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(2) Horizontal runs of cargo piping installed in pipe tunnels may penetrate gravity type tanks below the weatherdeck: *Provided,* That each penetration is fitted with a stop valve operable from the weatherdeck. If the tunnel is directly accessible from the weatherdeck without penetrating the cargo tank, the stop valve shall be located on the tunnel side. If the tunnel is not accessible from the weatherdeck, the valve shall be located on the tank side of the penetration.

(3) The tunnel shall comply with all tank requirements for construction, location, ventilation, and electrical hazard. There shall be cargo compatibility in the event of a piping failure.

(4) The tunnel shall have no other openings except to the weatherdeck or a cargo pumproom.

§ 151.20–5 Cargo system valving requirements.

For the purpose of adequately controlling the cargo, both under normal operating and casualty conditions, every cargo piping system shall be provided with one of the following sets of control valves and meet the requirements listed below. Cargo tanks, whether gravity or pressure vessel type, for cargoes having a saturated vapor pressure of 10 pounds per square inch gauge or less at 115°F. (105°F. if the tank is insulated) shall be provided with a valving system designated as Gravity–1. Cargo tanks, whether gravity or pressure vessel type, for cargoes which are carried below ambient temperature and whose vapor pressure is maintained at 10 pounds per square inch gauge or below shall be provided with a valving system designated as Gravity–2. Cargo tanks for cargoes which have vapor pressures above 10 p.s.i.g. at 115°F. (105°F. if tank is insulated) shall be provided with a valving system designated as Pressure–1. Cargo tanks for cargoes which have vapor pressures above 10 pounds per square inch gauge at 115°F. (105°F. if tank is insulated) and which require greater protection due to their hazardous characteristics shall be provided with a valving system designated as Pressure–2. The requirements of paragraphs (a) through (d) of this section for stop valves or excess flow valves to be fitted at tank penetrations are not applicable to nozzles at which pressure vacuum or safety relief valves are fitted.

(a) *Gravity–1 (G–1).* (1) One manually operated stop valve shall be installed on each tank filling and discharge line, located near the tank penetration.

(2) One stop valve or blind flange shall be installed at each cargo hose connection. When a cargo hose connection is in use, it shall be provided with a stop valve; which may be part of the vessel's equipment or may be part of the shore facility and attached to the barge end of the loading hose. When a cargo hose connection is not in use, it may be secured with a blind flange.

(3) If individual deepwell pumps are used to discharge the contents of each cargo tank, and the pumps are provided with a remote shutdown device, a stop valve at the tank is not required on the tank discharge line.

(b) *Gravity–2 (G–2).* (1) One manually operated stop valve shall be installed on each tank penetration, located as close as possible to the tank.

(2) One remote operated, quick closing shut-off valve shall be installed at each cargo hose connection.

(3) A remote shutdown device shall be installed for all cargo handling machinery.

(c) *Pressure–1 (P–1).* (1) One manually operated stop valve and one excess flow valve shall be installed on each tank penetration, located as close as possible to the tank.

(2) One manually operated stop valve shall be installed at each cargo hose connection, when in use.

(d) *Pressure–2 (P–2).* (1) One manually operated stop valve and one excess flow valve shall be installed at each tank penetration, located as close as possible to the tank.

(2) One remote operated quick closing shutoff valve shall be installed at each cargo hose connection when in use.

(3) No tank penetration shall be less than 1 inch diameter.

(e) Cargo tank penetrations which are connections for gauging or measuring devices need not be equipped with excess flow or remote operated quick closing valves provided that the opening is constructed so that the outward flow of tank contents shall not exceed

that passed by a No. 54 drill size (0.055–inch diameter).

(f) The control system for any required quick closing shutoff valves shall be such that the valves may be operated from at least two remote locations on the vessel; if means of fire protection is required by Table 151.05, the control system shall also be provided with fusible elements designed to melt between 208°F. and 220°F., which will cause the quick closing shutoff valves to close in case of fire. Quick closing shutoff valves shall be of the fail-closed (closed on loss of power) type and be capable of local manual operation. Quick closing shutoff valves shall operate from full open to full closed under all service conditions in not more than 10 seconds, without causing excessive pressure surges.

(g) Excess flow valves, where required, shall close automatically at the rated closing flow of vapor or liquid as tested and specified by the manufacturer. The piping, including fittings, valves, and appurtenances protected by an excess flow valve, shall have a greater capacity than the rated closing flow of the excess flow valve. Excess flow valves may be designed with a bypass not to exceed 0.040–inch diameter opening to allow equalization of pressure, after an operating shutdown.

(h) Suitable means shall be provided to relieve the pressure and remove liquid contents from cargo lines and hoses to the cargo tank or other safe location prior to effecting disconnections.

§ 151.20–10 Cargo system instrumentation.

(a) Each tank operated at other than ambient temperature shall be provided with at least one remote reading temperature sensor located in the liquid phase of the cargo. The temperature gauge shall be located at the cargo handling control station or another approved location.

(b) Where required, each tank equipped with safety relief valves shall be fitted with a pressure gauge which shall be located at the cargo handling control station or at another approved location.

§ 151.20–15 Cargo hose if carried on the barge.

(a) Liquid and vapor line hose used for cargo transfer shall be of suitable material resistant to the action of the cargo. Hose shall be suitable for the temperatures to which it may be subjected and shall be acceptable to the Commandant.

(b) Hose subject to tank pressure, or the discharge pressure of pumps or vapor compressors, shall be designed for a bursting pressure of not less than 5 times the maximum safety relief valve setting of the tank, pump, or compressor, whichever determines the maximum pressure to which the hose may be subjected in service.

(c) Each new type of cargo hose, complete with end fittings, shall be prototype tested to a pressure not less than five times its specified maximum working pressure. The hose temperature during this prototype test shall duplicate the intended extreme service temperature. Thereafter, each new length of cargo hose produced shall be hydrostatically tested at ambient temperature to a pressure not less than twice its maximum working pressure nor more than two-fifths its bursting pressure. The hose shall be marked with its maximum working pressure, and if used in other than ambient temperature service, its maximum or minimum temperature.

§ 151.20–20 Cargo transfer methods.

(a) Cargo transfer may be accomplished by means of gravity, pumping, vapor or gas pressurization, or fluid displacement unless otherwise provided in Subpart 151.50 of this part.

(b) Vapor or gas pressurization may be used only in transferring cargo from pressure vessel type cargo tanks. The pressurizing vapor or gas lines shall be provided with safety relief device in the lines set to open at a pressure no greater than 90 percent of the set pressure of the cargo tank safety relief valve. The pressurizing line shall be fitted with a stop valve at the tank, and a check valve to prevent the accidental release of cargo through the pressure line.

(c) Fluid displacement is permitted with either gravity or pressure vessel type cargo tanks. The displacing fluid