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PROPERTY INSURANCE COMMITTEE Prevention Specifications

CEA Specifications for fire-fighting systems using a gaseous extinguishant Requirements and test methods for system approval

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(EFSAC endorsed)

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1 Scope and field of application

These CEA Specifications specify requirements and describe test methods for systems for CO₂-, Inert Gas- or Halocarbon Gas-Fire Extinguishing Installations.

For the correct function of a fire extinguishing installation it is important,

- that all components are suitable for their use in fire extinguishing installations using the specific gas
- that connected components are technically compatible
- that all components are functionally compatible, which means that the combinations of the components ensure the correct function of the fire extinguishing installation in accordance with the corresponding CEA Specifications for fire extinguishing installations - Planning and installation

A fire extinguishing system incorporates all components which can be used in fire extinguishing installations and describes the combination of the components to fire extinguishing installations (see figure 1).

Systems differ in

- controlling
- triggering
- actuation

These CEA Specifications are applicable to systems where controlling, triggering and actuation are carried out

- electrically or
- pneumatically or
- mechanically or
- in combination.

These CEA Specifications should be used only as guidance for testing systems which work on principles different from the description in these CEA Specifications.

All pressure data in these CEA Specifications are given as gauge pressure, unless otherwise stated.

Note 1 bar = 10^5 N m^{-2} = 100 kPa

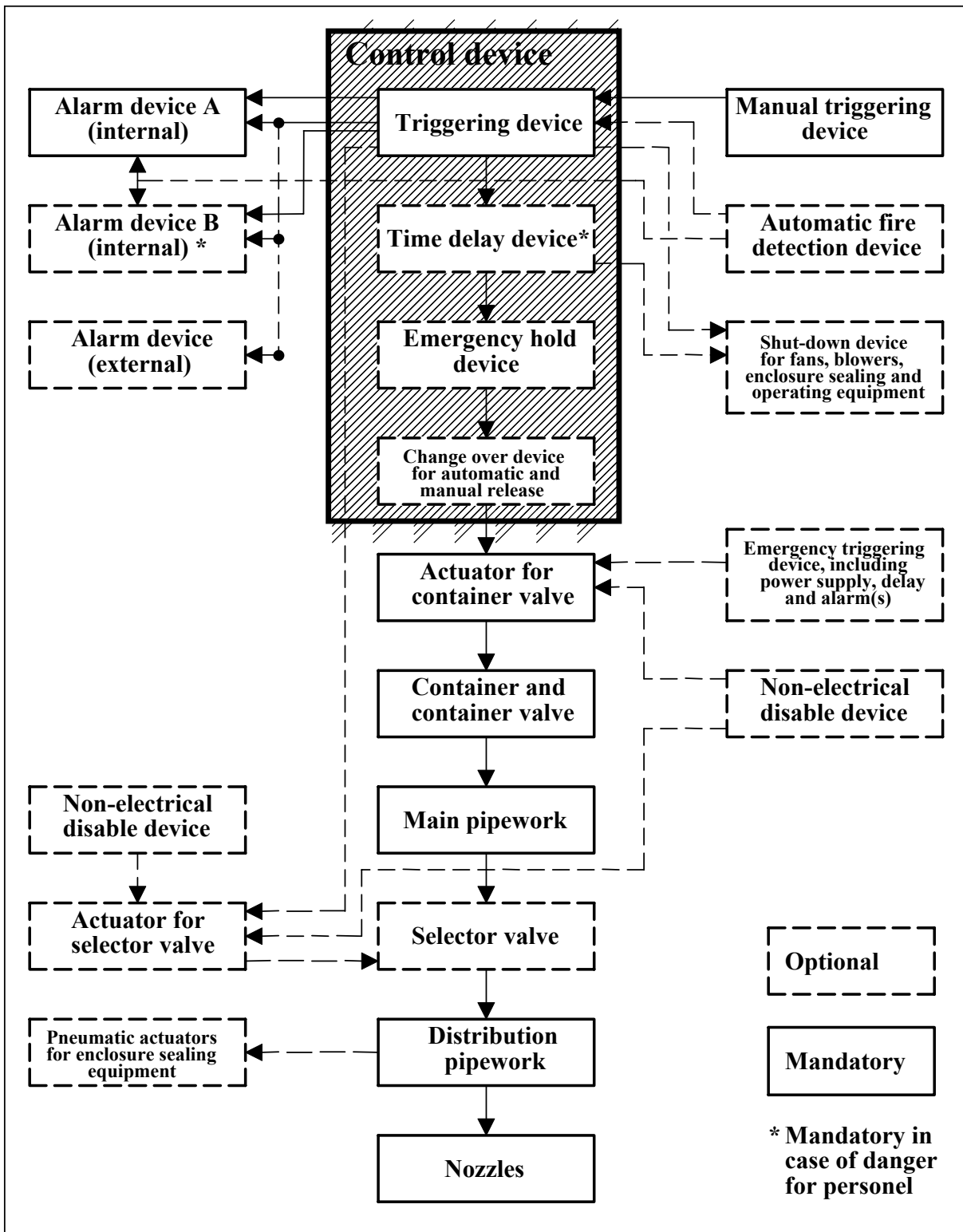


Figure 1: Example of a fire extinguishing system using a gaseous extinguishant

2 References

These CEA Specifications incorporate by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to these CEA Specifications only when incorporated in them by amendment or revision. For undated references the latest edition of the publication referred to applies.

- CEA Specifications for fire fighting systems using a gaseous extinguishant - Requirements and test methods for components

3 Definitions

For the purpose of these CEA Specifications the following definitions apply.

Actuation:

Operation of container valves and selector valves.

CO₂-high-pressure installation:

Fire extinguishing installation in which the CO₂ is stored at ambient temperature. For example, the pressure of the CO₂ in storage is $p_{\text{abs}} = 58,6$ bar at 21°C.

CO₂-low-pressure installation:

Fire extinguishing installation in which the CO₂ is stored at low temperature, normally -19°C to -21°C.

Compatibility:

technical compatibility: Ability of connected components to interact directly only with regard to the operational aspects of this interaction with e.g. defined type of power, range of power level or force, means for connection, function (e.g. valve and actuator).

functional compatibility: Ability of a defined combination of technically compatible components to interact, to realise the required design function of this combination of components.

Control device:

Device which receives a signal from a fire sensor, a fire detector, a fire detection installation or a manual triggering device and processes and transmits signals for actuation and auxiliary functions.

Delay device:

Component of the control device to delay the signal for actuation for a given period of time.

Electrical power supply:

Battery power supply and mains supply.

