Condensed aerosol fire extinguishing systems (CAFES) in-cabinet protection applications

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

Issue by: Ins.Co./Trade Ass/AHJ name here

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: In-Cabinet Protection

For the purposes of this exercise 'In-cabinet protection' refers to installations protecting individual items of equipment within cabinets whose correct function has NO RELIANCE upon any properties of, or even the existence of, the building compartment boundaries in which the protected item may be located, but may require a degree of enclosure by the cabinet itself.

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 cabinets that are not normally occupied, or where interlocks and pre-alarms will guarantee successful evacuation and cabinet 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*. Please do not use this form for compartment (see IQ4) or local application protection scenarios.

Form: IQ 5

Version 2 April 2023

IQ 5

RISCAuthority

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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 cabinet is uninhabited, and appropriately sealed for agent retention (if required), prior to agent discharge?	
3.	Are the referenced product standards, approvals, and third-party installer qualifications appropriate to this protection scenario?	
4.	Where required in fire-engineered solutions, has 'equivalency' for *Performance* (ability to put out fire), *Reliability* (ability to actuate and perform optimally upon a fire starting over time), and *Safety* (impact on people) been demonstrated against e.g. a BS alternate fire protection system?	
5.	Has the protected cabinet been assessed to ensure that the extinguishing agent will not exceed the pressure strength of the cabinet upon activation, and will be retained (if required) or discharged (streamed) for sufficient duration to extinguish and nullify all sources of reignition?	
6.	Does the fire test evidence provided adequately ensure system capability in terms of the risk, scale, detection method, cabinet size, fuels, ventilation etc.?	
7.	With reference to 6 – has due consideration been given to all operating modes of the cabinet and associated equipment (i.e. normal, in-maintenance, open, in-cleaning, dirty (grease build up etc.) to ensure 100% system operability?	
8.	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?	
9.	Are the interlocks with fuel, ventilation, plant control, conveyors etc. appropriate to ensuring the system has the best opportunity to function correctly?	
10.	Have sufficient measures been taken to mitigate single-point failure modes?	
11.	Have sufficient measures been taken to mitigate unwanted system activation?	
12.	Have sufficient measures been taken to ensure condensed aerosol generators will not become obstructed, damaged, or subject to water ingress?	
13.	Are all components of the system approved by a third-party certifying body?	
14.	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)?	
15.	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?	
16.	Is it understood that a performance objective of 'suppression' or 'control', rather than 'extinguishment' is not a correct objective for this type of system?	

Questions – For the risks described:		Answer
17.	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?	
18.	Have roles and responsibilities for all decisions of design and installation of the system been correctly identified?	
19.	Is condensed aerosol, as described in this completed form, the ideal suppression technology to use?	

Contents

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	
Note: System Installation Standards and approvals are dealt with at 14	
Component (Make/Model)	**Approval details (standard and third-party certifying body)**
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 cabinet type and use identified in 7c?
6d. What is the anticipated life-span of the system for the cabinet type and use identified in 7c?

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

7	Cabinet details
7i. Give details of any automated movement of combustible materials, including combustible components of any transportation or conveyance system within the protected cabinet – 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. What is the ambient temperature range of the cabinet?	

8 Condensed aerosol system design		
In the following sections, please give details of the system design		
8a. Is the information on the product Safety Data Sheet acceptable for this application?		
8b. What is the system design concentration for this application?	Concentration g/m^3	
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. Will the fire be extinguished, and all potential sources of reignition annulled, within the discharge time?		
8i. What is the system design agent retention time (if part of the design) or discharge streaming time?		

8 Condensed aerosol system design	
8j. Does the protected cabinet have sufficient integrity to contain the extinguishing agent after discharge (if needed)?	
8k. Does the protected cabinet have sufficient structural strength to withstand the increase in pressure caused by the extinguishant discharge?	
8n. Does the ambient temperature of the risk area fall within the manufacturer's recommended parameters?	

9 Ventilation and Interlocks	
9a. What systems are in place to ensure the aerosol generators cannot operate whilst the cabinet is occupied?	
9b. Provide details of ventilation systems present in the protected cabinet. 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. Is any process equipment or machinery within the protected cabinet?	
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	
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	

9 Ventilation and Interlocks	
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 9c	
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 – or clean up procedures:	

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
14a. Which specification(s) is the system designed to?	
14b. Who is the provider of the installed system third-party certification? (i.e. Lloyds, LPCB, Warrington, VdS, FM etc.)	
14c. Fire test evidence – please provide the accredited third-party test report(s) that demonstrate the system performance in a representative scenario for in-cabinet use* with reference to answers given in 2, 3 & 5. List here by: issuing body, title, date, report number. Please provide copies of reports separately:	

* With reference to system operating parameters, cabinet size, the risk protected, 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 plan of the protected cabinet.

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) condensed aerosol generators;
  b) indication of obstructions which may adversely influence performance of condensed aerosol generators;
  c) the fire-detecting means and their method of detection;
  d) location and type of isolators and delay devices;
  e) fire alarms, sounders, and alarm panel;
  f) cable type, size, and route;
  g) a key to the symbols used on drawings;
  h) 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.