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(b) Each device required by paragraph (a) must have a readout at the cargo control station.

(c) Except for independent tanks type C, each cargo containment system for a design temperature colder than −55° C (−67°F) must have temperature measuring devices that meet the following:

(1) The number and location of the devices must be specially approved by the Commandant (G–MSO).

(2) The devices must be within the cargo tank's insulation or on the adjacent hull structure.

(3) Each device must show the temperature continuously or at regular intervals of one hour or less.

(4) Each device must actuate an audible and visual alarm at the cargo control station and a remote group alarm in the wheelhouse before the temperature of the steel of the adjacent hull structure is cooled below the lowest temperature allowed for the steel under § 154.172.

(d) For each cargo tank with a design temperature colder than −55°C (−67°F), the number and arrangement of the devices that show the temperature of the tank during cool down procedures must be specially approved by the Commandant (G–MSO).

[CGD 74–289, 44 FR 26009, May 3, 1979, as amended by CGD 82–063b, 48 FR 4782, Feb. 3, 1983]

§ 154.1345 Gas detection.

(a) Each vessel carrying a cargo that is designated with an ''I'' or ''I and T'' in Table 4 must have:

(1) A fixed flammable gas detection system that meets § 154.1350; and

(2) Two portable gas detectors that can each measure 0 to 100% of the lower flammable limit of the cargo carried.

(b) Each vessel carrying a cargo that is designated with a ''T'' or ''I and T'' in Table 4 must have:

(1) Two portable gas detectors that show if the concentration of cargo is above or below the threshold limit value listed in 29 CFR 1910.1000 for that cargo; and

(2) Fixed gas sampling tubes in each hold space and interbarrier space with:

(i) The number of tubes specially approved by the Commandant (G–MSO);

(ii) Each tube valved and capped above the main deck unless it is connected to a fixed toxic gas detector;

(iii) If the vessel carries cargo that is heavier than the atmosphere of the space, each tube's open end in the lower part of the space;

(iv) If the vessel carries cargo that is lighter than the atmosphere of the space, each tube's open end in the upper part of the space;

(v) If the vessel carries cargo that is heavier than the atmosphere of the space and another cargo that is lighter than the atmosphere of the space, tubes with their open ends in the lower part of the space and tubes with their open ends in the upper part of the space; and

(vi) If the vessel carries cargo that can be both heavier and lighter than the atmosphere of the space, tubes with their open ends in the lower part of the space and tubes with their open ends in the upper part of the space.

(c) A vessel that carries methyl bromide or sulfur dioxide must have a fixed gas detection system that is not located in a gas-safe space.

(d) A vessel that carries sulfur dioxide must have a fixed gas detection system that meets § 154.1350 except paragraph (j).

(e) Each alarm under § 154.1350(e) on a vessel that carries methyl bromide or sulfur dioxide must be set at or below the threshold limit value listed in 29 CFR 1910.1000 for the cargo carried.

[CGD 74–289, 44 FR 26009, May 3, 1979, as amended by CGD 82–063b, 48 FR 4782, Feb. 3, 1983]

§ 154.1350 Flammable gas detection system.

(a) The vessel must have a fixed flammable gas detection system that has sampling points in:

(1) Each cargo pump room;

(2) Each cargo compressor room;

(3) Each motor room for cargo handling machinery;

(4) Each cargo control station that is not gas-safe;

(5) Each hold space, interbarrier space, and other enclosed spaces, except fuel oil or ballast tanks, in the cargo area, unless the vessel has independent tanks type C; and

(6) Each space between the doors of an air lock under §154.345.

(b) The sampling points under paragraph (a) of this section must meet §154.1345(b)(2) (iii) through (vi).

(c) Gas sampling lines for the flammable gas detection system must not pass through any gas-safe space, except the gas-safe space in which the gas detection equipment is located.

(d) Gas detection systems must have a readout with meters that show flammable gas concentration over the concentration or volume ranges under paragraph (t) or (u) of this section.

(e) Each flammable gas detection system must have audible and visual alarms that are actuated at a cargo concentration that is 30% or less of the lower flammable limit in air of the cargo carried.

(f) Each flammable gas detection system must have an audible and visual alarm for power failure and loss of gas sampling flow.

(g) The alarms under paragraphs (e) and (f) of this section must signal in the space where the gas detection system's readout is located and must meet §154.1365.

(h) Remote group alarms, that indicate that one of the alarm conditions under paragraphs (e) and (f) of this section exists, must meet §154.1365 and must be in each wheelhouse and in each cargo control station if the gas detection system's readout is not located in those spaces.

(i) Each flammable gas detection system must monitor each sampling point at 30 minute or shorter intervals.

(j) Electrical equipment for each flammable gas detection system that is in a gas-dangerous space or area must meet §§154.1000 through 154.1015.

(k) Each flammable gas detection system must have enough flame arrestors for all gas sampling lines to prevent flame propagation to the spaces served by the system through the sampling lines.

(l) Each flammable gas detection system must have a filter that removes particulate matter in each gas sampling line.

(m) Each filter under paragraph (l) of this section must be located where it can be removed during vessel operation, unless it can be freed by back pressure.

(n) Each flammable gas detection system in a gas-safe space must:

(1) Have a shut-off valve in each sampling line from an enclosed space, such as a hold or interbarrier space; and

(2) Exhaust gas to a safe location in the open atmosphere and away from all ignition sources.

(o) Each flammable gas detection system must not have common sampling lines, except sampling lines may be manifolded at the gas detector location if each line has an automatic valve that prevents cross-communication between sampling points.

(p) Each flammable gas detection system must have at least one connection for injecting zero gas and span gas into the system for testing and calibration.

(q) Each flammable gas detection system must have span gas for testing and calibration that is of known concentration.

(r) The calibration test procedure and type and concentration of span gas under paragraph (q) of this section must be on or in each gas analyzer cabinet.

(s) Each flammable gas detection system must have at least one flow meter capable of measuring the flow to the gas analyzer, and must provide a means for ensuring that there is a positive flow in the right direction in each sampling line at all times.

(t) Each flammable gas detection system must measure gas concentrations that:

(1) Are at least 0% through 200% of the alarm concentration; and

(2) Allow calibration of the equipment with span gas.

(u) In each hold and each interbarrier space that contains tanks other than independent tanks type A, B, or C, the flammable gas detection system must measure cargo concentrations of 0 to 100% by volume with:

(1) An analyzer other than the one under paragraph (t) of this section; or

(2) The analyzer under paragraph (t) of this section with a scale switch that automatically returns the analyzer to the concentration range under paragraph (t) of this section when released.