



**Fire Protection
Association**
Project Consultancy

Watermist protection of commercial risks: Demonstrating competent design

IWMA 16th International Watermist Conference

21st & 22nd September 2016: Vienna Austria

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RISK INSIGHT, STRATEGY AND CONTROL AUTHORITY

Reducing insurable risk through research, advice and best practice

FPA, RISCAuthority & Watermist

- Authors of UK Defence Standards for watermist protection of warships
- Development and proving of watermist protection for Astute and Successor submarines



- Technical advisors to UK insurance industry through RISCAuthority
- Litigation SME advisers to legal profession for system failures
- Technical advisors to UK Ministry of Defence through NAIA
- Business & Property (Resilience focus)

Reference Documentation (www.RISCAuthority.co.uk)

Objective: to demonstrate that Watermist is the correct technology choice and that it has been integrated with the environment it operates within to optimise / assure performance.

Water Mist is a form of active fire protection that, like all extinguishing technologies, can be effective in the protection of certain, but not all, risks.

The questions herein are intended to elicit information that could be useful in providing evidence of the "equivalence" of such systems to alternative fixed firefighting systems and their associated published and recognised standards.

It is recommended that one of these forms be completed for each risk to be protected by water mist systems. This form is to be used to capture and record some of the data required to support a reasonable claim of "equivalence" and to provide evidence of sound engineering practice. In Fire Engineering Documents "equivalency" must be demonstrated BOTH in terms of firefighting capability AND reliability.

Do not use this form for local application systems, or building compartment protection systems of the 'thermally-actuated' close head type (separate forms are available for these systems, IQ 2 and IQ 3, respectively).

Form IQ 1
Version 2.0 November 2015

IQ 1

Water Mist Questionnaire: Building Compartment Protection – 'Deluge' open-head systems

To be completed at the design and proposal stage of suppression system planning

Issued by:

DOCUMENT SCOPE: Building Compartment Protection - Deluge open head systems

For the purposes of this exercise 'Building Compartment Protection - 'Deluge' open head systems' refers to installations protecting building compartments to their boundaries with open head spray heads arranged to mist the compartment in its entirety upon activation. Systems using 'zoning' within compartments are excluded.

NOTE: COMPLETION GUIDANCE NOTES

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Form IQ 2
Version 2.0 November 2015

IQ 2

Water Mist Questionnaire: Local Application Protection

To be completed at the design and proposal stage of suppression system planning

Issued by:

DOCUMENT SCOPE: Local Application Protection

For the purposes of this exercise 'Local Application' refers to installations protecting individual items of equipment whose correct function has NO RELIANCE upon any properties of, or over the existence of, the building compartment boundaries in which the protected item may be located.

NOTE: COMPLETION GUIDANCE NOTES

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Do not use this form for local application systems, or building compartment protection systems of the 'deluge' open head type (separate forms are available for these systems, IQ 2 and IQ 1, respectively).

Form IQ 3
Version 2.0 November 2015

IQ 3

Water Mist Questionnaire: Building Compartment Protection – Systems incorporating 'thermally-actuated' closed heads

To be completed at the design and proposal stage of suppression system planning

Issued by:

DOCUMENT SCOPE: Building Compartment Protection – Systems incorporating thermally actuated closed heads

For the purposes of this exercise 'Building Compartment Protection - Systems incorporating thermally actuated closed heads' refers to installations protecting building compartments to their boundaries with closed head thermally actuated 'ballcock' spray heads arranged to protect the compartment in its entirety. Systems using 'zoning' within compartments are excluded.

NOTE: COMPLETION GUIDANCE NOTES

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1. IQ1 - Water Mist Questionnaire - 'Deluge' open-head systems
2. IQ2 - Water Mist Questionnaire - Local Application Protection
3. IQ3 - Water Mist Questionnaire - Systems incorporating 'thermally-actuated' closed heads

What has prompted this work?

