

MARINE HFC-227ea SYSTEM



INTRODUCTION

Fire can cause a great amount of damage to a business operation and property as well as the devastating loss of life. A fire that is out of control on land is devastating to those involved and a fire at sea can be the most tragic of all accidents.

For these reasons people have made attempts to be as mindful as possible of potential fire conditions and have been diligent to provide fire protection systems for areas that are at risk of fire.

For many shipboard applications a HFC-227ea system will provide safe and reliable fire protection for the hazard as well as personnel on board.

SHIPBOARD HAZARDS

Fike Marine HFC-227ea Systems are used for suppressing fires in specific hazards or equipment and in occupancies where an electrically nonconductive agent is essential or desirable, or where cleanup of other media presents a problem. Total flooding HFC-227ea Clean Agent Fire Suppres-

sion Systems are used primarily to protect hazards that are in enclosures or equipment that includes an enclosure to contain the agent. Some typical hazards that can be protected include, but are not limited to the following:

- Machinery Rooms
- Flammable Liquid Storage
- Electrical Areas
- Pump Rooms
- Generator Rooms
- Paint Lockers

In order to assure safe navigation of the vessels, HFC-227ea Fire Suppression Systems on board ships must be operated manually. The reason for this is to assure the safety of the personnel on board as well as other ships that may be near by. For instance, you would not want an automatic fire protection system to shut down your main engine room in a high traffic area where an accident could occur.

THE FIRE PROTECTION SOLUTION – FIKE HFC-227ea

Fike HFC-227ea system design is based on the requirements of NFPA 2001, the United States Coast Guard NVIC 6-72, and MSC Circular 776/848.

There are two configurations of HFC-227ea systems acceptable to the marine market. System design is based on the volume of the protected hazard. For hazard volumes that are less than 6000 ft³(170 m³) system release is permitted without time delays and warning sirens. For spaces larger than 6000 ft³(170 m³) there must be a 30 or 60 second delay in the discharge with warning sirens to warn personnel of the impending discharge.

HFC-227ea agent concentrations vary depending on the hazard being protected. For Class A combustible and Class C electrical areas HFC-227ea systems shall be designed at a minimum of 7% HFC-227ea concentration as calculated in Fike Manual, 06-210.

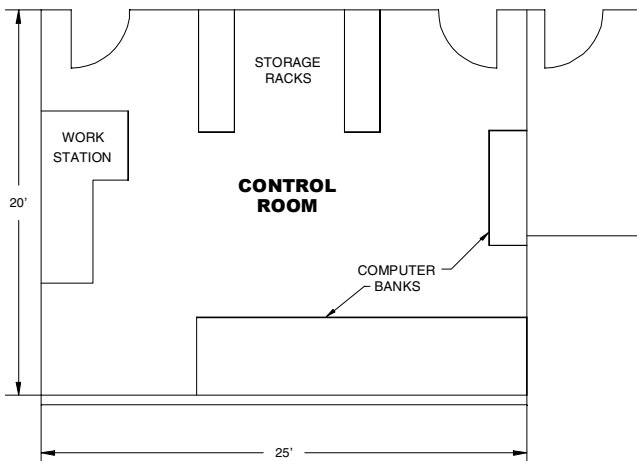
Fike HFC-227ea systems that protect Class B flammable liquids onboard ship shall be designed with a design concentration of 30% above the “cup burner” concentration.

SYSTEM EXAMPLES

The following examples show two typical applications found off shore. The first example is a control room with a room volume less than 6000 ft³(170 m³). The next example is an engine room with a volume greater than 6000 ft³(170 m³). Both systems utilize coast Guard approved two step actuation methods for system operation. Detailed information on system components and their limits can be found in the Fike Marine HFC-227ea Manual, 06-210.

I. CONTROL ROOM HAZARD

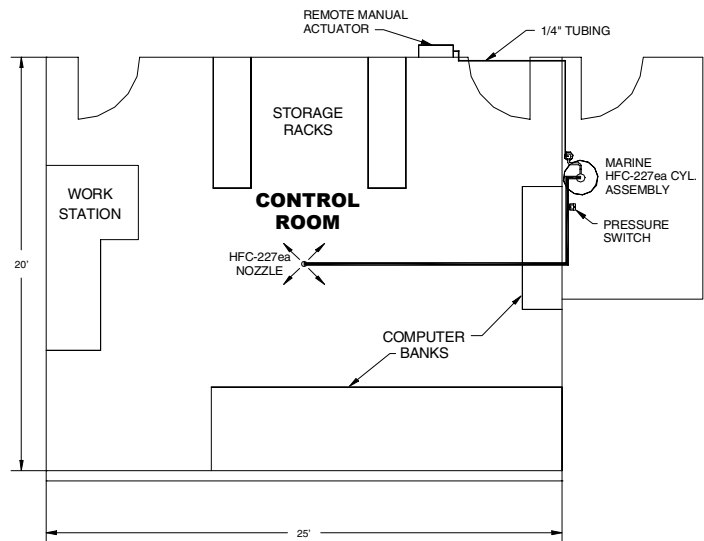
The following example shows an approved system protecting a control room on board a ship. The control room is 25' X 20' X 10' and has important computer equipment located in the room.



