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cargo tanks by being passed through a heat exchanger. Refrigeration is not accomplished by direct compression of the cargo.

(c) *Internal heat exchange.* A refrigeration system in which a cooling fluid is passed through heat transfer coils immersed in the cargo tank liquid or vapor phases.

(d) *Tank refrigeration.* A refrigeration system in which the cooling fluid is passed around the cargo tank exterior in order to remove heat from the tank or its surroundings.

(e) *No refrigeration.* A system that allows the liquefied gas to warm up and increase in pressure. The insulation and tank design pressure shall be adequate to provide for a suitable margin for the operating time and temperatures involved.

(f) *Tank heating.* (1) A system in which the cargo is heated by means of steam or other heat transfer fluid running through coils within or around the tank. The cargo itself does not leave the tank.

(2) A recirculating system in which the cargo leaves the tank, is pumped through a heater and then returned to the tank.

§ 151.40–2 Materials.

Materials used in the construction of temperature or pressure control systems shall be suitable for the intended application and meet the requirements of Subchapter F and the Special Requirements section of this subchapter.

§ 151.40–5 Construction.

Construction of machinery or equipment, such as heat exchangers, condensers, piping, etc., associated with temperature or pressure control systems shall meet the requirements of Subchapter F of this chapter. The electrical portions of these installations shall meet the requirements of Subchapter J of this chapter.

§ 151.40–10 Operational requirements.

Control systems, required by Table 151.05 shall be provided with an audible or visual high cargo temperature or high cargo pressure alarm which is discernible at the towboat. The alarm shall operate when either the pressure or the temperature exceeds the operating limits of the system. The alarm may monitor either pressure or temperature, but must be independent of the control system.

§ 151.40–11 Refrigeration systems.

(a) *Boiloff systems.* The venting of cargo boiloff to atmosphere shall not be used as a primary means of temperature or pressure control unless specifically authorized by the Commandant.

(b) Vapor compression, tank refrigeration, and secondary refrigeration systems: The required cooling capacity of refrigeration systems shall be sufficient to maintain the cargo at design operating conditions with ambient temperature of 115°F. still air and 90°F. still water. The number and arrangement of compressors shall be such that the required cooling capacity of the system is maintained with one compressor inoperative. Portions of the system other than the compressors need not have standby capacity.

Subpart 151.45—Operations

§ 151.45–1 General.

(a) Barges certificated as tank barges (Subchapter D of this chapter) or cargo barges (Subchapter I of this chapter) for the carriage of cargoes regulated by this subchapter shall meet all applicable requirements for operations in the appropriate subchapter; in addition, requirements prescribed in this subpart shall apply to either type of certification.

(b) [Reserved]

§ 151.45–2 Special operating requirements.

(a) The requirements of this section shall apply to all barges carrying in bulk any cargoes regulated by this subchapter; however, the provisions of this section are not applicable to such barges when empty and gas-freed.

(b) When it is necessary to operate box or square-end barges as lead barges of tows, the person in charge of the towing vessel shall control the speed to insure protection against diving and swamping of such barges, having due regard to their design and freeboard, and to the operating conditions.

(c) No cargo tank hatch, ullage hole, or tank cleaning openings shall be