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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

opened or remain open except under the supervision of the person in charge, except when the tank is gas free.

(d) Barges, when tendered to the carrier for transportation, shall have all bilges and void spaces (except those used for ballasting) substantially free of water. Periodic inspections and necessary pumping shall be carried out to insure maintenance of such water-free condition in order to minimize the free surface effects, both in longitudinal and transverse directions. Except when otherwise considered necessary for inspection or pumping, all hatch covers and other hull closure devices for void spaces and hull compartments other than cargo spaces shall be closed and secured at all times.

(e) *Cargo signs and cards.* (1) Warning signs shall be displayed on the vessel, port and starboard, facing outboard without obstructions, at all times except when the vessel is gas free. The warning sign shall be rectangular and a minimum of 3 feet wide and 2 feet high. It shall be of sufficient size to accommodate the required alerting information, which shall be shown in black block style letters and numerals (characters) at least 3 inches high on a white background. The minimum spacing between adjacent words and lines of characters shall be 2 inches. The minimum spacing between adjacent characters shall be one-half inch. All characters shall have a minimum stroke width of one-half inch and shall be a minimum of 2 inches wide, except for the letters ''M'' and ''W'', which shall be a minimum of 3 inches wide, and except for the letter ''I'' and the Numeral ''1'', which may be ½–inch wide. The signs shall have a 2–inch minimum white border clear of characters. The signs shall be maintained legible. The alerting information shall include the following:

WARNING

DANGEROUS CARGO

(This sign may be covered or removed when Subchapter *O* commodities are not being carried.)

NO VISITORS

NO SMOKING

(This sign may be removed or covered when the commodity is not flammable or combustible.)

NO OPEN LIGHTS

(This sign may be removed or covered when the commodity is not flammable or combustible.)

(2)(i) Names and locations of all cargoes will be displayed in a readily discernible manner on all barges carrying one or more commodities regulated by this subchapter. This may be an individual sign at or on each tank or by a single sign similar to the following example:

Tank No.	*Cargo*
1P	/xxxx/
1S	/xxxx/
2P	/xxxx/
2S	/xxxx/

These signs may be printed, handwritten, permanent or changeable, but be visible and readable at all times. These signs should be as readable, as those specified in paragraph (e)(1) of this section. Cargoes regulated by other subchapters will be included whenever carried simultaneously with commodities regulated by this subchapter.

(ii) When the dangerous cargo barge is carrying only a single product, the Warning Sign required by paragraph (e)(1) of this section can be considered as meeting the requirements for the cargo location sign. The name of the commodity shall be added to the Warning Sign.

(3) A cargo information card for each cargo regulated by this subchapter shall be carried on the bridge or in the pilot house of the towing vessel, readily available for use by the person in charge of the watch. This information card shall also be carried aboard the barge, mounted near the Warning Sign required by paragraph (e)(1) of this section, in such position as to be easily read by a man standing on the deck of the barge. The minimum card size shall be 7″ × 9½″. The card shall have legible printing on one side only. The card

shall be laminated in clear plastic or otherwise made weatherproof. The following data shall be listed:

(i) *Cargo identification and characteristics.* Identification of the cargo, as listed in Table 151.05, its appearance and odor. A statement of the hazards involved and instructions for the safe handling of the cargo and, as applicable, the need for special cargo environments.

(ii) *Emergency procedures.* Precautions to be observed in the event of spills, leaks, or equipment or machinery breakdown and/or uncontrolled release of the cargo into the waterway or atmosphere. Precautions to be observed in the event of exposure of personnel to toxic cargoes.

(iii) *Firefighting procedures.* Precautions to be observed in the event of a fire occurring on or adjacent to the barge, and enumeration of firefighting media suitable for use in case of a cargo fire.

