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Condensed Aerosol Fire Extinguishing Systems (CAFES) is a form of active fire protection that, like all extinguishing technologies, can be effective in the protection of certain, but not all risks. As an 'extinguishing' system, the primary requirement of the overall design is to completely extinguish the fire, and control all other features that may act to re-ignite the fire, to make reignition impossible – no further intervention, such as attendance by fire service, should be necessary.

As systems that can be harmful to humans, their use is restricted to compartments that are not normally occupied, or where interlocks and pre-alarms will guarantee successful evacuation and compartment isolation before discharge.

The questions herein are intended to elicit information that could be useful in providing evidence of being equal to, or better than, 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 a condensed aerosol system. 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 in terms of *firefighting capability, reliability, and safety*.

Do not use this form for in-cabinet (see IQ5) or local application protection scenarios.

Form: IQ 4

Version 2 April 2023

# **IQ 4**

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# Condensed aerosol fire extinguishing systems (CAFES) compartment protection applications

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To be completed at the design and proposal stage of building planning

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Issue by:

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## NOTE: COMPLETION GUIDANCE NOTES

Completion of this form neither guarantees building performance or acceptance by the issuer. It is strongly recommended that each completed form and the supporting data be reviewed by an independent expert.

## DOCUMENT SCOPE: Building Compartment Protection

For the purposes of this exercise 'Building Compartment Protection' refers to installations protecting building compartments to their boundaries (fire compartment boundaries) with generators arranged to fill the fire compartment in its entirety upon activation. Systems using 'zoning' within compartments are excluded.

## IMPORTANT NOTICE

This document has been developed by RISCAuthority and published by the Fire Protection Association (FPA). RISCAuthority membership comprises a group of UK insurers that actively support a number of expert working groups, developing and promulgating best practice for the protection of people, property, business and the environment from loss due to fire and other risks.

The technical expertise for this document has been provided by the Technical Directorate of the FPA, external consultants, and experts from the insurance industry who together form the various RISCAuthority Working Groups. Although produced with insurer input it does not (and is not intended to) represent a pan-insurer perspective. Individual insurance companies will have their own requirements which may be different from or not reflected in the content of this document.

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## COMPLETION GUIDANCE NOTES:

This questionnaire is designed to elicit technical information required to underpin a satisfactory fire protection system design. As such, it covers many areas of system design. To avoid confusion as to what information is required at each question, it is suggested that the questionnaire is read in its entirety prior to commencing completion.

Where multiple discrete extinguishing systems are proposed, it will simplify the process of completing the questionnaire, to complete a separate questionnaire for each system.

In all cases, if insufficient space is provided to answer the questions in the questionnaire, continue on separate sheets. If separate sheets are used, indicate this is the case and record the document number, title, issue number and date at the location of the question.

Completion of this form neither guarantees system performance nor system acceptance by the issuer. It is strongly recommended that each completed form and supporting data be reviewed by an independent expert.

Failure to be able to provide answers to any of the questions might demonstrate there to be a shortfall in the knowledge and evidence that the FPA considers to be appropriate to the implementation of a quality extinguishing system.

## Scoring matrix for completion ONLY by insurer/trade association or AHJ

The table below is for completion by the insurer/trade association or AHJ and NOT by those proposing or designing the condensed aerosol system. The matrix is made visible to assist those completing the form understand in advance the key elements considered fundamental to the delivery of a quality condensed aerosol system.

