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the vapors are such that their release will not create a hazard.

(e) If the design of a safety or relief valve is such that liquid can collect on the discharge side of the disk, the valve shall be equipped with a drain at the lowest point where liquid can collect (for installation, see UG-134 of section VIII of section VIII of the ASME Boiler and Pressure Vessel Code (incorporated by reference; see 46 CFR 54.01-1).

(f) Cast iron may be employed in the construction of relief valves for pressures not exceeding 125 pounds per square inch and temperatures not exceeding 450 °F. Seats or disks of cast iron are prohibited.

(g) The spring in a relief valve in service for pressures up to and including 250 pounds per square inch shall not be reset for any pressure more than 10 percent above or 10 percent below that for which the relief valve is marked. For higher pressures, the spring shall not be reset for any pressure more than 5 percent above or 5 percent below that for which the relief valve is marked.

(h) The rated relieving capacity of safety and relief valves for use on pressure vessels shall be based on actual flow test data and the capacity shall be certified by the manufacturer in accordance with one of the following:

(1) 120 percent of the valve set pressure for valves rated in accordance with CGA S-1.2 (incorporated by reference; see 46 CFR 54.01-1).

(2) 110 percent of the valve set pressure for valves rated in accordance with UG-131 of section VIII of section VIII of the ASME Boiler and Pressure Vessel Code.

(3) 103 percent of the valve set pressure for steam in accordance with PG-69 of section VIII of the ASME Boiler and Pressure Vessel Code.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGD 81-79, 50 FR 9436, Mar. 8, 1985; USCG-2003-16630, 73 FR 65170, Oct. 31, 2008]

§ 54.15-13 Rupture disks (modifies UG-127).

(a) Paragraph UG-127 of section VIII of the ASME Boiler and Pressure Vessel Code (incorporated by reference; see 46 CFR 54.01-1) provides for the use of rupture disks in series with spring loaded safety or relief valves.

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(b) For certain pressure vessels containing substances which may render a relief or safety valve inoperative, or where the installation of a valve is considered impractical, the Commandant may authorize or require the use of a rupture disk in parallel with or in lieu of a spring loaded safety or relief valve. These rupture disks shall:

(1) Comply with the general provisions of § 54.15-5 except as noted otherwise in this section;

(2) Have a capacity for discharge such that the volume of release is sufficient to prevent the internal pressure from exceeding 120 percent of the “maximum allowable working pressure” with the pressure vessel exposed to fire conditions (see § 54.15-25); and,

(3) Operate at a pressure level which does not produce fatigue failure of the disk. The normal maximum operating pressure multiplied by 1.3 shall not exceed the nominal disk burst pressure. (Notice that this restriction for protection of the rupture disk will usually require operation below the “maximum allowable working pressure” of the pressure vessel and therefore should be considered in design.)

(c) All disks shall be oriented so that if rupture occurs, the disk fragments and pressure vessel discharge will be directed away from operating personnel and vital machinery.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by USCG-2003-16630, 73 FR 65170, Oct. 31, 2008]

§ 54.15-15 Relief devices for unfired steam boilers, evaporators, and heat exchangers (modifies UG-126).

(a) An approved safety valve set to relieve at a pressure not exceeding the “maximum allowable working pressure” of the shell shall be fitted to all unfired steam boilers and evaporators except for evaporators of the atmospheric type designed for vapor discharge direct to a distiller with no shutoff valve in the discharge line. The distiller connected to atmospheric evaporators shall be fitted with a vent to prevent a buildup in pressure. In no case shall the vent be less than 1½ inches in diameter. Evaporators operating between atmospheric pressure and 15 p.s.i.g., may use a rupture disc as an alternative to the safety valve.

(b) Safety valves for use on pressure vessels in which steam or pressure is generated shall comply with the requirements of § 54.15-10. Rupture discs used in lieu of these safety valves, as provided for in paragraph (a) of this section, shall comply with the requirements of § 54.15-13.

(c) The relieving capacity of evaporator safety valves required by paragraph (a) of this section shall be at least equal to the capacity of the orifice fitted in the steam supply to the evaporator. The orifice capacity shall be determined in accordance with the formula in paragraph (c) (1) or (2) of this section as appropriate:

(1) Where the set pressure of the evaporator shell safety valve is 58 percent or less than the setting of the safety valve in the steam supply:

$$W=51.45AP$$

(2) Where the set pressure of the evaporator shell safety valve exceeds 58 percent of the setting of the safety valve on the steam supply:

$$W=105.3A\sqrt{P_1(P - P_1)}$$

where:

W=The required orifice capacity, in pounds per hour.

A=Cross-sectional area of rounded entrance orifice, in square inches. The orifice shall be installed near the steam inlet or the coils or tubes and where no orifice is employed the area used in the formula shall be that of the inlet connection or manifold.

P=Set pressure of steam supply safety valve, in pounds per square inch, absolute.

P₁=Set pressure of evaporator shell safety valve, in pounds per square inch, absolute.

(d) The relieving capacity of safety valves on unfired steam boilers shall not be less than the maximum generating capacity of the unfired steam boiler as certified by the manufacturer.

(e) On new installations and where the orifice size of an existing unfired steam boiler or evaporator is increased, an accumulation test shall be made by closing all steam outlet connections except the safety valves for a period of five minutes. When conducting the accumulation test, the water shall be at the normal operating level and the steam pressure shall be at the normal operating pressure, and while under this test the pressure shall not rise

more than 6 percent above the safety valve setting.

(f) A heat exchanger with liquid in the shell and the heating medium in the tubes or coils, shall be fitted with a liquid relief valve meeting the requirement of § 54.15-5.

(g)(1) A heat exchanger with steam in the shell and liquid in the tubes or coils at a pressure exceeding that in the shell, shall have a liquid relief valve fitted to protect the shell against excess pressure.

(2) The discharge capacity of such relief valves shall be calculated on the basis of the discharge from one tube using the difference in pressures between that in the shell and that in the tubes and shall be not less than that determined by the following formula:

$$Q=29.81KD 2\sqrt{P_1 - P_2}$$

where:

Q=Required relief valve discharge capacity, in gallons per minute, based on relief valve set pressure.

P₁=Pressure in the tube or coils, in pounds per square inch.

P₂=Set pressure of the shell relief valve, in pounds per square inch.

D=Internal diameter of the largest tube or coil, in inches.

K=Coefficient of discharge=0.62.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGD 72-206R, 38 FR 17226, June 29, 1973]

§ 54.15-25 Minimum relief capacities for cargo tanks containing compressed or liquefied gas.

(a) Each tank shall be fitted with one or more safety relief valves designed, constructed, and flow tested in accordance with subpart 162.017 or 162.018 in subchapter Q (Specifications) of this chapter. Valves conforming to specification subpart 162.017 shall be limited to use on tanks whose maximum allowable working pressure is not in excess of 10 pounds per square inch. With specific approval of the Commandant, such valves may be connected to the vessel in lieu of being directly fitted to the tanks.

(b) The discharge pressure and the maximum overpressure permitted shall be in accordance with § 54.15-5.

(c) The rate of discharge for heat input of fire must meet the following formula: