

# MSC Guidelines for Foam Fire Suppression Systems

Procedure Number: E1-11

Revision Date: 02/16/2017

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## References:

- a. 46 CFR 34.17, Tank Vessel Fixed Foam Systems
- b. 46 CFR 34.20, Tank Vessel Deck Foam Systems
- c. 46 CFR 76.17 Passenger Vessel Foam Systems
- d. 46 CFR 95.17, Cargo Vessel Foam Systems
- e. 46 CFR 108.459 and 108.487, MODU Foam Systems
- f. Navigation and Vessel Inspection Circular 6-72, “Guide to Fixed Fire-Fighting Equipment Aboard Merchant Vessels”
- g. Navigation and Inspection Circular 11-82, “ Deck Foam Systems for Polar Solvents”
- h. CG-522 Policy Letter 09-01, “Guidance on Implementation of IMO Resolution A673(16) for U.S. Offshore Supply Vessels”
- i. PFM 1-03, “Acceptance of Aluminum Helicopter Platforms”
- j. COMDINST M16714.3, “Equipment List” , Equipment Class 162.033
- k. International Code for Fixed Fire Systems, Chapter 14
- l. SOLAS II-2, Regulation 18, “Helicopter Facilities”
- m. CAP 437, “Offshore Helicopter Landing Areas-Guidance on Standards”
- n. CG- Eng Policy Letter 03-15, “Acceptance of CAP 437, ‘Standards for Helicopter Offshore Landing Areas”
- o. Marine Inspection Notice 01-08, “Portable Foam Applicators for SOLAS Vessels”

## Contact Information:

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If you have any questions or comments concerning this document, please contact the Marine Safety Center by email or phone, referring to the Procedure Number: **E1-11**.

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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, and arrangement plans. The submission shall be made in triplicate.

**General Guidance:** Foam fire suppression system requirements vary based on the application. Specified foam system applications are for protection of the following spaces: (1) machinery spaces, (2) cargo tank deck areas, (3) helicopter flight decks and (4) offshore supply vessels carrying flammable liquids. The following guidance outlines requirements applicable to all foam systems and additional requirements specific to the application.

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## **Applicable to all foam system applications:**

- ❑ The foam system, including the foam concentrate, tank discharge nozzles, discharge monitors, proportioning device and other control components must be “USCG Type Approved”; as evidenced by listing in manufacturer’s O & M manual. A system O&M manual is included as part of the USCG Type Approval. (34.17-10(a), 34.20-10(a), 76.17-10(a), 95.17-10(a) and 108.473(a))
- ❑ All piping, valves, and fittings shall meet the applicable requirements of Subchapter F. Additionally, acceptable piping materials are listed in the USCG Type Approved manuals. (34.17-15(a), 34.20-15(a), 76.17-15(a), 95.17-15(a) 108.475(a))
  - ❑ All piping, valves, and fittings of ferrous materials shall be protected inside and outside against corrosion. (34.17-15(b), 34.20-15(b), 76.17-15(b), 95.17-15(b) and 108.475(b))
- ❑ The type of foam being provided must be compatible with the cargo or area being protected (e.g. polar and non polar cargoes). This information may be verified in the manufacturer’s USCG approved manual and/or 46 CFR Part 153 Table 1, column “h”.
- ❑ The foam proportioner, must be adequately sized and sufficient supply pressure (usually the firemain) must be provided to produce the required flow. Proportioner capacity should be verified in the pressure-flow charts provided in the type approved manual.

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## General Guidance (cont):

- ❑ The number and location of discharge devices must be sufficient to provide a uniform distribution of foam over the protected area. Minimum nozzle or monitor pressure shall be in accordance with the USCG Type Approved manual.
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### **Machinery Space and Pump Room Foam Systems**

These systems are designed to provide primary protection of compartments such as for a machinery space in lieu of a carbon dioxide system or other fixed fire suppression system.