Fire extinguishing installation:

Installed system

Halocarbon Gas:

Extinguishing agent that contains as primary components one or more organic compounds containing one or more of the elements fluorine, chlorine, bromine or iodine.

Halocarbon Gas installation:

Fire extinguishing installation in which the Halocarbon Gas is stored at ambient temperature.

Inert Gas:

Non-liquefied gas or mixture of gases which extinguish the fire mainly by reducing the oxygen-concentration in the protected zone, like Argon, Nitrogen or CO₂ or mixtures of these gases.

Inert Gas installation:

Fire extinguishing installation in which the Inert Gas is stored at ambient temperature.

Functional reliability:

Ability to function under different working conditions.

Manual triggering device:

Manually-operated device to trigger the control device.

Operational reliability:

Resistance against wear.

Pre-warning time:

Period of time between activation of the evacuation alarm devices and the discharge of the agent.

System:

Selection of approved components tested for correct interaction and compatibility.

System delay:

system delay for alarms: Time between the triggering and the operation of the sounders.

system delay for discharge: Time between the response of a fire detection installation or a manual triggering device and the triggering of the actuator of the valve which causes the agent discharge, with a zero delay device time.

Triggering:

Transmission of a signal from the control device which causes the automatic operation of the fire extinguishing installation.

4 Requirements

4.1 Documentation

4.1.1 The system-supplier shall prepare and maintain documentation which specifies the installation, operation, routine testing and maintenance of the system.

4.1.2 The documentation shall be submitted to the testing authority and shall comprise at least the following:

- a) a general description of the system, including a list of the features and functions and including a list of the standard-configurations according to annex 1 or 2.
- b) a technical specification including:
 - type and level of power used for controlling, triggering and actuation
 - suitability for use in various environments
 - mounting instructions
- c) maintenance instructions

4.1.3 The system-supplier shall also prepare, maintain and submit the following detailed documentation:

- a) component list with all components of the system
- b) for all standard-configurations, descriptions and drawings showing
 - all components used in the system (identifiable)
 - the location of the components in the system
 - all connections of components

- necessary informations about the connections
- type and quantity of power supply
- available power supply (battery power supply and mains supply)

c) only for systems which use electrical energy for triggering, controlling or actuation:

detailed information about the interaction of the electrical control device (e.c.d.) and the non-electrical control device (n.e.c.d.) including at least:

- a document showing a list of all components in the system which need electrical signals, with the following information:
 - each function of the components
 - type of component
 - manufacturer
 - nominal voltage
 - working range of voltage
 - current consumption
 - requirements concerning the form of the signal (duration, delayed or undelayed)
 - delay of reset and time of delay if necessary
 - special conditions and other requirements if necessary for the correct function of the system
- and a system chart showing the relationship of the components performing these signals

This documentation shall also comprise details of any components specific to the manufacturer.

