



ADMINISTRATIVE RULES OF MONTANA



4.12.722 REFRIGERATED STORAGE

- (1) Design of tanks:
 - (a) Tanks may be designed for any storage pressure desired as determined by economical design of the refrigerated system.
 - (b) Tanks with a design pressure exceeding 15 psig shall be constructed in accordance with ARM 4.12.704 in addition the materials shall comply with ARM 4.12.704.
 - (c) Tanks with a design pressure of 15 psig and less shall be constructed in accordance with the general requirements of American Petroleum Institute Standard 620 or API Standard 12-C with the following modifications:
 - (i) The liquid specific gravity used for design shall be at least as high as the maximum specific gravity at minimum storage temperature of the ammonia being stored.
 - (ii) The joint efficiency shall not exceed 0.85 unless inspection requirements exceed those of API Standard 12-C. A joint efficiency of 1.00 may be used provided all shell weld junctions are radiographed in addition to the spot radiographic requirements of API Standard 12-C. Full penetration double butt weld shall be used for girth joints.
 - (iii) The design of shells other than vertical cylindrical tanks for all pressure up to 15 psig inclusive shall use design stresses no higher than the stress values given for pressures from 0.5 to 5 psig inclusive in the first edition of API Standard 620.
 - (d) Refrigerated storage tanks shall be hydrostatically tested to the highest level possible without the shell membrane stress during the test exceeding 30 percent of the specified minimum yield strength of the shell material. When this limitation precludes completely filling the tank, the remaining welded joints shall be tested using penetrant test methods specified in API Standard 12-C.
 - (e) Ferritic steels for tank shells and bottoms shall be selected for the design temperature. This application may be based on impact test requirements or equivalent criteria (See Table B) .
 - (f) When austenitic steels or non-ferrous materials are used the code shall be used as a guide for temperature requirements.
 - (g) Materials for nozzles, attached flanges, structural members which are in tension, and other such critical elements shall be selected for the design temperature. This selection may be based on impact test requirements or equivalent criteria (See Table B) .
- (2) Installation of storage tank:

- (a) Tanks shall be supported on a non-combustible foundation designed to accommodate the type of tank being used.
- (b) Secure anchorage or adequate pier height shall be provided against tank flotation wherever high flood water might occur.
- (3) Tank valves and accessories, fill pipes and discharge pipes:
 - (a) Shutoff valves shall be:
 - (i) provided for all connections, except those with a No. 54 drill size restriction, plugs, safety valves, thermometer wells; and
 - (ii) located as close to the tank as practicable.
 - (b) When operating conditions make it advisable, a check valve shall be installed on the fill connection and a remotely operated shutoff valve on other connections located below the maximum liquid level.
- (4) Safety devices:
 - (a) Safety relief valves shall be set to start-to-discharge at a pressure not in excess of the design pressure of the tank and shall have a total relieving capacity sufficient to prevent a maximum pressure in a container of more than 120 percent of the design pressure.
 - (b) The size of relief valves shall be determined by the largest volume requirement of the following:
 - (i) possible refrigeration system upset, such as:
 - (A) cooling water failure,
 - (B) power failure,
 - (C) instrument air or instrument failure,
 - (D) mechanical failure of any equipment, or
 - (E) excessive pumping rates.
 - (ii) the American National Standards Institute's Fire Safety Provisions (Section 4.5.2.2) .
 - (c) All safety devices shall comply with the following;
 - (i) The discharge from safety relief valve shall be vented away from the tank at any desired angle above the horizon using a vent stack designed for weather protection. The size of discharge lines from safety relief valves shall not be smaller than the nominal size of the relief valve outlet connections. Provisions shall be made for draining condensation which may accumulate.
 - (ii) Discharge lines from two or more safety relief devices located on the same unit may be run into a common discharge header, provided the cross-sectional area of such header is at least equal to the sum of the cross-sectional area of the individual discharge lines and that the settings of the safety relief valves are the same.
- (5) Protection of tank accessories and grounding: Refrigerated storage tanks shall comply with the provisions of ARM 4.12.719(9) .