We see a great number of cases where watermist is used but:

1. the protection capability is misunderstood by the owner
2. it is not the best choice of media for the application
3. it is the correct choice but it is very poorly implemented
4. there is concern over the use of 'closed heads' in large arrays and 'equivalency' specification with sprinkler systems

Significant financial losses have occurred in the commercial sector where watermist suppression systems have underperformed and reputation of watermist is being damaged

1. Protection Objective Clarity

Confusion of performance terminology:

- **Extinguishing system** – extinguishes and secures the fire against refresh 100% - no other actions necessary
- **Suppression system** – holds the fire in a constrained state until other factors are deployed to actually put the fire out (i.e. manual 1st aid fire-fighting or F&RS in association with alarm raising)

However

Definitions

- Wikipedia

*“Automatic fire **suppression** systems **control and extinguish fires** without human intervention. Examples of automatic systems include fire sprinkler system, gaseous fire suppression, and condensed aerosol fire suppression.”*

- Manufacturer’s / Supplier’s website

*“Fire **Suppression** Systems & Automatic Fire **Suppression** Systems **control and extinguish fires** in buildings without human intervention. Automatic Fire Suppression Systems fall into two categories engineered and pre-engineered systems. Fire Suppression Systems can use a variety of extinguishing agents depending on the assets it is designed to protect.”*

Question: What is the average man in the street supposed to think?

Definitions

Confusion of Terminology between 'Extinguishing system' and 'Suppression system' means -

- The average end-user may have safety systems in place that assume one level of performance (extinguishment), which ultimately turn out to be useless in mitigating loss because the system can only 'suppress'.
- Legal investigations ongoing currently where this has been the case for watermist and other technologies (incl. gas / aerosol)
- For an 'expert solutions provider' to provide a 'suppression system' in a safety framework where other actions are required to meet the safety ambition, but not provide them or note their need, could be legally challengeable



Design Objectives

It is vitally important to understand the Design Objectives for the system as this can remove much of the complexity of the design:

- Guaranteed Extinguishment of fire
- Suppression of fire until other actions can be implemented
- Prevention of flashover
- Security of escape routes for a defined period of time
- To meet Building Regulations (Passive make-up)
- Business & Property / Process protection (£)
- Etc.

2. Choice of media

Watermist is best where:

LOCAL APPLICATION

- Momentum of the mist is maintained
- Mist densities are high

COMPARTMENT PROTECTION

- The compartment is sealed
- The fire is LARGE in comparison to the volume of the enclosure
- Fuels have high heat output (Class B liquid fuels)
- Fuels burn on the surface
- Ceiling heights are low

BOTH

- *Suppression* rather than *guaranteed extinguishment* is the objective



2. Choice of media

Yet we still see it specified in applications with multiple characteristics of:

- big volumes with high ceiling heights
- often well ventilated
- Class A, deep-seated & smouldering fuels
- complex geometries
- with a necessity to extinguish

and, as 'expert system providers' failure of poorly selected systems will be, and is, challenged in the courts following loss

3. Correct technology poor implementation

The most prevalent source of problems observed for all active fire protection systems, examples:

- Design intention is not properly understood (i.e. property protection vs. LS)
- Risk never properly investigated and/or understood
- System design never validated against appropriate risk (marine)
- System design does not consider all 'modes' of operation of the equipment it is protecting
- Very short water supply durations in comparison with shut down & control of ignition sources *



3. Correct technology poor implementation

- Activation of system not interlocked with:
 - Power
 - Fuel
 - Ignition sources
 - Ventilation
 - Conveyancing equipment (conveyor belts)
- Inappropriate detection in the context of suppression system's / risk's needs*
- Insufficient guidance, training, and manuals
- Poor ergonomics
- Inappropriate referencing of sprinkler equivalency *
- No overall ownership
- Fraud and mis-selling (poorly regulated market)

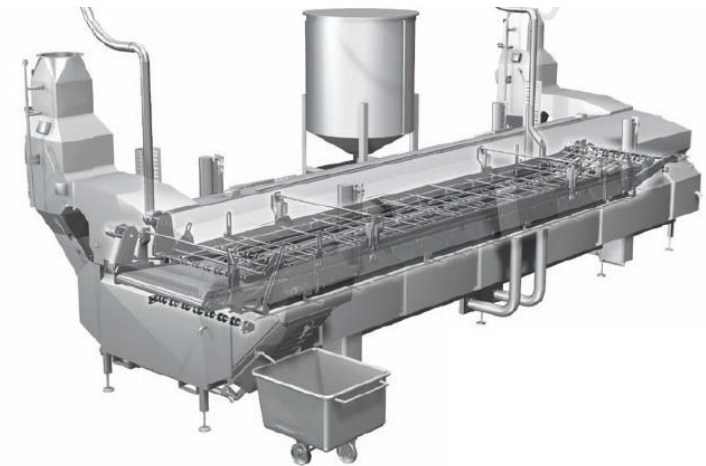


Real Case Study

Proposal made for a system to protect a deep fat fryer.