(f) *Surveillance.* During the time the cargo tanks contain any amount of liquid or gaseous dangerous cargoes requiring Type I or Type II barge hulls, the barge shall be under surveillance, as set forth in this paragraph:

(1) The licensed operator, person in command, and mate of a vessel towing a tank barge that need not be manned, and each of them, shall be responsible for monitoring the security and integrity of the tank barge and for ensuring adherence to proper safety precautions. These responsibilities include, but are not limited to—

(i) Ensuring that every tank barge added to the tow has all tank openings properly secured; has its freeing-ports and scuppers, if any, unobstructed; meets any loadline or freeboard requirements; and neither leaks cargo into the water, voids, or cofferdams nor leaks water into the tanks, voids, or cofferdams;

(ii) Ensuring that every tank barge in the tow is properly secured within the tow;

(iii) Ensuring that periodic checks are made of every tank barge in the tow for leakage of cargo into the water, voids, or cofferdams and for leakage of water into the tanks, voids, or cofferdams;

(iv) Knowing the cargo of every tank barge in the tow, all hazards associated with the cargo, and what to do on discovery of a leak;

(v) Ensuring that the crew of the vessel know the cargo of every tank barge in the tow, all hazards associated with the cargo, and what to do on discovery of a leak;

(vi) Reporting to the Coast Guard any leaks from a tank barge in the tow into the water, as required by 33 CFR 151.15; and

(vii) Ensuring that the crew of the vessel and other personnel in the vicinity of the tank barges in the tow follow the proper safety precautions for tank vessels, and that no activity takes place in the vicinity of the barges that could create a hazard.

(2) A towing vessel engaged in transporting such unmanned barges shall not leave them unattended. When a barge is moored, but not gas free, it shall be under the care of a watchman who may be a member of the complement of the towing vessel, or a terminal employee, or other person. This person shall be responsible for the security of the barge and for keeping unauthorized persons off the barge. Such person shall be provided with, read, and have in his possession for ready reference the information cards required by paragraph (e) of this section.

(g) All cargo hatches shall be closed, dogged down, or otherwise tightly secured.

[CFGR 70–10, 35 FR 3714, Feb. 25, 1970, as amended by CGD 88–100, 54 FR 40040, Sept. 29, 1989; CGD 79–116, 60 FR 17158, Apr. 4, 1995]

§ 151.45–3 Manning.

Except as provided for in this section, barges need not be manned unless in the judgment of the Officer in Charge, Marine Inspection, such manning is necessary for the protection of life and property and for safe operation of the vessel. Vessels requiring manning for safe operation shall be subject to additional requirements as determined by the Commandant. Towing vessels, while towing barges which are not required to be manned, shall be provided with and have on board the information card required by § 151.45–2(e)(3). This card shall be in the possession of the master or person in charge.

§ 151.45–4 Cargo-handling.

(a) On a United States tank barge subject to inspection—

(1) The owner and operator of the vessel, and his or her agent, and each of them, shall ensure that no transfer of liquid cargo in bulk or cleaning of a cargo tank takes place unless under the supervision of a qualified person designated as the person in charge of the transfer or the cleaning under Subpart C of 33 CFR part 155.

(2) The person in charge of the transfer shall ensure that enough qualified personnel are on duty to safely transfer liquid cargo in bulk or to safely clean cargo tanks.

(b) *Closing of sea and ballast valves.* All sea and ballast valves are to be properly aligned and lashed, or sealed in their correct position prior to beginning cargo transfer operations. Under no circumstances shall such valves be secured by locks.

(c) *Connecting for cargo transfer.* (1) Movement of the vessel shall be considered when making the cargo connections to insure safe cargo transfer. Suitable material shall be used in joints and in couplings when making connections to insure that they are tight. Under no circumstances shall less than three bolts be used in a bolted flanged coupling.

(2) When cargo connections are supported by the vessel's tackle, the person in charge of the transfer operations shall inspect the vessel to insure that sufficient tackles are used.

(3) Pans or buckets shall be placed under cargo hose connections.

(4) Cargo transfer operations for any cargo requiring a PV or safety relief venting device in Table 151.05 shall be performed with cargo hatch covers closed.