4.1.4 All documentation normally supplied and specified by the manufacturer for use by the end user shall be supplied with the system and constitute part of the supply.

4.2 Components

All components of the system shall be tested and approved in accordance with the relevant CEA Specifications for components of fire extinguishing installations.

If the system includes container valves without a test facility, the system shall include a test facility which can be used to separately test each group of containers actuated at the same time, to verify that the necessary type and level of power is provided. If this test facility incorporates an isolating device, which prevents discharge, there shall be physical protection against unauthorized operation (e.g. protective cover).

4.3 Technical compatibility and operating force

Components which are connected shall be technically compatible.

The available force shall be at least twice and in the case of pyrotechnical devices at least thrice the force necessary for the proper function of the components, when tested as described in clause 5.6.

4.4 Functional compatibility

All components shall be functionally compatible; that is the combination of the components in each documented standard-configuration shall ensure the correct function of the fire extinguishing installation in accordance with the corresponding CEA Specifications for Fire Fighting Systems - Planning and installation.

4.5 System delay

Under most unfavourable conditions the system delay for discharge shall not exceed 15 s, when tested as described in clause 5.8.

Under most unfavourable conditions the system delay for alarms shall not exceed 5 s, when tested as described in clause 5.8.

4.6 Power supply

4.6.1 The power supply shall be tested as described in clause 5.9.

4.6.2 For electrical power the manufacturer shall specify:

- current during the power supply fault warning condition
- current during the release cycle
- current during the operation of alarm equipment.

These values shall be tested as described in clause 5.9.

The reserve capacity for pneumatic power supplies (CO₂, air or permanent inert gases may be used) shall be at least five times the quantity required to execute a release cycle for control and discharge plus the quantity for alarm equipment with the maximum number of sounders for a period of at least 30 min. In the case of power supplies using CO₂ the content of the pilot pressure containers shall be at least 500 g.

4.7 Operational reliability

The system shall operate as intended, when tested as described in clause 5.10.

4.8 Test facilities

Provision shall be made for checking the complete function of the system excluding the function of cylinder valves. If necessary special means shall be provided for this e.g. connection for a pneumatic power supply for checking. The test shall be carried out in accordance with clause 5.11.

4.9 Flow characteristics

For individual components in the pipework downstream the manifold, flow resistance coefficients shall be specified and proven, when the documentation is tested in accordance with clause 5.4.

For each combination of container valve, container connection hose, check valve and, if applicable, dip-tube a common flow resistance coefficient shall be specified and tested as described in clause 5.12. This test can be dropped, if separate flow resistance coefficients for the components check valve and container valve including dip-tube, if applicable, are specified and proven and if the calculation of the common flow resistance coefficient is described and plausible.

5 Tests

5.1 Test conditions

The test samples shall be tested assembled as recommended for installation by the manufacturer. The tests shall be carried out at a temperature of (25 ± 10) °C, except when otherwise stated.

5.2 test data and test samples

All test reports of the components shall be made available. The need for tests with test samples depends on the system configuration and the available information.

The system configuration required for evaluation shall be specified by the laboratory.

5.3 Order of tests

The order of tests is:

- Documentation (5.4)
- Approval of the components (5.5)
- Technical compatibility and operating force (5.6)
- Functional compatibility (5.7)
- System delay (5.8)
- Power supply (5.9)
- Operational reliability (5.10)
- Test facilities (5.11)
- Flow characteristics (5.12)

5.4 Documentation

5.4.1 This test relates to the requirements of clause 4.1 and 4.9.1.

5.4.2 The submitted documentation shall be examined for completeness of information.

5.5 Approval of the components

5.5.1 This test relates to the requirements of clause 4.2.

5.5.2 The submitted documentation shall be examined to determine whether all components of the system are tested and approved in accordance with the relevant CEA Specifications.

5.6 Technical compatibility and operating force

5.6.1 This test relates to the requirements of clause 4.3.

5.6.2 The submitted documentation shall be examined to determine whether all connected components of the system are technically compatible with regard to the required effective force. The check has to take into account:

- type of power (e.g. pneumatic)
- range of level of pressure or force (e.g. 20 bar to 140 bar)
- required capacity of the power
- means for connection
- required effective force

5.6.3 For all combinations of connected components where the performance of interaction cannot be checked by examination of the documentation only, practical tests with test samples have to be carried out.