**Control Room
Plan View**

The first step is to determine the quantity of HFC-227ea required to protect the hazard. Since the hazard is Class C electrical and Class A combustibles a design concentration of 7% will be used. Taking into account the room volume of 5000 ft³ this calculates to a required amount of 177 pounds of HFC-227ea at the minimum expected room temperature of 55°F.

As mentioned before, hazards that are less than 6000 ft³(170 m³) are not required to have a discharge delay, therefore the cylinder can discharge immediately into the enclosure upon manual activation of the system. Below is a layout of the HFC-227ea system installed in the room.



**Control Room
Equipment Layout**

If a fire condition is noticed in the protected space, personnel are trained to evacuate the area and operate the remote manual actuator. System operation is accomplished by opening the door on the manual actuation station, removing a locking pin and moving the lever on the Remote Pneumatic Actuator cylinder, then operating the 1/4 turn ball valve to send the nitrogen to the HFC-227ea cylinder. The nitrogen from the remote manual actuator opens the HFC-227ea valve and sends the agent into the protected space.

All Fike Marine HFC-227ea systems are provided with a manual actuator at the cylinder in case of failure of the Remote Manual Actuator. This system has an optional pressure switch installed for notification of the system discharge.

II. ENGINE ROOM

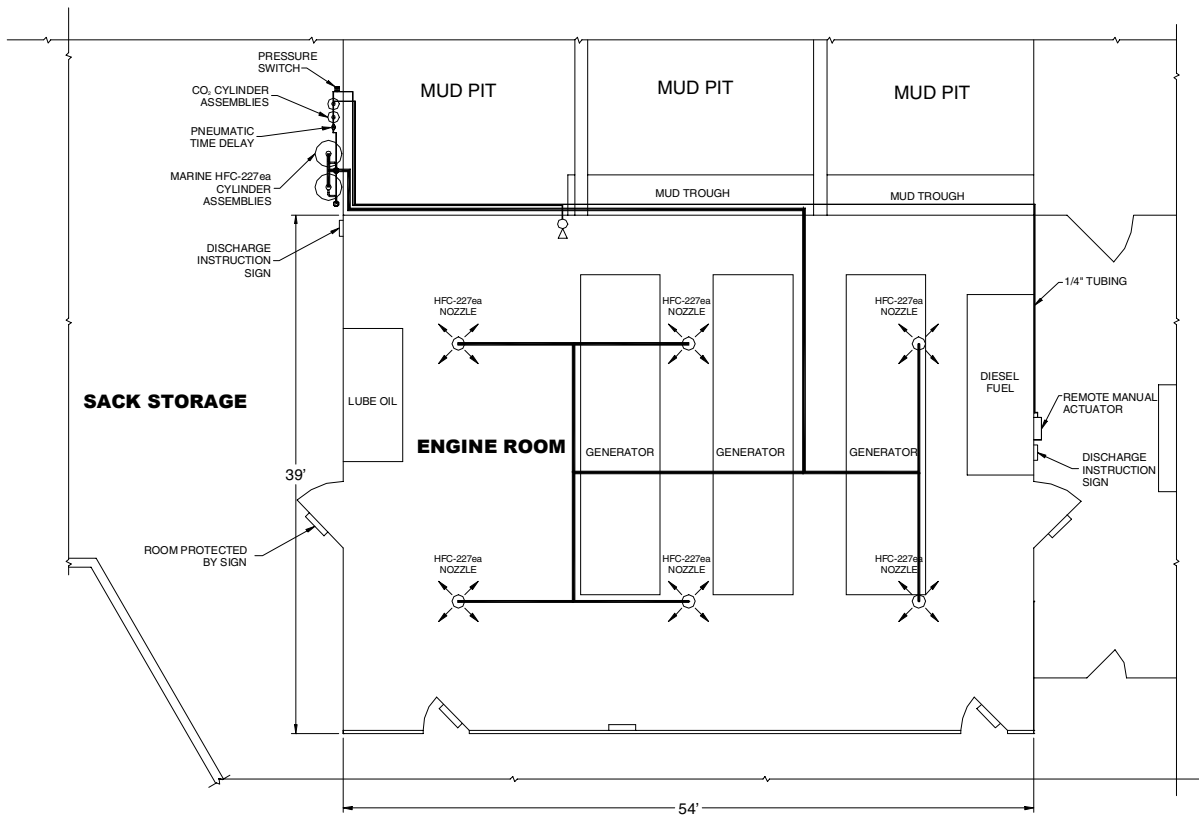
The following example is of an engine room containing three(3) engine/generator units fueled by #2 diesel oil. The room also contains a lubrication system, with lubricating oil for the three (3) engine/generator units. The room is 39' X 54' X 14.5' tall which totals 30,537 ft³ in volume.