(d) *Inspection prior to transfer of cargo.* Prior to the transfer of cargo, the person in charge of the transfer operation shall inspect the barge and other cargo equipment to assure himself that the following conditions exist:

(1) The Certificate of Inspection is endorsed for the products to be loaded. Loading restrictions, if any, should be noted.

(2) Warning signs are displayed as required.

(3) Cargo information cards for the product are aboard.

(4) No repair work in way of cargo space is being carried out.

(5) Cargo connections and hatch covers conform with the provisions of paragraph (c) of this section and cargo valves are properly set.

(6) All connections for cargo transfer have been made to the vessel's fixed pipeline system.

(7) In transferring flammable or combustible cargoes, there are no fires or open flames present on the deck, or in any compartment which is located on, facing, open or adjacent to the part of the deck on which cargo connections have been made.

(8) The shore terminal or other tank vessel concerned has reported itself in readiness for transfer of cargo.

(9) All sea valves are properly set and those connected to the cargo piping are closed.

(10) When transferring flammable or combustible cargoes that a determination was made as to whether or not boiler and/or galley fires can be maintained with reasonable safety.

(e) *Duties of the person in charge during transfer operations.* The person in charge of the transfer operations shall control the operations as follows:

(1) Supervise the operation of the cargo system valves.

(2) Start transfer of cargo slowly.

(3) Observe cargo connections and hose for leakage.

(4) Observe operating pressure on cargo systems.

(5) Comply with loading limitations placed on the vessel by the Certificate of Inspection, if, any, for the purpose of not overloading individual tanks or the vessel.

(6) Observe the loading rate for the purpose of avoiding overflow of the tanks.

(f) Cargo transfer operations shall not be started or, if started, shall be discontinued under the following conditions:

(1) During severe electrical storms.

(2) If a fire occurs on the barge, the wharf or in the immediate vicinity.

(3) If potentially dangerous leakage occurs.

(g) No vessel shall come alongside or remain alongside a barge in way of its

cargo tanks while it is transferring cargo unless the conditions then prevailing are mutually acceptable to the persons in charge of cargo handling.

(h) *Auxiliary steam, air, fuel, or electric current.* When discharging cargo from one or more barges, the towing vessel may furnish steam, air, fuel, or electric current for pumps on barges or dock, but in no case shall the cargo pass through or over the towing vessel.

(i) *Termination of transfer operations.* When transfer operations are completed, the valves on cargo connections on the vessel shall be closed. The cargo connections shall be drained of cargo.

(j) *Transfer of other cargo or stores on a barge.* (1) Packaged goods, freight, and ship's stores shall not be loaded or discharged during the loading of flammable cargoes except by permission of the person in charge of the transfer operation. Explosives shall not be loaded or carried on any barge containing products regulated by this subchapter.

(2) Where package and general cargo is carried directly over bulk cargo tanks, it shall be properly dunnaged to prevent chafing of metal parts and securely lashed or stowed.

(k) *Transportation of other cargo or stores on barges.* Barges may be permitted to transport deck cargoes directly over bulk cargo spaces when the nature of such deck cargoes and the methods of loading and unloading same do not create an undue hazard. Such barges shall have their decks properly dunnaged to prevent chafing between the steel parts of the vessel and the deck cargo.

(l) Deck construction must be adequate to support the intended load. Provisions for carrying deck cargo shall be endorsed on the Certificate of Inspection by the Officer in Charge, Marine Inspection.

(m) *Emergencies.* In case of emergencies, nothing in the regulations in this subchapter shall be construed as preventing the person in charge of transfer operations from pursuing the most effective action in his judgment for rectifying the conditions causing the emergency.

[CGFR 70–10, 35 FR 3714, Feb. 25, 1970; 35 FR 6431, Apr. 22, 1970, as amended by CGD 75–59, 45 FR 70273, Oct. 23, 1980; CGD 81–059, 54 FR 151, Jan. 4, 1989; CGD 79–116, 60 FR 17158, Apr. 4, 1995]

§ 151.45–5 Open hopper barges.

