

# Guidelines for Clean Agent Fire Suppression Systems

Procedure Number: E1-08

Revision Date: 02/16/2017

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## References:

- a. National Fire Protection Association (NFPA) 2001, 2012 Edition (Clean Agent Fire Extinguishing Systems)
  - b. International Code for Fire Safety Systems (FSS), Chapter 5
  - c. USCG Research and Development Center Report No. CG-D-02-07
  - d. COMDTINST M16714.3, "Equipment List", Equipment Classes 162.161 and 162.162
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## Contact Information:

If you have any questions or comments concerning this document, please contact the Marine Safety Center (MSC) by email or phone, referring to the Procedure Number: **E1-08**.

Email: [msc@uscg.mil](mailto:msc@uscg.mil)

Phone: 202-795-6729

Website: <http://homeport.uscg.mil/msc>

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## Responsibilities:

The submitter shall provide sufficient documentation and plans to indicate compliance with the applicable requirements; this includes a complete bill of materials, component technical data sheets, calculations and arrangement plans. The submission shall be made in triplicate.

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## General Guidance:

FM200, Novec 1230 and Inergen clean agent systems are covered by these guidelines. Other total flooding systems such as carbon dioxide and watermist are detailed under separate guidance.

Each USCG Type Approved clean agent system is provided with a Design, Operation, Installation and Service manual that is an integral part of the USCG Type Approval. It is imperative that the approved manual be referenced in the design and installation of these systems.

A list of Type Approved systems is available at the following website:

<http://cgmix.uscg.mil/Equipment/EquipmentSearch.aspx>. In the "Approval Number" field, enter 162.161 for halocarbon systems or 162.162 for inerting systems.

# Guidelines for Clean Agent Fire Suppression Systems

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## General Guidance (cont):

- ❑ All components shall be listed on the bill of materials and shall be traceable to the plans. System components shall include only the components listed in the USCG Type Approved manual. Use of components from multiple Approvals in a single installation is not acceptable.
- ❑ Pipe and fittings shall be in accordance with the USCG Type Approved manuals. All ferrous pipe and fittings shall be galvanized.

**Note:** Inergen systems have considerably higher storage and distribution pressures than FM200 and NOVEC 1230. A pressure reducer decreases the storage pressure of approximately 2,175 psi to the required distribution pressure. Additional strength pipe is required upstream of the pressure reducer valve, as outlined in the USCG Type Approved manual.

- ❑ Determine the volume of the protected space(s). Reduction in volume may be taken for solid, permanent structures or equipment such as auxiliary machinery, boilers, condensers evaporators, main engines, reduction gears, tanks, trunks, compartments that will always be closed and any other large permanently fixed objects that cannot be removed from the enclosure.
  - 1) The flooding factor associated with the lowest expected protected space temperature and the required design concentration must be used. (Gross volume \* flooding factor = required agent).
  - 2) If the air receivers are located in the protected space and the receiver relief valves discharge into the space, the free air volume of the receivers must be in the gross volume of the space.

# Guidelines for Clean Agent Fire Suppression Systems

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## General Guidance (cont):

- A copy of the design flow calculations must be provided with the submittal. Design parameters shall be within the limitations established in the USCG Type Approved manual. At a minimum, the following details shall be included on the calculations/data sheets:
  - 1) Protected space volume;
  - 2) amount of agent provided;
  - 3) the minimum and maximum temperatures of the protected space;
  - 4) agent discharge time;
  - 5) nozzle pressures;
  - 6) pipe nodal calculations consistent arrangement plans
  - 7) minimum design concentration;
  - 8) adjusted design concentration;
  - 9) equivalent pipe lengths for each pipefitting, valve and component.
- Arrangement plans must be provided to address each of the following requirements:
  - The boundaries of the protected space should be gas-tight such that the amount of escaping gas is minimized. Opening such as watertight doors, side ports and ventilation openings should be capable of being closed from outside the protected space. The gas tight boundaries are the basis for determining the protected space gross volume.
  - **FOR SOLAS VESSELS:** Doors fitted in boundary bulkheads of Category A machinery spaces shall be reasonably gastight and SELF-CLOSING to be considered as a boundary for the protected spaced. For OSVs having an “extended machinery space”, as defined in Marine Technical Note 02-00, which includes the space adjacent to the engine room, the entire “extended space” must be considered in determining the protected space gross volume.
  - Spaces < 6,000 ft<sup>3</sup> may have the storage cylinders located inside or outside of the protected space. If the storage cylinders are located inside the protected space, the system must be equipped with rate of rise detectors for automatic activation. The activation arrangements shall be in accordance with the approved manual.