Design documentation presented:

- Nozzle numbers and positions
- Rudimentary detection system description
- Discharge time (water capacity) 10 minutes
- Large bundle of Approvals Documentation
- Letter stating imminent Approvals with well recognised organisations

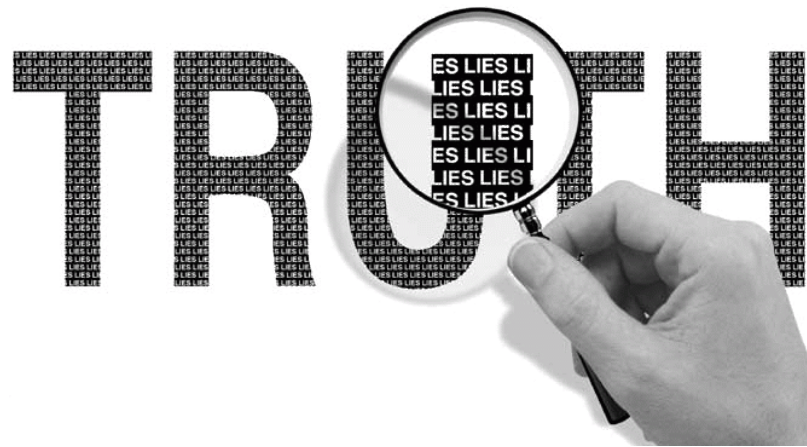


Real Case Study

Insurer analysis made using IQ2

The reality:

- NO interlocking of gas supplies, ventilation or conveyancing with WM operation
- NO approvals relevant to deep fat fryers (paperwork was for a marine compartment system using different nozzles and sundry other QA stuff)
- NO test data or evidence of operation on deep-fat fryers
- The supposedly 'proven' 10 minute discharge time is the minimum allowed IF the system had gone through FM/UL testing (which it had not)*
- Contact made with one of the 'imminent approvals bodies' – they had never heard of the company
- Some key areas of the machine were unprotected
- System design only considered 'normal operation'. No capability to protect during high risk times of maintenance or malfunction.



Real Case Study



But it's not all bad news:

Going through the questionnaire with the installer resulted in enough of the issues being addressed in a revised design for it to be considered acceptable to the insurer

Future challenge is to ensure these Questionnaires are a 'starting point' for installers to work with – we are currently working closely with FIA to make IQ2 an 'industry document'.

4. Large array 'Closed-Head' Systems



- To all intents and purposes (on-shore property protection) these systems do not currently exist
- BS 8489 will be an enabler for their introduction to the UK
- FPA / RISC Authority / ABI have the following grave concerns:
 - Fundamental operational technical shortcomings in the use of 'bulbed' watermist heads
 - An almost certain belief of 'equivalency' with sprinkler systems – when they are actually performing very different roles



