

220 CMR 112.00: DESIGN, OPERATION, MAINTENANCE AND SAFETY OF
LIQUEFIED NATURAL GAS (LNG) PLANTS AND FACILITIES

Section

- 112.01: Applicability and Scope
- 112.02: Applications for Exceptions from Provisions of 220 CMR 112.00
- 112.03: Definitions
- 112.10: Standards and Codes
- 112.11: Plans and Procedures
- 112.12: Records
- 112.20: Control Center
- 112.21: Alarm Systems at Plants Not Continuously Attended
- 112.22: Inspection of Plants Not Continuously Attended
- 112.23: Emergency Controls
- 112.24: Cargo Transfer Operations
- 112.25: Portable Vaporizers
- 112.30: Maintenance -- General
- 112.31: Relief Valves
- 112.32: Transfer System Valves
- 112.40: Fire Prevention and Control -- Fire Study and Prevention Plan
- 112.41: Emergency Plan: Equipment and Procedures
- 112.42: Evacuation Plan
- 112.43: Accessibility to Plant Site
- 112.44: Fire Detection System
- 112.45: Dike Penetrations
- 112.46: Sumps and Grading
- 112.47: Transfer Piping Protection
- 112.48: Control Room Warning Devices
- 112.49: High Expansion Foam Systems
- 112.50: Cargo Transfer System Valves
- 112.60: Construction Materials and Procedures -- Notification of Plant Modifications
- 112.61: Piping Materials
- 112.62: Welding
- 112.63: Threaded Joints
- 112.64: Bolted Connections

112.01: Applicability and Scope

- (1) 220 CMR 112.00 is adopted pursuant to M.G.L. c. 30A, § 2, and M.G.L. c. 164, § 76, and is effective on final publication in the Massachusetts Register.
- (2) 220 CMR 112.00 regulates the design, construction, operation or maintenance of a facility or plant to liquefy, store, or vaporize natural gas.

- (3) 220 CMR 112.00 applies to every gas company, municipal gas department, or other person engaged in the siting, design, construction, operation, maintenance, security, or fire protection of an LNG facility or plant within the jurisdiction of the Commonwealth of Massachusetts.
- (4) 220 CMR 112.00 applies to each new facility or plant installed after the effective date of 220 CMR 112.00.
- (5) 220 CMR 112.00 applies to each facility and plant, existing in Massachusetts on the effective date of 220 CMR 112.00 (9/14/90), to the maximum extent not inconsistent with the Natural Gas Pipeline Safety Act of 1968 and the United States Constitution.
- (6) Each facility or plant made subject to the requirements of 220 CMR 112.01(4) and (5) shall comply with any requirement subsequently imposed under 220 CMR 112.00 within 18 months of the effective date.

112.02: Applications for Exceptions from Provisions of 220 CMR 112.00

Any person engaged in the operation of an LNG plant or facility may make a written request to the Department for an exception to the provision of 220 CMR 112.00.

The request shall justify why the exception should be granted and shall demonstrate why the exception sought does not derogate from the safety objectives of 220 CMR 112.00. The Department may issue the exception as requested, or as modified and subject to conditions, to the person requesting such exception. After receipt of a written request, the Department shall set forth in writing its reasons for granting or denying the request. The Department may authorize the Director of the Division of Pipeline Engineering and Safety to grant or deny requests for exceptions.

112.03: Definitions

Except as otherwise specified in 220 CMR 112.03, all words are defined as in 49 C.F.R. Part 193, Liquefied Natural Gas Facilities: Federal Safety Standards.

Department means, the Massachusetts Department of Public Utilities.

Operator means a person who owns, operates, or maintains an LNG facility or plant.

Person means any individual, firm, joint venture, partnership, corporation, association, state agency, municipality, cooperative association, or joint stock association, and includes any trustee, receiver, assignee or personal representative thereof.