Questions – For the risks described:		Answer
1.	Does the overall design appreciate that CAFES are ‘extinguishing’ systems that must extinguish the fire and control all features that might act to reignite the fire, ensuring reignition is not possible (no external assistance required, such as Fire Service attendance, as might be the case for a ‘suppression’ system)?	
2.	Are sufficient controls in place to ensure the protected space is uninhabited, and appropriately sealed for agent retention, prior to agent discharge?	
3.	Are the referenced product standards, approvals, and third-party installer qualifications appropriate to this protection scenario?	
4.	Is the extent of coverage and maximum area of operation appropriate to the fire threats?	
5.	Where required in fire-engineered solutions, has ‘equivalency’ for <i>Performance</i> (ability to put out fire), <i>Reliability</i> (ability to actuate and perform optimally upon a fire starting over time), and <i>Safety</i> (impact on people) been demonstrated against e.g. a BS alternate fire protection system?	
6.	Has the protected compartment been assessed to ensure that the extinguishing agent will not exceed the pressure strength of the compartment upon activation, and will be retained for sufficient duration to extinguish and nullify all sources of reignition?	
7.	Does the fire test evidence provided adequately ensure system capability in terms of the risk, scale, detection method, ceiling height, fuels, ventilation etc.?	
8.	With reference to 7, has due consideration been given to all operating modes of the equipment or compartment (i.e. normal, in-maintenance, in-cleaning, dirty (grease build up etc.) temporary / backlog storage etc.) to ensure 100% system operability?	
9.	Is the detection method and equipment appropriate to ensuring the system actuates before the fire grows to a size that might be ‘unmanageable’ or result in excessive damage?	
10.	Are the interlocks with fuel, ventilation, plant control, conveyors etc. appropriate to ensuring the system has the best opportunity to function correctly?	
11.	Have sufficient measures been taken to mitigate single-point failure modes?	
12.	Have sufficient measures been taken to mitigate unwanted system activation?	
13.	Have sufficient measures been taken to ensure condensed aerosol generators will not become obstructed, damaged or subject to water ingress?	
14.	Are all components of the system approved by a third-party certifying body?	
15.	Will the system be installed by an accredited organisation (i.e. to LPS 1204: Issue 3.2 Requirements for firms engaged in the design installation, commissioning, and servicing of gas extinguishing & condensed aerosol systems)?	
16.	Is the ‘performance objective’ of the system correctly assessed (extinguishment) together with an appreciation of any simultaneous and follow-on actions required to satisfactorily bring the fire threat to a conclusion?	

Questions – For the risks described:		Answer
17.	Is it understood that a performance objective of 'suppression' or 'control', rather than 'extinguishment' is not a correct objective for this type of system?	
18.	Where manual operation of the system is an option, have appropriate instructions been given to the end-user and are means in place (training and signage) to ensure this is appropriately communicated?	
19.	Is the design correct and is the effective duration correctly calculated for all areas of varying height, all in accordance with the manufacturer's instructions?	
20.	Have roles and responsibilities for all decisions of design and installation of the system been correctly identified?	
21.	Is condensed aerosol, as described in this completed form, the ideal suppression technology to use?	

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1 Location	
1a. Full address(s) of premises with risk(s) to be protected:	

2 Roles and responsibilities – System design		
2a. Entity responsible for the design of the water mist system	Company or organisation's name	
	Responsible person's name & job title	
	Company or organisation's address	
	Accreditations held for design (i.e. to LPS 1204)	

3 Roles and responsibilities – System installation		
3a. Entity responsible for the installation of the condensed aerosol system (if different to question 2a above)	Company or organisation's name	
	Responsible person's name & job title	
	Company or organisation's Address	
	Accreditations held for installation (i.e. to LPS 1204)	

4 Condensed aerosol component supplier(s)
4a. Give the name and address of the condensed aerosol component supplier(s):

5 Condensed aerosol component details for critical and key components	
<i>Note: System Installation Standards and approvals are dealt with at 14</i>	
Condensed aerosol generators	
Sequential activators	
Fire suppression control panel	
Cable and accessories	
Fire detection	
Alarms	
Other components critical to system function	

**6 Condensed aerosol system properties**

In the following sections, please give details of the system properties

6a. What is the active extinguishing agent used?

6b. What metals are used for the cannister body, fixings, and connectors?

6c. Are the condensed aerosol materials (container and agent) compatible with the compartment type and use identified in 7c?

6d. What is the anticipated life-span of the system for the compartment type and use identified in 7c?



7 Compartment details			
<i>In the following sections, please give details of the size and occupancy of the compartment, including details of whether it is an occupied space</i>			
7a. Compartment size:	Width (m)	Length (m)	Height (m)
7b. Describe the function of the building the compartment is in:			
7c. Describe the function of the compartment:			
7d. Describe why the compartment needs protection:			
7e. Compartment occupation details:	Never occupied	Never normally occupied	Normally occupied
7f. What are the major sources of fuel and energy within the compartment?			
7g. Does the compartment contain materials that are hazardous but non-combustible?			
7h. What are the major sources of ignition within the compartment?			

