

this chapter for the service temperature, and this temperature shall be permanently marked on the tank as prescribed in §38.05-5.

(h) Where applicable, the design shall investigate the thermal stresses induced in the cargo tank at the service temperature.

(i) The shell and head thickness of liquefied gas cargo tanks shall not be less than five-sixteenths inch.

[CGFR 66-33, 31 FR 15269, Dec. 6, 1966, as amended by CGFR 68-82, 33 FR 18806, Dec. 18, 1968]

§38.05-4 Design and construction of nonpressure vessel type cargo tanks—TB/ALL.

(a) The requirements in this section anticipate a cargo containment system consisting of a primary tank which is structurally self-supporting and, where required, a secondary barrier. Other vessel or cargo tank configurations, such as membrane type liners externally supported, will be considered upon submission of substantiating data, and based upon such additional tests as the Commandant may direct.

(b) A secondary barrier is an arrangement or structure designed to contain the cargo temporarily if leakage develops in the primary container. A secondary barrier shall be provided where leakage from the primary container may cause lowering of the temperature of the ship's structure to an unsafe level. The secondary barrier shall be constructed of material suitable to contain the cargo at the service temperature.

(c) The design of the cargo containment systems shall be such that under normal service conditions, or upon failure of the primary tank, the hull structure shall not be cooled down to a temperature which is unsafe for the materials involved. Structural members not suitable for the service temperatures of the cargo shall be protected by a secondary barrier consisting of suitable structural containment together with necessary associated insulation. Heat transmission studies and tests may be required to demonstrate that the arrangement is feasible and that the final material temperatures are acceptable.

(d) The design and construction of the cargo tanks shall be at least equiv-

alent to the standards established by the American Bureau of Shipping or other recognized classification society. For special tanks, or designs not contemplated by standards of the classification society, a detailed analysis of the entire tank, or designated parts thereof, shall be made and submitted to the Commandant for approval.

(e) The cargo tank shall be designed for a head of cargo at least equal to the highest level the liquid cargo may attain plus the maximum venting pressure. In no case shall a head of cargo less than 4 feet above the cargo hatch or expansion trunk be used.

(f) The design shall investigate the thermal stresses induced in the cargo tank during loading. Where necessary, devices for spray loading or other methods of precooling or cooling during loading shall be included in the design.

(g) All weld intersections or crossings in joints of primary tank shells shall be radiographed for a distance of 10 thicknesses from the intersection. All other welding in the primary tank and in the secondary barrier shall be spot radiographed in accordance with the requirements of part 54 of subchapter F (Marine Engineering) of this chapter.

[CGFR 66-33, 31 FR 15269, Dec. 6, 1966, as amended by CGFR 68-82, 33 FR 18807, Dec. 18, 1968]

§38.05-5 Markings—TB/ALL.

(a)(1) Upon satisfactory completion of tests and inspection, pressure vessel and nonpressure vessel type cargo tanks, shall have markings as required by §54.10-20 of subchapter F (Marine Engineering) of this chapter except that for nonpressure vessel type tanks, the Coast Guard number and pressure vessel class shall be omitted.

(2) Hydrostatic test for pressure vessel type tanks shall be that specified in §38.25-1(b). In the case of nonpressure vessel type tanks, the hydrostatic test pressure shall mean the pressure specified in §38.25-1(d), while the maximum allowable pressure shall mean the maximum venting pressure as used in §38.05-4(e). Where it is not feasible to attach the nameplate to the tank, it shall be conspicuously displayed nearby.

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(b) All tank inlet and outlet connections, except safety relief valves, liquid level gaging devices, and pressure gages, shall be labeled to designate whether they terminate in the vapor or liquid space. Labels of corrosion-resistant material may be attached to valves.

(c) All tank markings shall be permanently and legibly stamped in a readily visible position, and shall not be obscured by painting. If the tanks are lagged, the markings attached to the tank proper shall be duplicated on a corrosion-resistant plate secured to the outside jacket of the lagging.

[CGFR 66-33, 31 FR 15269, Dec. 6, 1966, as amended by CGFR 68-82, 33 FR 18807, Dec. 18, 1968]

§ 38.05-10 Installation of cargo tanks—general—TB/ALL.

(a)(1) Cargo tanks shall be supported on foundations of steel or other suitable material and securely anchored in place to prevent the tanks from shifting when subjected to external forces. Each tank shall be so supported as to prevent the concentration of excessive loads on the supporting portions of the shell or head as prescribed under § 38.05-2(d).

(2) Cargo tanks installed in barges shall comply with the requirements of § 32.63-25 of this subchapter.

(b) Foundations, and stays where required, shall be designed for support and constraint of the weight of the full tank, and the dynamic loads imposed thereon. Thermal movement shall also be considered.

(c) Foundations and stays which may be exposed to the cargo shall be suitable for the temperatures involved and be impervious to the cargo.

(d) The design of the foundations and stays shall consider the resonance of the cargo tank, or parts thereof, and the vibratory forces, found in the tank vessel. If necessary, effective damping arrangements shall be provided.

(e) Independent containment systems shall be so arranged as to provide a minimum clearance of not less than 24 inches from the vessel's side and not less than 15 inches from the vessel's bottom to provide access for inspection of the hull. Clearances for collision protection, where required by other

parts of the regulations in this subchapter, may increase the clearances specified here.

(1) For pressure vessel type tanks the distance between adjacent tanks and between tanks and vessel's structure shall be adequate to permit access for inspection and maintenance of all tank surfaces and hull structure as approved by the Commandant. Alternate provisions may be made for inspection and maintenance of the vessel's structure and tanks by moving such tanks or by providing equivalent acceptable means for remote inspection.

(2) For nonpressure vessel type containment systems, access shall be arranged to permit inspection of one side each of the primary tank and secondary barrier, under normal shipyard conditions. Containment systems which, because of their peculiar design, cannot be visually inspected to this degree, may be specially considered provided an equivalent degree of safety is attained.

(f) Cargo tanks may be installed *on deck, under deck*, or with the tanks protruding through the deck. All tanks shall be installed with the manhole openings located in the open above the weather deck. Provided an equivalent degree of safety is attained, the Commandant may approve cargo tanks installed with manhole openings located below the weather deck.

(g) For pressure vessel type cargo tanks, the following conditions apply:

(1) Liquefied flammable gas cargo tanks may be located in cargo tanks or in spaces which meet the requirements for cofferdams as defined in § 30.10-13 of this subchapter. When liquefied flammable gas cargo tanks are installed in cargo tanks, such cargo tanks may be used simultaneously or separately for the carriage of flammable or combustible liquids up to and including the grade for which the cargo tanks are otherwise certified in accordance with the requirements of this subchapter.

(2) Where the liquefied flammable gas tanks are installed in cargo tanks and a portion of the liquefied flammable gas tanks extend above the weather deck, the penetration shall be made gastight and watertight, and shall be such as to provide full compliance with the structural requirements including