Due to the large volume of non-permeable, unmoveable equipment located in this room it is desirable to deduct this volume from the total room volume. In order to make this deduction it is required that the room have a door fan test performed as outlined in NFPA 2001, Appendix B. The equipment deducted from this room is the three generators and the diesel fuel tank. This equipment totals 3420 ft³ in volume. Therefore the net volume of the hazard is 27117 ft³.

The next step is to determine the quantity of HFC-227ea

required to protect the hazard. The fuels in the hazard are diesel fuel which has an extinguishing concentration of 8.7% and lubricating oil which has an extinguishing concentration of 7.6%. The total amount of HFC-227ea required to reach a design concentration of 8.7% for this hazard is 1272 pounds at 32°F. Coast Guard requirements mandate that systems designed for machinery spaces be calculated at 32°F (0 C) and systems for cargo pump rooms and paint lockers be calculated at 0°F (-18 C). This ensures proper HFC-227ea design concentration at temperature extremes.

Because this hazard is greater than 6000 ft³, a pneumatic time delay and a warning siren will be incorporated into the system design. The siren and the discharge will be operated by two 50 pound carbon dioxide cylinders which will discharge the HFC-227ea cylinders after the time delay finishes cycling.



**Engine Room
Equipment Layout**

If a fire condition is noticed in the protected space, personnel are trained to evacuate the area and operate the remote manual actuator. System operation is accomplished by opening the door on the manual actuation station, removing a locking pin and moving the lever on the Remote Pneumatic Actuator cylinder, then operating the 1/4 turn ball valve to send the nitrogen to the carbon dioxide cylinders. The nitrogen from the remote manual actuator operates two 50 pound carbon dioxide cylinders which perform various functions. The carbon dioxide flows into the pipe network

containing a pneumatic time delay, pneumatic siren, and pressure switch. This flow will cause the Pressure Switch to operate, the Pneumatic Siren to sound, and the Pneumatic Time Delay to begin its cycle. When the time delay finishes its cycle, the flow of carbon dioxide travels to, and operates, the Local Pneumatic Actuator(s), opening the HFC-227ea cylinder valve and allowing the agent to flow to the system nozzles.

The function of the pressure switch is to provide notification of system discharge, and shutdown ventilation and equipment.

Fike Corporation

In addition to Fike's Marine HFC-227ea System, Fike has an extensive product offering for facility and process protection for commercial and industrial applications.

Rupture Disc – A pressure relief device, typically applied to a closed chemical process, will open at a predetermined pressure and temperature to prevent the bursting or explosion of the process.

Explosion Venting/Isolation/Suppression - Total Concept Explosion Protection, including explosion testing, explosion venting, explosion isolation, and explosion suppression systems to mitigate the effects of industrial explosions.

Fire Detection Systems – Fike offers a full line of detection products from single hazard to multi zone analog addressable systems. These controls are suited for fire alarm, agent suppression systems, or sprinkler/pre-action fire detection and control systems. The Cheetah analog addressable control panel can be configured to communicate directly with one or more VESDA[®] LaserPLUS detectors via a High Level Interface (HLI).

Fire Suppression Systems – Fike offers a full range of suppression systems to protect your equipment and/or process. Because Fike offers more than one choice of extinguishing agents you are certain to get the right agent for your hazard. Fike systems incorporate the following agents:

- HFC-227ea
- Carbon Dioxide
- Water Mist



704 South 10th Street • Blue Springs, Missouri 64015-4263 U.S.A.

Phone (816) 229-3405 • Fax (816) 229-4615 • e-mail fpssales@fike.com • www.fike.com