## 7 Compartment details

7i. Give details of any automated movement of combustible materials, including combustible components of any transportation or conveyance system within the protected compartment (if a process requiring protection involves automated transport of combustible materials or flammable liquid flows within the protected cabinet (e.g. a conveyor), state velocities and mass flow rates):

7j. Are the visible boundaries of the room the same as the fire compartment, or are there hidden voids (false ceiling/raised floors etc.)?

Please describe any voids giving locations and dimensions

7k. What is the ambient temperature range of the compartment?

7l. Provide details of building construction and fire protecting separation. Include details of fire-resisting separation between the protected compartment and adjacent compartments. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number, and date here):

8 Condensed aerosol system design		
<i>In the following sections, please give details of the system design</i>		
8a. Is the information on the product Safety Data Sheet acceptable for this application?		
8b. What is the system design concentration?	Concentration g/m <sup>3</sup>	
8c. How many generators of each size will be used to achieve the design concentration?	Size	Number
8d. What is the expected agent retention within the generator?		
8e. Which standards test fuel load-certificated concentration has been used as the basis for protecting the fuels identified in 7c?		
8f. What safety factor has been applied to the provision of agent (% above minimum extinguishing value as determined through standards tests)?		
8g. What is system design discharge time?		
8h. What is the system design agent retention time (time that the compartment will hold an extinguishing concentration for)?		
8i. Does the protected compartment have sufficient integrity to contain the extinguishing agent after discharge?		
8j. Does the protected compartment have sufficient structural strength to withstand the increase in pressure caused by the extinguishant discharge?		

8 Condensed aerosol system design	
8k. Will any generators be positioned at a location higher than their permitted height – if YES, how will the design accommodate this?	
8l. Confirm the agent is compatible with any chemicals it will be exposed to in the protected risk:	
8m. Are the visible boundaries of the room the same as the fire compartment, or are there hidden voids (false ceiling / raised floors etc.)? Please describe any voids giving locations and dimensions	
8n. Does the ambient temperature of the risk area fall within the manufacturer's recommended parameters?	
8o. Has the structure been assessed/modified to withstand any increase in pressure when the system is discharged?	
8p. Has the structure been assessed for capability to hold the agent for the necessary post discharge time?	

## 9 Ventilation and Interlocks

9a. What systems are in place to ensure the system cannot operate whilst the compartment is occupied?

9b. Provide details of ventilation systems (including smoke ventilation) present in the condensed aerosol protected compartments. Will any ventilation system be operational during condensed aerosol system operation (it is normally a requirement to shut down all forced air movement)? Give details of any interlock controls. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number, and date here):

9c. In relation to possible natural and forced (wind) ventilation sources. Provide details of doors, windows, shutters, other openings, and controls upon their use:

9d. Is any process equipment or machinery within the protected space?

If 'yes', provide a full description and describe any interlocks provided to enable the condensed aerosol system to perform optimally:

Electrical power

Gas supply

Other fuels

9 Ventilation and Interlocks	
Forced ventilation (fans)	
Natural ventilation (doors and windows)	
Ductwork dampers and fire barriers (physical barriers to block fire spread)	
Conveyors (to stop spread of fire by transport systems)	
Rotating machinery	
Hot machinery	
Other	
Other	

## 10 Resilient design features

10a. Please indicate below any design features in-built to prevent single-point failures within key system components from rendering the system ineffective (such as duplication and automatic reconfiguration):

Loss of power	
Failure of detection device	
Damage to electrical circuit	
Failure of main isolation / actuation valve	
Failure of interlocks as specified in 9	
Damage to condensed aerosol system	
Other	
Other	
Other	
Other	

If 'yes' to any of 10a please describe in full:

10b. Please state all conditions of compartment configuration that would cause the system to not extinguish a fire (i.e. doors open, ventilation left running etc.):

## 11 Post-discharge ventilation

11a. Provide details of post-discharge condensed aerosol extract systems, if any:

## 12 Avoidance of unwanted discharges

12a. Confirm that every condensed aerosol system is fitted with a device to allow for the system to be isolated:

12b. Advise on what measures have been taken to avoid an unwanted discharge:

12c. Where there are multiple condensed aerosol systems (or similar) that may cause adjacent systems to activate unnecessarily, advise on what precautions have been taken to avoid this scenario:



**13**      Compensatory/trade-off and fire-engineered features

13a. Are any trade-offs/compensatory features proposed as a result of the presence of the system? If so, provide full details. Where part of a fire-engineered solution, please provide details of the Fire Strategy. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number, and date here):

13b. If there is a remit for this system to be 'equivalent' to a BS extinguishing system, demonstrate how 'equivalency' for *Performance* (ability to put out fire), *Reliability* (ability to actuate and perform optimally upon a fire starting over time), and *Safety* (protection of people) has been assured.