- ❑ For machinery spaces and pump rooms, the system shall be so arranged as to spread a blanket of foam over the entire tank top or bilge of the space protected. Where an installation is made to protect an oil-fired boiler installation on a flat which is open to or can drain to the lower engine room or other space, both the flat and the lower space shall be fitted with suitable coamings on all openings. (34.17-5(a), 76.17-5(a) and 95.17-5(a))
- ❑ The rate of discharge to foam outlets protecting a machinery space or pump room hazard shall be at least 1.6 gallons per minute for each 10 square feet over the entire protected area. The rate of discharge to foam outlets protecting tank hazards shall be at least 1 gallon per minute for each 10 square feet over the entire tank top. (76.17-5 and 95.17-5)
- ❑ The total available supply shall be at least sufficient for the space requiring the greatest amount. (34.17-5(b)(1), 76.17-5(b)(1), and 95.17(b)(1))
- ❑ A sufficient amount of foam concentrate shall be provided to operate the system at the required flow rate for a minimum of 3 minutes for spaces other than tanks and 5 minutes for tanks. (34.17-5(c), 76.17-5(c), 95.17-5(c))
- ❑ The water supply shall be from outside and completely independent of the space protected. (34.17-5(e), 76.17-5(c)(3) and 95.17(5)(e))
- ❑ The foam-concentrate tank and all controls and valves for the operation of the system shall not be located in a space which might be made inaccessible in the event of a fire in any protected space. (34.17-10(b), 76.17-10(b) and 95.17-10(b))

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## General Guidance (cont):

- ❑ Piping shall not be used for any other purpose than firefighting, drills and testing. (34.17-15(e), 76.17-15(e) and 95.17-15(e))
  - ❑ At least 2 foam stations shall be installed outside the machinery space entrance with approved combination nozzle, applicator, and self-cleaning strainer such that any part of the machinery space may be reached with at least 2 streams of foam/water. This is in addition to the fire hydrants required for the firemain system as required by 34.17-25, 76.17-25 and 95.17-25.
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## **Deck Foam Systems**

These systems are designed to provide primary protection of cargo tanks.

- ❑ The water rate of the foam production equipment shall be determined as follows (34.20-5(b) and NVIC 6-72):
  - a) For the common petroleum products, the rate of supply of foam solution shall be not less than the greatest of the following (for the purpose of this section, the term cargo deck area is defined as the maximum beam of the vessel times the total longitudinal extent of the cargo spaces):
    - i. 0.6 lpm/square meter) (0.016 gpm/square feet) of cargo tanks deck area;
    - ii. 6.0 lpm/square meter (0.16 gpm/square feet) of the horizontal sectional area of the single tank having the largest such area; or
    - iii. 3.0 lpm/square meter (0.08 gpm/square feet) of the area protected by the largest monitor, such area being entirely forward of the monitor, but not less than 1250 lpm (330 gpm).
  - b) For polar solvent products, the water rate shall be determined by the approved manufacturers' design manuals. The rate of supply of foam solution shall not be less than the greatest of the following:
    - i. (highest required application rate) x (.1) x (total cargo deck area);
    - ii. (highest required application rate) x (area of each adjacent pair of tanks); or
    - iii. (highest required application rate) x (.045) x (area protected by the monitor).

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## General Guidance (cont):

- ❑ A sufficient amount of foam concentrate shall be provided to operate the system at the required flow rate for a minimum of 20 minutes (vessels with keel dates after January 1970), without recharging the system.
- ❑ Where the same foam-producing material is used for multiple fixed foam systems, separate supplies need not be provided for each space protected. The total available supply shall be at least sufficient for the space requiring the greatest amount. (34.20-5(d))
- ❑ Fire pumps may be used for the deck foam system water supply provided the pump has capacity to provide the firemain and foam systems, simultaneously. (34.20-5(e))
- ❑ At least 50 percent of the required rate of application shall be from the mounted appliances. One or more hose outlets for hand-held appliances shall be provided at each foam station. For enclosed spaces, application of at least 1.6 gpm water rate for each 10 square feet of the enclosed area for at least 5 minutes is acceptable. (34.20-15(c))
- ❑ Tankships of 100,000 or more DWT and combination carriers of 50,000 DWT must have at least one foam station port and at least one foam station starboard that are separated by a distance equal to one-half the beam of the vessel. (34.20-15(g)).
- ❑ The foam-agent container and the main controls for operating this system shall not be located in a space which might be made inaccessible in the event of a fire in any protected space. (34.20-10(b))
- ❑ The capacity of each foam monitor must be at least 3.0 lpm/square meter (0.073 gpm/square feet) of cargo area protected by that monitor. (34.20-25)
- ❑ Drains and dirt traps shall be fitted to prevent accumulation of dirt or moisture. (34.20-15(e))
- ❑ Piping shall not be used for any other purpose than firefighting, drills and testing. (34.20-15(f))
- ❑ Installations contracted for prior to 1970 have exceptions listed in 34.20-90.