- (6) Tanks of such size as to require field fabrication shall, when moved and reinstalled, be reconstructed and reinspected in complete accordance with the code under which they were constructed. The tanks shall be subjected to a pressure retest, and if re-rating is necessary, it shall be done in accordance with the applicable code procedures.
- (7) Precaution shall be taken to avoid any damage by trucks, tractors or other vehicles.
- (8) Refrigerated load and equipment:
 - (a) The total refrigeration load shall be computed as the sum of the following:
 - (i) Load imposed by heat flow into the tank caused by the temperature differential between design ambient temperature and storage temperature.
 - (ii) Load imposed by heat flow into the tank caused by maximum sun radiation.
 - (iii) Maximum load imposed by filling the tank with anhydrous ammonia warmer than the design storage temperature.
 - (b) More than one storage tank may be handled by the same refrigeration system.
 - (c) Compressors:
 - (i) A minimum of two compressors shall be provided either of which is of sufficient size to handle the loads listed in ARM 4.12.722(8) (a) (i) (ii) . Where more than two compressors are provided, minimum standby equipment equal to the largest normally operating equipment shall be installed.
 - (ii) Compressors shall be sized to operate with a suction pressure at least 10 percent below the minimum setting of the safety valves) on the storage tank and shall withstand a suction pressure at least equal to 120 percent of the design pressure of the tank. Discharge pressure will be governed by condensing conditions.
 - (d) Compressor drives:
 - (i) Each compressor shall have its individual driving unit.
 - (ii) Any standard drive consistent with good design may be used.
 - (iii) An emergency source of power of sufficient capacity to handle the loads in ARM 4.12.722(8) (a) (i) (ii) shall be provided, unless facilities are provided to safely dispose of vented vapors while the refrigeration system is not operating.
 - (e) Automatic control equipment:
 - (i) The refrigeration system shall be arranged with suitable controls to govern the compressor operation in accordance with the load as evidenced by pressure in the tank or tanks.
 - (ii) Any emergency alarm system shall be installed to function in the event the pressure in the tank or tanks rises to the maximum allowable operating pressure.
 - (iii) An emergency alarm and shutoff shall be located in the condenser system to respond to excess discharge pressure caused by failure of the cooling medium.
 - (iv) All automatic controls shall be installed in a manner to preclude operation of alternate compressors unless the controls will function with the alternate compressors.

- (f) Separators:
 - (i) An entrainment separator of a size capable of holding any liquid material entering the line during the transfer operation shall be installed in the compressor suction line. The separator shall be equipped with a drain and gauging device.
 - (ii) An oil separator of a size capable of holding any liquid material entering the line during the transfer operation shall be installed in the compressor discharge line. It shall be designed for at least 250 psig and shall be equipped with a gauging device and drain valve.
- (g) Condensers: The condenser system may be cooled by air or water or both. The condenser shall be designed for at least 250 psig. Provision shall be made for purging non-condensibles either manually or automatically.
- (h) Receiver and liquid drain: A receiver shall be provided which is equipped with an automatic float valve to discharge the liquid anhydrous ammonia to storage or with a high pressure liquid drain trap of a capacity capable of holding any liquid material entering the line. The receiver shall be designed for at least 250 psig operating pressure and be equipped with the necessary connections, safety valves, and gauging device.
- (i) Insulation:
 - (i) Where insulation is required, insulation thickness shall be determined by good design.
 - (ii) Insulation of refrigerated tanks and pipelines shall be waterproofed. The insulating material shall be fire retardant. The weatherproofing shall be fire resistant.
- (j) Piping: All piping shall be well supported and provision shall be made for expansion and contraction. All refrigeration system piping shall conform to Section 5 of the American Standards Association's "Code for Pressure Piping" (B 31.1) as it applies to anhydrous ammonia.
- (k) Safety equipment: All refrigerated storage plants shall have on hand the minimum safety equipment required under ARM 4.12.711(2) .

Authorizing statute(s): Sec. 80-10-503, MCA

Implementing statute(s): Sec. 80-10-503, MCA

History: NEW, 1986 MAR p. 1820, Eff. 10/31/86.