

barrier. Materials used in the fabrication of the cargo containment and handling system shall satisfy the requirements for toughness specified in subchapter F (Marine Engineering) of this chapter.

(d) Cargo tank spaces are to be isolated from the remainder of the vessel by cofferdams in accordance with § 32.60-10 of this subchapter. In a non-pressure vessel configuration, the void between the primary and secondary barriers shall not be acceptable as the required cofferdam between the tank spaces and the main machinery spaces.

(e) Compartments containing cargo tanks or pipes shall be accessible from the weather deck only. No openings from these compartments to other parts of the vessel are permitted.

(f) Barges utilized for the carriage of liquefied gases shall be of Type II barge hull as defined in § 32.63-5(b)(2) of this subchapter. The Commandant may, based on the properties of the liquefied gas to be carried, require a Type I barge hull, as defined in § 32.63-5(b)(1) of this subchapter, to ensure the hull is consistent with the degree and nature of the hazard of the liquefied gas to be carried.

[CGFR 66-33, 31 FR 15269, Dec. 6, 1966, as amended by CGFR 68-82, 33 FR 18806, Dec. 18, 1968; CGFR 68-65, 33 FR 19985, Dec. 28, 1968; CGFR 70-10, 35 FR 3709, Feb. 25, 1970]

#### § 38.05-2 Design and construction of cargo tanks—general—TB/ALL.

(a) The maximum allowable temperature of the cargo is defined as the boiling temperature of the liquid at a pressure equal to the setting of the relief valve.

(b) The service temperature is the minimum temperature at which cargo is loaded and/or transported in the cargo tank. However, the service temperature shall in no case be taken higher than given by the following formula:

$$t_s = t_w - 0.25(t_w - t_b) \quad (1)$$

where:

$t_s$  = Service temperature.

$t_w$  = Boiling temperature of gas at normal working pressure of tank but not higher than +32 °F.

$t_b$  = Boiling temperature of gas at atmospheric pressure.

(c) Heat transmission studies, where required, shall assume the minimum ambient temperatures of 0 °F. still air and 32 °F. still water, and maximum ambient temperatures of 115 °F. still air and 90 °F. still water.

(d) Cargo tanks in vessels in ocean; Great Lakes; lakes, bays, and sounds; or coastwise service shall be designed to withstand, simultaneously, the following dynamic loadings:

(1) Rolling 30° each side (120°) in 10 seconds.

(2) Pitching 6° half amplitude (24°) in 7 seconds.

(3) Heaving  $L/80'$  half amplitude ( $L/20'$ ) in 8 seconds.

(e) Cargo tanks on barges shall be designed in accordance with § 32.63-25 of this subchapter.

(f) Each liquefied flammable gas tank shall be provided with not less than a 15-inch by 23-inch or an 18-inch nominal diameter manhole fitted with a cover located above the maximum liquid level and as close to the top of the tank as possible. Where access trunks are fitted to the tanks, the nominal diameter of the trunks shall be not less than 30 inches.

(g) Cargo tanks vented above 10 pounds per square inch gage shall be of the pressure vessel type.

#### § 38.05-3 Design and construction of pressure vessel type cargo tanks—TB/ALL.

(a) Cargo tanks of pressure vessel configuration (e.g. cylindrical, spherical, etc.) shall be designed, fabricated, inspected, and tested in accordance with the applicable requirements of part 54 of subchapter F (Marine Engineering) of this chapter, except as otherwise provided for in this part.

(b) The requirements of this section anticipate that cargo tanks constructed as pressure vessels will, by themselves, constitute the cargo containment system and usually will not require a secondary barrier.

(c) In the design of the tank, consideration shall be given to the possibility of the tank being subjected to external loads. Consideration shall also be given to excessive loads that can be imposed on the tanks by their support due to static and dynamic forces under operating conditions or during testing. The

design shall show the manner in which the tanks are to be installed, supported, and secured, and shall be approved prior to tank installation.

(d) Tanks with a service temperature of minus 20 °F. or lower and fabricated of ferritic materials shall be stress relieved.

(e) Unlagged cargo tanks, where the cargo is transported, at or near ambient temperatures, shall be designed for the vapor pressure of the gas at 115 °F. The design shall also be based on the minimum internal pressure (maximum vacuum), plus the maximum external static head to which the tank may be subjected. Whenever surrounding cargo is at a greater temperature than the maximum allowable temperature of the liquefied flammable gas tanks, the liquefied flammable gas cargo is to be such that the design pressure of the liquefied flammable gas tank is not exceeded.

(f) Where cargo tanks, in which the cargo is transported at or near ambient temperature, are lagged with an insulation material of a thickness to provide a thermal conductance of not more than 0.075 B.t.u. per square foot per degree Fahrenheit differential in temperature per hour, the tanks shall be designed for a pressure of not less than the vapor pressure of the gas at 105 °F. The insulation material shall conform to the requirements of § 38.05-20. The design shall also be based on the minimum internal pressure (maximum vacuum) plus the maximum external static head to which the tank may be subjected.

(g) Cargo tanks in which the temperature is maintained below the normal atmospheric temperature by refrigeration or other acceptable means shall be designed for a pressure of not less than 110 percent of the vapor pressure corresponding to the temperature of the liquid at which the system is maintained, or the pressure corresponding to the greatest dynamic and static loads expected to be encountered either in service or during testing. For mechanically stress relieved cargo tanks, additional factors relating design pressure and maximum allowable pressure shall be as specified by the Commandant. The material of the tank shall satisfy the requirements of

subchapter F (Marine Engineering) of 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.