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General Guidance  
(cont):

## **Offshore Supply Vessels**

This section applies to offshore supply vessels that carry flammable liquids or NLS's listed in the IBC. See reference (h), section 3.9.2.3.3 for details.

- ❑ The foam agent, tank, discharge nozzle/monitor, proportioner and other controls shall be part of a USCG Type Approved system. Self contained foam hose reels are not acceptable for the purposes of meeting the foam system requirements.
- ✚ All piping, valves, and fittings shall meet the applicable requirements of Subchapter F.
- ❑ All piping, valves, and fittings of ferrous materials shall be protected inside and outside against corrosion.
- ❑ The type of foam being provided must be compatible with the cargo or area being protected (e.g. polar and non polar cargoes). This information may be verified in the manufacturers USCG approved manual and/or 46 CFR Part 153 Table 1, column "h". A comment regarding cargo and foam system compatibility must be included in our correspondence.
- ❑ The system shall be sized to protect the areas of integral tank tops, manifolds, vents and deck areas within 10 feet of the vents. The foam application rate shall be in accordance with the foam system type approved manual for the cargo being carried.
- ❑ A sufficient amount of foam concentrate shall be provided to operate the system at the required flow rate for a minimum of 20 minutes, without recharging the system.
- ❑ Verify the foam proportioner is adequately sized and sufficient supply pressure (usually the firemain) is provided to produce the required flow. Proportioner capacity should be verified in the pressure-flow charts provided in the type approved manual.
- ❑ The system must consist of fixed foam monitors or foam applicators and at least one hose line capable of reaching all of the required areas.

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## General Guidance (cont):

- ❑ For vessels with integral tanks, foam water sprinklers or a fixed gas extinguishing system shall be provided in the cargo pump room except where the pump room is located in a normally inaccessible space (sealed by bolted manhole or cover)
  - ❑ Approved semi-portable dry chemical may be used in lieu of a fixed foam system if the extinguishers are permanently affixed to the ships structure, provide adequate hose for deck coverage and meet the following application rates:
    - a) for a deck area less than 45 m<sup>2</sup> there are two or more dry chemical extinguishers whose total capacity is not less than 135 kg,
    - b) for a deck area more than 45 m<sup>2</sup> there are three or more dry chemical extinguishers whose total capacity is not less than  $C = 3A$ , where C equals total extinguisher capacity (kg) and A equals deck area (m<sup>2</sup>), and,
    - c) the minimum rate of supply is not less than 3kg/min
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## **Offshore Platform (Helicopter Deck) Foam Systems**

These systems are designed to provide primary protection of helicopter decks with refueling capabilities and the helicopter fueling facility (portable tanks, fuel transfer pumps and fuel hose reels. Note that a helicopter deck on a SOLAS vessel ALWAYS requires a foam fire suppression system (independent of having fueling capabilities).

As provided in reference (n), a helicopter deck foam system designed in accordance with CAP 437 is acceptable.