5.7 Functional compatibility

5.7.1 This test relates to the requirements of clause 4.4.

5.7.2 The submitted documentation shall be examined to determine whether for each standard-configuration the combination of components ensures the correct function of the system under consideration. If this cannot be checked by examination of the documentation only, practical tests with test samples have to be carried out.

5.7.3 In the case of electrical triggering, controlling or actuation, the submitted document showing the components which need electrical connections shall be examined to determine whether, in theory, the requirements for correct operation are in place. Following this the submitted document showing the components performing these signals shall be examined to determine whether these components fulfill the practical requirements.

5.7.4 In the case of electrical triggering, controlling or actuation, the performance of the electrical transmission shall be physically tested. The test samples shall comprise an e.c.d. with a manual triggering device and the components which need electrical signals.

5.8 System delay

5.8.1 This test relates to the requirements of clause 4.5.

5.8.2 The submitted documentation shall be examined to determine whether under the most unfavourable conditions the system delay for discharge does not exceed 15 s and the system delay for alarms does not exceed 5 s.

5.8.3 If this cannot be checked by examination of the documentation only, practical tests with test samples have to be carried out.

With the maximum configuration of components like alarm sounders, actuators and pipe volume connected, the n.e.c.d. shall be triggered under the most unfavourable power supply conditions, e.g. low temperature, and the system delay shall be measured and reported.

5.9 Power supply

5.9.1 This test relates to the requirements of clause 4.6.

5.9.2 The submitted documentation shall be examined to verify compliance with clause 4.6. If this cannot be checked by examination of the documentation only, practical tests with test samples have to be carried out in accordance with 5.9.3 or 5.9.4, where applicable.

5.9.3

For electrical signals, install the test sample with the specified power supply, e.c.d. and electrical components. Condition the test samples for a period as specified by the manufacturer in the fault warning condition "Power Supply Fault". Trigger the electrical components once. The connected alarm sounder(s) shall be run for at least a period as specified by the manufacturer.

For pneumatic signals, where applicable calculate the volume of pipe-work and components. Install the test sample with the specified power supply, n.e.c.d., the maximum number of sounders and a test volume equal to the calculated volume. Condition the test sample for at least 12 hours at (-20 +0/-3) °C. Trigger the n.e.c.d. five times. After the fifth cycle the alarm sounder(s) shall be run for at least 30 min, if connected to the same power supply.

5.10 Operational reliability

5.10.1 This test relates to the requirements of clause 4.7.

5.10.2 The submitted documentation shall be examined to determine whether in the combination of the components there are aspects of operational reliability other than those arising from the operational reliability of the components.

5.10.3 If there are other aspects of operational reliability specific to the system, functional tests with a test sample have to be carried out 100 times.

5.11 Test facilities

5.11.1 This test relates to the requirements of clause 4.8.

5.11.2 The submitted documentation shall be examined to determine whether there is provision for checking the complete function of the system without actually releasing the extinguishing media.

5.12 Flow characteristics

5.12.1 This test relates to the requirements of clause 4.9.

5.12.2 The submitted documentation shall be examined to determine whether the required flow resistance coefficients are specified and proven. Values not specified or not proven shall be determined in accordance with the CEA-Specification for the specific component. Flow resistance coefficients for combinations of container valve, container connection hose, check valve and, if applicable, dip-tube shall be tested as described in the CEA-Specification for container valve assemblies.

5.13 Other tests

Where special designs or new manufacturing methods make it necessary to conduct additional testing, this is to be carried out after consultation with the manufacturer.

Annex 2
Standard-configurations for CO₂-low-pressure systems

For marks	No. of f.z.	Pre-warning time	Design quantity per f.z.	Nr. of n.e.d.d	Delay device		Flooding time control		Secondary flooding time control			emerg.- Stop
					n.e.	n.e./e.	e.	n.e.	e.	n.e.	n.e./e.	
	1	none										
	1	e.c.d.										
	1	n.e.d.d.										
	multi	none	equal									
	multi	none	different									
	multi	e.c.d.	equal									
	multi	e.c.d.	different									
	multi	n.e.d.d.	equal	per f.z.								
	multi	n.e.d.d.	equal	1								
	multi	n.e.d.d.	different	per f.z.								
	multi	n.e.d.d.	different	1								

- e.c.d. electrical control device
- n.e.d.d. non-electrical delay device
- e. electrical
- n.e. non-electrical
- f.z. flooding zone