(a) All open hopper barges not constructed or modified in conformance with the provisions of Subpart 151.10 of this part when carrying in bulk any cargoes regulated by this subchapter shall meet the provisions of this section. However, the provisions of this section are not applicable to such barges when empty (not necessarily cleaned or gas-freed).

(1) Except as otherwise provided in this section, no such open hopper type barge shall be placed as lead barge in any tow. These barges shall be placed in protected positions within the tow so that the danger from diving or swamping will be minimized. Where, due to operating conditions, compliance with this paragraph is impossible, the provisions of paragraph (a)(3) of this section apply. The person in charge of the towing vessel shall be responsible for compliance with this paragraph.

(2) No such open hopper type barge shall be moved from a loading facility unless all void spaces and bilges are substantially free of water. Periodic inspections and necessary pumping shall be carried out to insure the maintenance of such water-free conditions, in order to minimize the free surface effect in both the longitudinal and transverse directions. Except when considered necessary for inspection or pumping, all hatch covers and other hull closure devices for void spaces and hull compartments shall be closed and secured at all times. In the case of unmanned barges, the person in charge of the towing vessel shall be deemed to be in charge of the barge, and all requirements to be carried out on the barge shall be carried out by or under the direction of this person.

(3) When an open hopper type barge is in an exposed position, such that protection from swamping provided by adjoining barges cannot be obtained from the location within the tow, it shall be the responsibility of the person in charge of the towing vessel to control speed so as to insure protection against diving and swamping of the barge, having regard to its design and freeboard, and other operating conditions.

(b) To show that special operating requirements apply to a specific open hopper type barge, additional placards or signs shall be displayed in at least four different locations on the barge when the cargoes subject to this part are carried in any form in the cargo tanks. The placards or signs shall be posted on the barge approximately amidships on each side and near the centerline fore and aft facing outboard. Racks, or other suitable means for mounting such placards or signs, shall be so arranged as to provide clear visibility and shall be protected from becoming readily damaged or obscured. The placards or signs shall be at least equal in dimensions to the DOT standard tank car ''Dangerous'' placard (10¾ inches square or larger) and shall display a circle (10 inches in diameter or larger) with alternating quadrants of white and red, and so mounted that the red quadrants are centered on the vertical axis. The shipper and/or owner of the barge shall be responsible for the installation of the required placards or signs, including maintenance of them while such barge is in temporary storage with cargo aboard. The person in charge of the towing vessel shall be responsible for the continued maintenance of the placards or signs while such barge is in transit.

§ 151.45–6 Maximum amount of cargo.

(a) Tanks carrying liquids or liquefied gases at ambient temperatures regulated by this subchapter shall be limited in the amount of cargo loaded to that which will avoid the tank being liquid full at 105°F. if insulated, or 115°F. if uninsulated. If specific filling densities are designated in Subpart 151.50 of this part, they shall take precedence over that noted above.

(b) Refrigerated and semirefrigerated tanks shall be filled so that there is an outage of at least 2 percent of the volume of the tank at the temperature corresponding to the vapor pressure of the cargo at the safety relief valve setting. A reduction in the required outage may be permitted by the Commandant when warranted by special design considerations. Normally, then, the maximum volume to which a tank may be loaded is:

$$V_L = 0.98 d_r V \div d_L$$

where:

V_L = Maximum volume to which tank may be loaded.
V = Volume of tank.
d_r = Density of cargo at the temperature required for a cargo vapor pressure equal to the relief valve setting.
d_L = Density of cargo at the loading temperature and pressure.

§ 151.45–7 Shipping papers.

Each barge carrying dangerous cargo shall have on board a bill of lading, manifest, or shipping document giving the name of shipper, location of the loading point, and the kind, grade, and approximate quantity by compartment of each cargo in the barge. Such manifest or bills of lading may be made out by the shipper, master of the towing vessel, owner, or agent of the owner. However, in the case of unmanned barges the master of the towing vessel shall either have a copy of the shipping papers for each barge in his tow or he shall make an entry in the towing vessel's log book giving the name of the shipper, location where the barge was loaded, and the kind, grade, and quantity of cargo by compartment in the barge. The barge shall not be delayed in order to secure the exact quantities of cargo.