Commentary and recommendations on fire test evidence:

- Fire testing shall be undertaken by an independent test body.
- The test body shall be accredited by a national accreditation body for undertaking such work.
- Fire test evidence shall be presented in formal test reports issued by the independent test body.

14 Standards, approvals, and performance evidencing
<p>14a. Which specification(s) is the system designed to?</p>
<p>14b. Who is the provider of the installed system third-party certification? (i.e. Lloyds, LPCB, Warrington, VdS, FM etc.)</p>
<p>14c. Fire test evidence – please provide the accredited third-party test report(s) that demonstrate the system performance in a representative scenario for all parts of the condensed aerosol protected property* with reference to answers given in 2,3 &amp; 5. List here by: issuing body, title, date, report number. Please provide copies of reports separately:</p>

\* With reference to e.g. system operating parameters, scale, the risk protected, obstructions, ceiling height, detection method, detection performance, and system performance objective.

## 15 Any other relevant data

15a. Details of all drawings, calculations, and documents supplied with this questionnaire which have not already referenced in previous questions above, or that contain additional parts that require consideration. (Continue on separate sheets if necessary. If separate sheets are used record the document number, title, issue number, and date here):

## 16 Declaration

I am authorised to represent the company identified below (16d) making this submission. I have supplied full and accurate information as required by this form.

16a. Name (please print)	
16b. Signature	
16c. Date	
16d. Representing (Please print company name)	

## Appendix A – Minimum supporting documentation which must be supplied with the completed questionnaire

At least the documentation identified in A1 to A4 shall be provided with this questionnaire. Any drawings shall be at a scale of not less than 100:1.

- A.1 A general specification for the system.
- A.2 A block plan of the premises showing:
- a) compartmentation;
  - b) the installation and the details of the protected object, space, or area;
  - c) the extent of the protection;
  - d) a cross-section of the protected object, space, or area
  - e) location and rating of fire boundaries.
- A.3 Design and operation manual for the condensed aerosol system.
- A.4 The following documentation shall be provided to support the questionnaire as part of the design process:
- A summary schedule, which shall include the following:
    - a) the name of the project;
    - b) drawing and document references including issue number, issue dates, and titles;
    - c) the installation type(s);
    - d) number and type of condensed aerosol generators;
    - e) the configuration of the actuation circuit.
  - Layout drawings of the condensed aerosol installation(s). The drawings shall include:
    - a) the north point indication;
    - b) the level of protection provided for each protected compartment;
    - c) constructional details of floors, ceilings, roofs, partitions, exterior walls in close proximity to the protected object, space, or area;
    - d) condensed aerosol generators;
    - e) indication of obstructions which may adversely influence performance of condensed aerosol generators;
    - f) the fire detecting means and their method of detection;
    - g) location and type of isolators and delay devices;
    - i) fire alarms, sounders and alarm panel;
    - j) cable type, size, and route;
    - k) a key to the symbols used on drawings; and
    - l) a schedule of condensed aerosol generators, their fire detection means, and the areas they protect.
- A.5 Condensed aerosol design
- Details shall be provided which show how the number and type of condensed aerosol generators has been determined;
- The calculations should show:
- a) volumetric calculations of protected volume;
  - b) the date of the data provided;

- c) the extinguishing application density for the class of fire risk;
- d) the safety factor used to determine the design application density;
- e) allowances made for un-closable openings;
- f) confirmation that the type of condensed aerosol chosen has suitable discharge characteristics for the area it is protecting;
- g) the density of condensed aerosol to be provided is within acceptable parameters.

The maximum equivalent leakage area for the system should be determined, based upon manufacturer's data. Verification should be obtained that the protected space has an equivalent leakage area less than the calculated ELA.