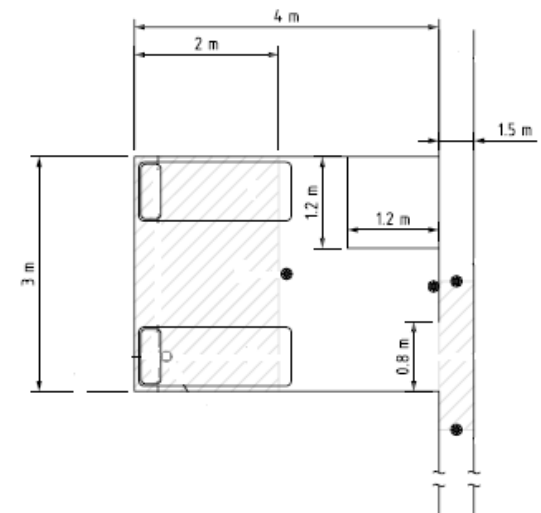
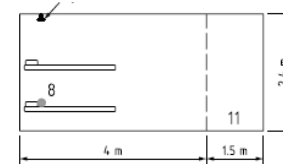
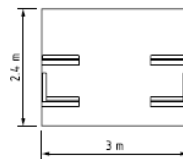
LPCB

Category 1

- large compartment, furniture
- DD 8489-7
- and tests for ventilation, fuel placement, maximum flow



- Small room, bunk bed
- 8489-7



System verification method



System verification

- For confirmation of real application design methodologies and practices, a complete watermist system shall be designed and installed
- At least three design arrangements of the watermist system shall be tested. The arrangements shall be agreed with LPCB
- Full details of the hydraulic calculation for each test shall be provided to LPCB before testing.

Component examination



LPCB

Components

- Water distribution nozzles
- Water control valves
- Water check valves
- Water pumps
- Water pipe, fittings and couplings
- Water strainers and filters
- Water flow switches
- Water tank
- Water ball valves and drain valves
- Water level switch
- Water sight glass
- Water flexible connectors
- Water pressure switches
- Water manifold
- Water pressure reducing valves
- Water pipe hangers
- Manual release
- Water additive

Assessment

- Examination
- Marking
- Strength test
- Internal pressure test
- Leakage test
- Corrosion tests
- Function/operation tests
- Long term ageing tests
- Thermal shock test
- Nozzle clogging test
- Pump running test

Next steps



Component and system approval

- Testing is critical, however it can only give a snapshot in time
- Approvals provide continual confirmation of:
 - Components
 - System fire tests
 - System design methods
 - System installations

Summary

LPS1283 should increase confidence in the market and should provide end users with an approved system that has been robustly assessed, has met performance requirements for components, systems and fire tests and has clear limits of application.

Manufacturers within the scheme will be subject to on-going assessments. Approval (or certification as it is known) by an independent third party provides reassurance that a product or service meet the appropriate standard and through regular Factory Production Control (FPC) audits ensures that the product or service continues to meet the requirements of the standard.



Thank you

Louise Jackman
LPCB

01923 664948

Jackmanl@bre.co.uk