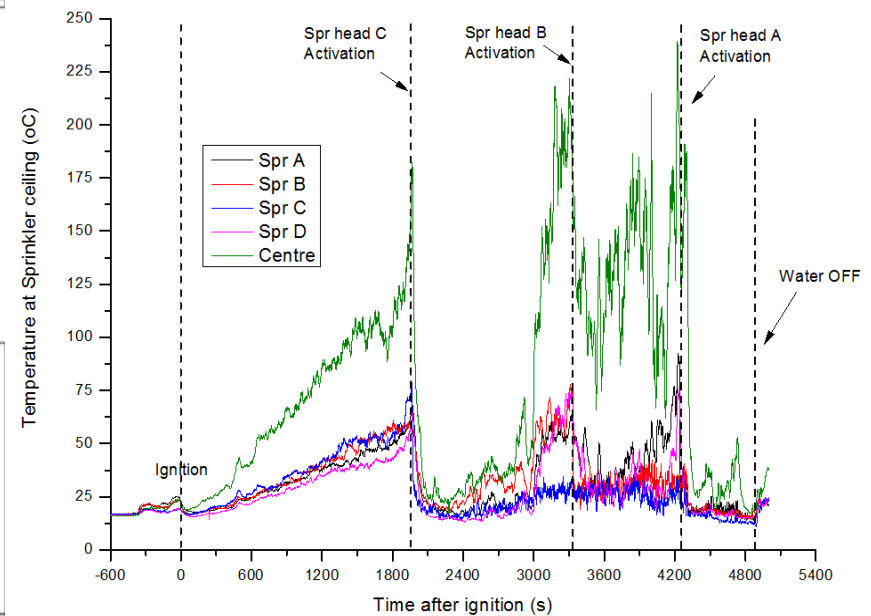
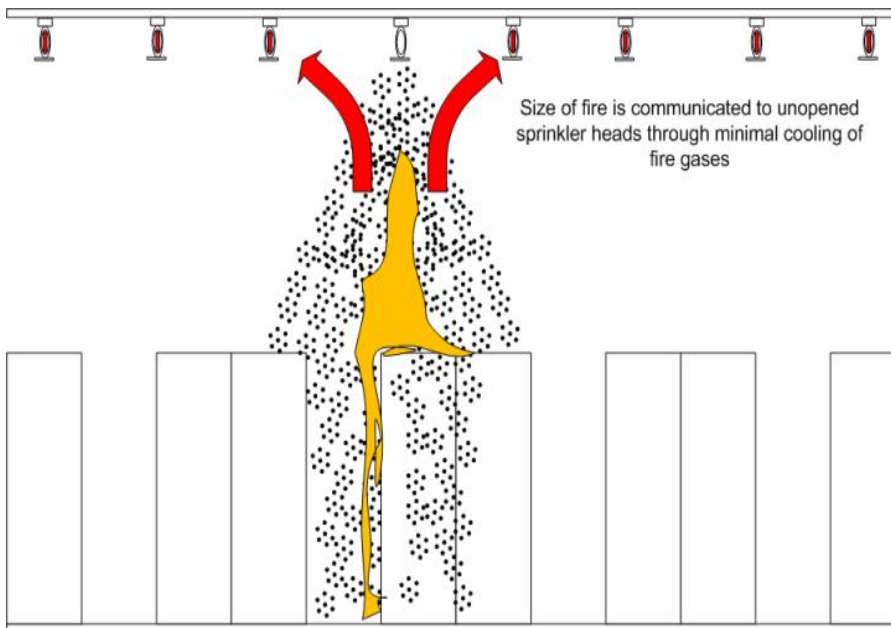
'Closed-Head' Systems



- 'Closed-head' or 'bulbed' systems demand good communication with the fire so the next head to open knows when it is needed
- In sprinkler systems this is achieved through:
 - Ensuring droplets do not cool the gas layer (large droplets)
 - Ensuring spray cannot impinge directly upon adjacent heads
 - Limiting ceiling heights
 - Controlling ceiling clearance above stock

