

cylinders, the system must have at least 2 pilot cylinders to release the CO<sub>2</sub> from the remaining cylinders.

(k) If the entrance to a space containing the CO<sub>2</sub> supply or controls of a CO<sub>2</sub> system has a lock, the space must have a key to the lock in a break-glass type box that is next to and visible from the entrance.

**§ 108.445 Alarm and means of escape.**

(a) Each CO<sub>2</sub> system that has a supply of more than 136 kilograms (300 pounds) of CO<sub>2</sub>, except a system that protects a tank, must have an alarm that sounds for at least 20 seconds before the CO<sub>2</sub> is released into the space.

(b) Each audible alarm for a CO<sub>2</sub> system must have the CO<sub>2</sub> supply for the system as its source of power and must be in a visible location in the spaces protected.

**§ 108.447 Piping.**

(a) Each pipe, valve, and fitting in a CO<sub>2</sub> system must have a bursting pressure of at least 420 kilograms per square centimeter (6,000 pounds per square inch).

(b) All piping for a CO<sub>2</sub> system of nominal size of 19.05 millimeters ( $\frac{3}{4}$  inch) inside diameter or less must be at least Schedule 40 (standard weight) and all piping of nominal size over 19.05 millimeters ( $\frac{3}{4}$  inch) inside diameter must be at least Schedule 80 (extra heavy).

(c) Each pipe, valve, and fitting made of ferrous materials in a CO<sub>2</sub> system must be protected inside and outside from corrosion.

(d) Each CO<sub>2</sub> system must have a pressure relief valve set to relieve between 168 and 196 kilograms per square centimeter (2,400 and 2,800 pounds per square inch) in the distribution manifold or other location that protects the piping when all branch line shut off valves are closed.

(e) The end of each branch line in a CO<sub>2</sub> system must extend at least 50 millimeters (2 inches) beyond the last discharge outlet and be closed with a cap or plug.

(f) Piping, valves, and fittings in a CO<sub>2</sub> system must be securely supported and protected from damage.

(g) Each CO<sub>2</sub> system must have drains and dirt traps located where dirt

or moisture can accumulate in the system.

(h) Discharge piping in a CO<sub>2</sub> system may not be used for any other purpose except as part of a fire detection system.

(i) Piping in a CO<sub>2</sub> system that passes through accommodation spaces must not have drains or other openings within these spaces.

**§ 108.449 Piping tests.**

(a) Each test prescribed in (b), (c), and (d) of this section must be performed upon completion of the piping installation.

(b) When tested with CO<sub>2</sub> or other inert gas under a pressure of 70 kilograms per square centimeter (1000 pounds per square inch), with no additional gas introduced into the system, the leakage in the piping from the cylinders to the stop valves in the manifold must not allow a pressure drop of more than 10.5 kilograms per square centimeter (150 pounds per square inch) per minute for a 2 minute period.

(c) When tested with CO<sub>2</sub> or other inert gas under a pressure of 42 kilograms per square centimeter (600 pounds per square inch), with no additional gas introduced into the system, the leakage in each branch line must not allow a pressure drop of more than 10.5 kilograms per square centimeter (150 pounds per square inch) per minute for a 2-minute period. The distribution piping must be capped within the protected space.

(d) Small independent systems protecting emergency generator rooms, lamp lockers and similar small spaces need not meet the tests prescribed in paragraphs (a) and (b) of this section if they are tested by blowing out the piping with air at a pressure of at least 7 kilograms per square centimeter (100 pounds per square inch).

**§ 108.451 CO<sub>2</sub> storage.**

(a) Except as provided in paragraph (b) of this section, each cylinder of a CO<sub>2</sub> system must be outside each space protected by the system and in a location that would be accessible if a fire occurred in any space protected by the system.

(b) A CO<sub>2</sub> system that has a CO<sub>2</sub> supply of 136 kilograms (300 pounds) or less

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may have one or more cylinders in the space protected by the system if the space has a heat detection system to activate the system automatically in addition to the remote and manual controls required by this subpart.

(c) Each space that contains cylinders of a CO<sub>2</sub> system must be ventilated and designed to prevent an ambient temperature of more than 54° C. (130° F.)

(d) Each cylinder in a CO<sub>2</sub> system must be securely fastened, supported, protected from damage, in an accessible location, and capable of removal from that location.

(e) Each unit must have a means for weighing cylinders of a CO<sub>2</sub> system.

(f) A cylinder in a CO<sub>2</sub> system may not be mounted in a position that is inclined more than 30° from a vertical position, except that a cylinder having flexible or bent siphon tubes may be mounted in a position that is inclined up to 80° from the vertical. The bottom of each cylinder when mounted must be at least 5 centimeters (2 inches) from the deck.

(g) If a cylinder does not have a check valve on its independent cylinder discharge, it must have a plug or cap to close the outlet when the cylinder is moved.

[CGD 73-251, 43 FR 56808, Dec. 4, 1978, as amended by CGD 84-044, 53 FR 7749, Mar. 10, 1988]

**§ 108.453 Discharge outlets.**

Each discharge outlet must be of an approved type.

**§ 108.455 Enclosure openings.**

(a) Mechanical ventilation for spaces protected by a CO<sub>2</sub> system must be designed to shut down automatically when the system is activated.

(b) Each space that is protected by a CO<sub>2</sub> system and that has natural ventilation must have a means for closing that ventilation.

(c) Each space protected by a CO<sub>2</sub> system must have the following means for closing the openings to the space from outside the space:

(1) Doors, shutters, or dampers for closing each opening in the lower portion of the space.

(2) Doors, shutters, dampers or temporary means such as canvas or other

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material normally on board a unit may be used for closing each opening in the upper portion of the space.

**§ 108.457 Pressure release.**

Each air tight or vapor tight space, such as a paint locker, that is protected by a CO<sub>2</sub> system must have a means for releasing pressure that accumulates within the space if CO<sub>2</sub> is discharged into the space.

**HALOGENATED GAS EXTINGUISHING SYSTEMS**

**§ 108.458 General.**

Halogenated gas extinguishing systems may be installed if approved by the Commandant.

**FOAM EXTINGUISHING SYSTEMS**

**§ 108.459 Number and location of outlets.**

(a) A foam extinguishing system in a space must have enough outlets to spread a layer of foam of uniform thickness over the deck or bilge areas of the space.

(b) A foam extinguishing system in a space that has a boiler on a flat that is open to or can drain into a lower portion of the space must have enough outlets to spread a layer of foam of uniform thickness over the—

(1) Flat; and

(2) Deck or bilge areas of the space.

(c) A foam extinguishing system for a tank must have enough outlets to spread a layer of foam of uniform thickness over the surface of the liquid in the tank.

**§ 108.461 Coamings.**

Each machinery flat in a space that has a foam extinguishing system must have coamings that are high enough to retain spilled oil and foam on the flat on all openings except deck drains.

**§ 108.463 Foam rate: Protein.**

(a) If the outlets of a protein foam extinguishing system are in a space, the foam rate at each outlet must be at least 6.52 liters per minute for each square meter (.16 gallons per minute for each square foot) of area covered by the systems.