§ 151.45–8 Illness, alcohol, drugs.

A person who is under the influence of liquor or other stimulants, or is so ill as to render him unfit to perform service shall not be permitted to perform any duties on the barge.

§ 151.45–9 Signals.

While fast to a dock, a vessel during transfer of bulk cargo shall display a red flag by day or a red light by night, which signal shall be so placed that it

will be visible on all sides. When at anchor, a vessel during transfer of bulk cargo shall display a red flag by day, placed so that it will be visible on all sides. This flag may be metallic.

Subpart 151.50—Special Requirements

EDITORIAL NOTE: Nomenclature changes to Subpart 151.50 appear at 60 FR 50465, Sept. 29, 1995 and at 61 FR 50732, Sept. 27, 1996.

§ 151.50–1 General.

Special requirements found in this subpart pertain to specific cargoes and to similar groups of cargoes. These requirements are in addition to and take precedence over any other requirements found in these regulations.

§ 151.50–5 Cargoes having toxic properties.

When table 151.05 refers to this section, the following apply:

(a) [Reserved]

(b) Independent tanks shall be designed and tested for a head of at least 8 feet above the top of the tank using the specific gravity of the product to be carried. In addition, tank design calculations shall demonstrate that the tank can withstand, without rupture, a single loading to the highest level to which the product may rise, if that exceeds 8 feet. In general, plate less than five-sixteenths inch in thickness shall not be used in the fabrication of independent tanks unless otherwise approved.

(c)(1) Cargo tanks transporting liquids having a Reid vapor pressure exceeding 14 pounds per square inch absolute or vented at a gauge pressure exceeding 4 pounds per square inch, or where air or water pressure is used to discharge the cargo, shall be fabricated as arc-welded unfired pressure vessels.

(2) Unfired pressure vessel cargo tanks shall be designed for a pressure not less than the vapor pressure, in pounds per square inch gauge, of the lading at 115°F., or the maximum air or water pressure used to discharge the cargo, whichever is greater, but in no case shall the design pressure of such tanks be less than 30 pounds per square inch gauge.

(d) *Piping.* (1) The pumps and piping used for cargo transfer shall be independent of all other piping.

(2) Where multiple cargoes are carried, and the cargo piping conveying cargoes covered under this section are led through cargo tanks containing other products, the piping shall be encased in a tunnel.

(3) Where cargo lines handling other products, or bilge and ballast piping are led through tanks containing cargoes covered by this section, the piping shall be enclosed in a tunnel.

(e) Gravity type cargo tanks shall be fitted with an approved pressure-vacuum relief valve of not less than 2½-inch size, which shall be set at a pressure of not less than 3 pounds per square inch gauge, but not in excess of the design pressure of the tank.

(f) The discharge fittings from each safety relief or pressure vacuum relief valve shall be directed in such a manner as to not impinge on another tank, piping or any other equipment which would increase the fire hazard should burning products be discharged from the safety or pressure vacuum relief valve as a result of a fire or other casualty. In addition, the discharges shall be directed away from areas where it is likely that persons might be working and as remote as practicable from ventilation inlets and ignition sources. A common discharge header may be employed if desired. The area near the discharge fittings shall be clearly marked as a hazardous area.

(g) A means shall be provided for either the reclamation or safe venting of vapors during the loading and unloading operations. For this purpose the safety relief or pressure vacuum relief valve shall be provided with a valved bypass to a vapor return line shore connection which shall be used whenever vapor return shore facilities are available. In the event vapors must be vented to the atmosphere, a vent riser shall extend at least 12 feet above the highest level accessible to personnel. The vent riser may be collapsible for ease of stowage when not in use. Vapor return lines or vent risers for tanks carrying the same class product may be connected to a common header system if desired. Tanks carrying cargoes covered by this section shall be vented