# Guidelines for Clean Agent Fire Suppression Systems

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## General Guidance (cont):

- ❑ **FOR SOLAS VESSELS:** The storage space for the agent cylinders shall be located aft of the collision bulkhead; the storage space shall not be used for other purposes. Entrance to the space should preferably be from the open deck and be independent of the protected space. If located below the open deck, the space shall be no more than one deck below the open deck and be directly accessible by stairway or ladder from the open deck. Spaces located below deck which are not directly accessible to open deck shall be provided with mechanical ventilation sized to provide six air exchanges per hour. (SOLAS II-2, Reg. 10.4.3)
- ❑ If located outside of the protected space, the storage cylinder(s) must be accessible in the event of a fire in the protected space and must be located as close to the protected space as practicable. The storage temperature range is 32° F to 130° F.
- ❑ Spaces > 6,000 ft<sup>3</sup> should have the agent storage cylinders located outside of the protected space. The activation arrangements shall be in accordance with the approved manual. Alternative arrangements for location of agent storage cylinders inside the protected space must be in compliance with reference (c).
- ❑ With exception of systems protecting spaces less than 6,000 ft<sup>3</sup>, two distinct and separate actions are required to operate the system. One action shall activate the agent storage cylinders and one action shall open the stop valve in the distribution piping to allow the agent to be released into the protected area.
  - 1) Actuation may be via cable or nitrogen pilot cylinders. Actuation cable and/or nitrogen actuation cylinder arrangements (length of cable, size of pipe, length of actuation piping, etc) shall be in accordance with the approved manual.
- ❑ Pressure switches or other acceptable means shall be provided for securing engines that draw intake air from the protected space and/or ventilation to the protected space.
- ❑ Pressure relief devices shall be provided in any closed section of the manifold (upstream of a manifold stop valve). Relief valve and settings are listed in the type approved manuals.
- ❑ **FOR SOLAS VESSELS:** Pressure relief valve discharge shall be piped to the open deck

# Guidelines for Clean Agent Fire Suppression Systems

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## General Guidance (cont):

- ❑ Pressure operated devices, including valves and time delay devices, shall be equipped with a means to allow manual operation.
- ❑ **FOR SOLAS VESSELS:** A fitting must be installed to facilitate the use of compressed air to be used to test for free air flow to all pipes and nozzles
- ❑ Manned spaces having volumes < 6,000 ft<sup>3</sup> that do not have a readily accessible horizontal escape and spaces > 6,000 ft<sup>3</sup> must be equipped with a time delay and pressure operated alarm device.
- ❑ The number of alarms per driver, length and size of alarm supply pipe must be in accordance with the approved manual. The number and location of sirens shall be adequate to allow the siren to be heard under normal operating conditions.
- ❑ Nozzle selection (180 degree or 360 degree) and installation details such as spacing, coverage area, distance from bulkheads and height above hazard placement shall be in accordance with the approved manual.
- ❑ If multiple storage cylinders are used to protect a single space, each cylinder must be the same size and have the same fill level. Each cylinder should be provided with a check valve.
- ❑ Tee flow splits shall be in accordance with the approved manuals. Generally, bull head tees (inlet is perpendicular to both outlets) must have both outlets on a horizontal plane. Side tees (inlet is inline with one outlet) must have the inlet and both outlets in a horizontal plane. Percentage of flow through tees is listed in the approved manuals.
- ❑ Warning placards shall be provided for the protected space. Operating instructions shall be provided at the remote and local actuation stations.

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## Disclaimer

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative, you may contact the Marine Safety Center (MSC), the unit responsible for implementing this guidance.