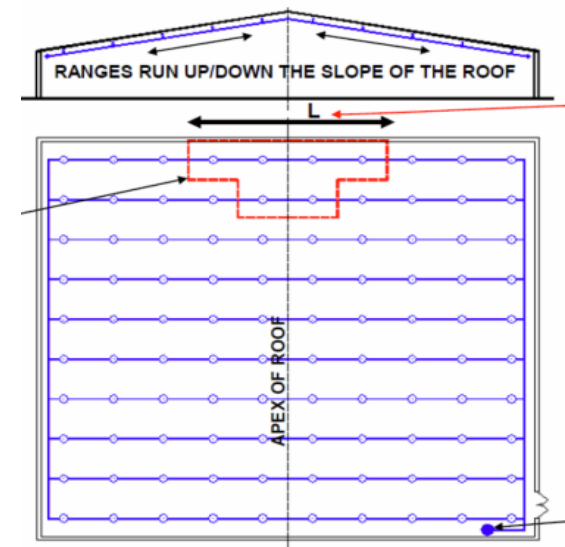
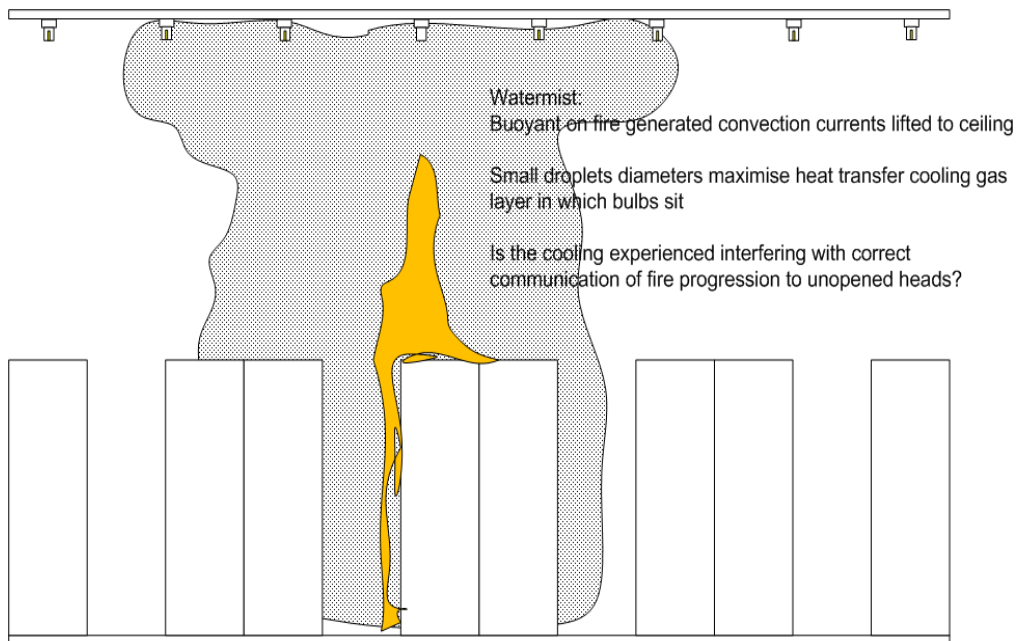


Full-Scale Sprinkler System Activation Data



'Closed-Head' Watermist Systems

- Watermist droplets
 - Cool in the gas phase immediately upon leaving the nozzle
 - Are buoyant on a fire plume and may hug the ceiling
 - Limit temperature almost universally to near-steam temperatures





Equivalency

Where EQUIVALENCY is request between competing water-based suppression systems (as is the case for building codes), the following must be considered in full:

- PERFORMANCE** – ability to tackle all fire challenges against the design objective
- RELIABILITY**
 - the ability of the system to deliver water when required
 - the ability of the system to NOT deliver water when NOT required
- EXTENT OF PROTECTION** – (Voids and all)

There is little by way of codes or standards to dictate that watermist systems will have many of the features that we know make Sprinkler Systems effective for the long term protection of property and business:

It will need to be specified separately – and this is addressed in the IQ series!

Why do we need questionnaires for watermist?

- Repeated calls from insurers for guidance, especially when proposed in place of sprinkler systems
- A need for RISC Authority to promote new technologies to where they can provide most benefit for business and property protection - in the right places watermist can be the BEST option.
- To allow the designer /s pecifier to demonstrate to the purchasers/insurer that a full and appropriate job has been/will be done in the design and implementation of the system



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Form IQ 1
Version 2.0 November 2015

IQ 1

Water Mist Questionnaire: Building Compartment Protection – 'Deluge' open-head systems

To be completed at the design and proposal stage of suppression system planning

Issued by:

DOCUMENT SCOPE: Building Compartment Protection - Deluge open head systems

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Version 2.0 November 2015

IQ 2

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Form IQ 3
Version 2.0 November 2015

IQ 3

Water Mist Questionnaire: Building Compartment Protection – Systems incorporating 'thermally-actuated' closed heads

To be completed at the design and proposal stage of suppression system planning

Issued by:

DOCUMENT SCOPE: Building Compartment Protection - Systems incorporating thermally actuated closed heads

For the purposes of this exercise 'Building Compartment Protection - Systems incorporating thermally actuated closed heads' refers to installations protecting building compartments to their boundaries with closed head thermally actuated 'bulldog' spray heads arranged to protect the compartment in its entirety. Systems using 'roving' within compartments are excluded.

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Water mist questionnaires

- Questionnaires ONLY ask details of the steps that MUST be taken in the provision of an effective water mist response
- **Difficultly to complete may indicate that all the bases have not been covered and should serve as a warning**
- The intention is to develop further questionnaires for gaseous extinguishing systems

Thank you

Dr Jim Glockling
Technical Director
Fire Protection Association

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www.thefpa.co.uk



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