- ❑ The foam agent, tank, discharge nozzle/monitor, proportioner and other controls shall be part of a USCG Type Approved system. Combination nozzles approved for use on the firemain system are not acceptable as foam discharge devices (108.473(a))
  - ❑ All piping, valves, and fittings shall meet the applicable requirements of Subchapter F. (108.475(a))
  - ❑ All piping, valves, and fittings of ferrous materials shall be protected inside and outside against corrosion. (108.475(b))
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## General Guidance (cont):

- ❑ The rate of discharge to foam outlets shall be as follows:
  - a) For a helicopter fueling station area, the area containing the tanks, pumps and hose reels shall be provided with foam at using protein foam, at least 1.6 gallons per minute for each 10 square feet of protected area or using AFFE, at least 1.0 gallons per minute for each 10 square feet of protected area.
  - b) For a steel landing deck with refueling capabilities, sufficient foam shall be provided to cover an area equivalent to the swept rotor area of the largest helicopter for which the deck is designed using protein foam, at least 1.6 gallons per minute for each 10 square feet of protected area or using AFFF, at least 1.0 gallons per minute for each 10 square feet of protected area.
  - c) For a helicopter aluminum landing deck with refueling capabilities, sufficient foam shall be provided to cover the entire deck area at a rate not less than:

Category	Helicopter Length	Foam Solution Discharge Rate
H1	<15m	250 L/min (66gpm)
H2	15m≤L<24m	500 L/min (132 gpm)
H3	24m≤L<35m	800 L/min (211 gpm)

- ❑ A sufficient amount of foam concentrate shall be provided to operate the system at the required flow rate for a minimum of 5 minutes, without recharging the system. (108.487)
- ❑ Verify the foam proportioner is adequately sized and sufficient supply pressure (usually the firemain) is provided to produce the required flow. Proportioner capacity should be verified in the pressure-flow charts provided in the type approved manual.
- ❑ If a single foam system is provided for protection of the helicopter landing deck and helicopter refueling facility, the quantity of foam concentrate shall be sufficient to protect **BOTH** areas. (108.489(b))
- ❑ The foam nozzle shall be capable of discharging a single foam stream of at least 90 gpm at 100 psi and a foam spray of at least 50 gpm. (108.487(b))

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## General Guidance (cont):

- ❑ Operating controls shall be provided at the hose locations. (108.457(c))
- ❑ A foam station shall be provided at each of the two accesses to the helicopter deck. These foam stations are in addition to the firemain stations required by 108.486. (108.487(d). Monitors may be used in lieu of foam hose stations provided the monitors are accessible in the event of fire on the deck and provide adequate coverage of the deck.
- ❑ The water supply for the foam system must not be the same as the firemain unless the firemain is of sufficient capacity to supply the firemain and foam systems, simultaneously. (108.467)
- ❑ Each water pump supplying the foam system must be outside the protected area and must not receive power from the protected spaces. (108.471)
- ❑ Coamings that are high enough to retain spilled oil and foam in the protected areas, except for deck drains, shall be provided. (108.461)

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## **Portable Foam Equipment**

This section is intended to address the portable foam equipment requirements of SOLAS II-2, Regulation 10. This section does not apply to domestic only vessels. Detailed guidance is provided in reference (o).

- ❑ The portable foam equipment should conform to one of the following acceptance criteria:
  - a) USCG Type Approved portable foam applicators (MISLE Equipment Class 162.163) with two 5 gallon containers of foam liquid concentrate specified on the USCG Type Approval certificate. The discharge nozzle should be identifiable by the approval number on its nameplate or stamped on the nozzle.
  - b) Educting nozzles specified in the instruction manual of an USCG Type Approved foam system (MISLE Equipment Class 162.033) with two 5 gallon containers of foam concentrate specified in the instruction manual or the USCG Type Approval Certificate. The nozzles should be identifiable by their part numbers and their identification in the USCG Type Approval or their listing in the online UL Certification Directory.

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## General Guidance (cont):

- c) Nozzles and separate inline educators as specified in the instruction manual of a USCG Type Approved (MISLE Equipment Class 162.033) with two 5 gallon containers of foam concentrate specified in the instruction manual or the USCG Type Approval Certificate. The nozzles and inline educators should be identifiable by their part numbers and their identification in the USCG Type Approval or their listing in the online UL Certification Directory.
  
- d) A 45 liter foam semi-portable extinguishers and other USCG class B-III extinguishers such as 35 pound CO<sub>2</sub> or 20 pound dry chemical are acceptable as equivalent to the portable foam equipment.

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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.

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