

(b) The minimum pipe size for the delayed discharge must be at least 1.25 centimeters (1/2 inch) standard pipe.

(c) The pipe used for the initial discharge must not be used for the delayed discharge, except systems having a volume of less than 57 cubic meters (2,000 cubic feet).

**§ 108.439 Quantity of CO<sub>2</sub> for protection of spaces.**

(a) The number of pounds of CO<sub>2</sub> required to protect a space must be equal to the gross volume of the space divided by the appropriate factor from Table 108.439.

(b) If a machinery space includes a casing, the gross volume of the space may be calculated using the reductions allowed in 46 CFR 95.10-5(e).

(c) If fuel can drain from a space to an adjacent space or if two spaces are not entirely separate, the requirements for both spaces must be used to determine the amount of CO<sub>2</sub> to be provided and the CO<sub>2</sub> system must be arranged to discharge into both spaces simultaneously.

TABLE 108.439—CO<sub>2</sub> Supply Factors  
[Gross volume of space in cubic feet]

Over	Not over	Factor
0 .....	500	15
500 .....	1,600	16
1,600 .....	4,500	18
4,500 .....	50,000	20
50,000 .....		22

**§ 108.441 Piping and discharge rates for CO<sub>2</sub> systems.**

(a) The size of branch lines to spaces protected by a CO<sub>2</sub> system must meet Table 108.441.

(b) Distribution piping within a space must be proportioned from the supply line to give proper distribution to the outlets without throttling.

(c) The number, type, and location of discharge outlets must distribute the CO<sub>2</sub> uniformly throughout the space.

TABLE 108.441—CO<sub>2</sub> System Pipe Size

CO <sub>2</sub> supply in system, kilograms (pounds)	Minimum pipe size (inches), millimeters (inches)
45 (100) .....	12.7 (1/2).
104 (225) .....	19.05 (3/4).
136 (300) .....	25.4 (1).
272 (600) .....	31.75 (1 1/4).
450 (1,000) .....	38.10 (1 1/2).

TABLE 108.441—CO<sub>2</sub> System Pipe Size—Continued

CO <sub>2</sub> supply in system, kilograms (pounds)	Minimum pipe size (inches), millimeters (inches)
1,110 (2,450) .....	50.80 (2).
1,130 (2,500) .....	63.5 (2 1/2).
2,023 (4,450) .....	76.2 (3).
3,229 (7,100) .....	88.9 (3 1/2).
4,750 (10,000) .....	101.6 (4).
6,818 (15,000) .....	114.3 (4 1/2).

(d) The total area of all discharge outlets must be more than 35 percent and less than 85 percent of the nominal cylinder outlet area or the area of the supply pipe, whichever is smaller. The nominal cylinder outlet area in square centimeters is determined by multiplying the factor 0.0313 by the number of kilograms of CO<sub>2</sub> required. (The nominal cylinder outlet area in square inches is determined by multiplying the factor 0.0022 by the number of pounds of CO<sub>2</sub> required). The nominal cylinder outlet area must not be less than 71 square millimeters (0.110 square inches).

(e) A CO<sub>2</sub> system must discharge at least 85 percent of the required amount within 2 minutes.

**§ 108.443 Controls and valves.**

(a) At least one control for operating a CO<sub>2</sub> system must be outside the space or spaces that the system protects and in a location that would be accessible if a fire occurred in any space that the system protects. Control valves must not be located in a protected space unless the CO<sub>2</sub> cylinders are also in the protected space.

(b) A CO<sub>2</sub> system that protects more than one space must have a manifold with a stop valve, the normal position of which is closed, that directs the flow of CO<sub>2</sub> to each protected space.

(c) A CO<sub>2</sub> system that protects only one space must have a stop valve installed between the cylinders and the discharge outlets in the system, except on a system that has a CO<sub>2</sub> supply of 136 kilograms (300 pounds) or less.

(d) At least one of the control stations in a CO<sub>2</sub> system that protects a machinery space must be as near as practicable to one of the main escapes from that space.

(e) All distribution valves and controls must be of an approved type.