112.10: Standards and Codes

- (1) Unless otherwise authorized, the minimum safety standards for all LNG plants and facilities are those issued under:
 - (a) The Natural Gas Pipeline Safety Act of 1968, 49 U.S.C. 1671-1684, as amended, as set forth in 49 C.F.R. Part 193, including all subsequent amendments thereto; and
 - (b) The regulations set forth in 220 CMR 112.00.
- (2) To the extent that any provision of 220 CMR 112.00 conflicts with the regulations of 49 C.F.R. Part 193, the more stringent regulation controls.
- (3) Subject to 220 CMR 112.01(5), each LNG plant or facility designed and constructed before the effective date of 220 CMR 112.00 shall comply with the standards and codes in effect at the time the plant or facility was designed and constructed.
- (4) Each modification to a component of an existing LNG plant or facility that is made after the effective date of 220 CMR 112.00 shall comply with the standards, codes and documents incorporated by reference in Appendix A of 49 C.F.R. Part 193.

112.11: Plans and Procedures

- (1) At each LNG plant, the operator shall prepare, adhere to, and maintain in promptly updated form the plans and procedures required by 220 CMR 112.00 and by 49 C.F.R. Part 193 for that plant. The plans and procedures shall be made available on request by the Department for review and inspection. In addition, each change to the plans or procedures shall be available at the LNG plant for review and inspection within 20 days after the change is made.
- (2) Each operator shall timely submit the plans and procedures and any changes thereto to the Department, except for security plans and procedures subject to the provisions of 220 CMR 69.02.
- (3) The Department may require the operator to amend its plans and procedures to provide a reasonable level of safety.

112.12: Records

- (1) Each operator shall keep records adequate to substantiate compliance with 49 C.F.R. Part 193 and 220 CMR 112.00.
- (2) Subject to the provision of 220 CMR 69.02, the Department may have access to records for inspection and copying.

- (3) Each operator shall keep a record of all materials used for components, buildings, foundations, and support systems. These records shall be maintained for the operating life of the aforementioned items.

112.20: Operations Control Center

- (1) Each LNG plant shall have a control center from which operations and warning devices are continuously monitored.
- (2) A control center shall have personnel in continuous attendance while any of the components under its control are in operation. If a plant is being operated from a remote control center, the controls shall be linked to an alarm audible throughout the plant.
- (3) Each control center shall have a means of communicating a warning of hazardous conditions to all locations in the plant frequented by personnel.
- (4) If more than one control center is located at an LNG plant, there shall be at least two means of communication between all such control centers.
- (5) All gas detectors and fire detectors shall be linked to visible and audible alarms at a continuously attended control center.

112.21: Alarm Systems at Plants Not Continuously Attended

An alarm system shall be provided in each plant that is not continuously attended to transmit an alarm to a continuously attended facility of the operator. Such alarm system shall be capable of indicating abnormal pressure, temperature, gas concentration, security breach, fire, and other abnormal conditions.

112.22: Inspection of Plants Not Continuously Attended

Each plant that is not continuously attended shall be visually inspected at least once a day by a qualified representative of the operator to ensure that it is in a safe condition.

112.23: Emergency Controls

Emergency controls shall be conspicuously marked with their designated function and located for ready access in emergencies.

112.24: Cargo Transfer Operations

Each hazardous fluid cargo transfer system shall be inspected before every use to verify that the valves and controls are in their proper operating position. Transfer

operations shall allow time for proper cooldown of piping and equipment. If any unusual pressure or temperature variations occur, transfer shall be stopped, as soon as safely possible, until the cause has been determined and corrected. Pressure readings shall be observed during LNG, propane, or refrigerant cargo transfer operations.

112.25: Portable Vaporizers

Portable LNG vaporizers shall be located inside the plant's fenced perimeter when used to vaporize gas from the LNG plant.

112.30: Maintenance -- General

- (1) All components in service shall be maintained in sound condition consistent with operational or safety purposes. The operator shall keep and update written maintenance procedures for all components whose failure to function as designed could result in a danger to the public or to plant personnel.
- (2) Written maintenance procedures shall include, but not be limited to, the following:
 - (a) details of inspection and testing to meet the requirements of 49 C.F.R. Part 193, Subpart G - Maintenance;
 - (b) frequency of inspection and testing;
 - (c) procedures for each maintenance activity performed on each component;
 - (d) description or procedures to follow for all other actions necessary to maintain the subject LNG plant in accordance with 49 C.F.R. Part 193, Subpart G - Maintenance, and Subpart I - Fire Protection, including maintenance procedures required to reduce to a minimum the occurrence and consequences of fire; and
 - (e) methods used to verify that maintenance standards for components are met.

112.31: Relief Valves

The means for adjusting the set point pressure on all adjustable relief devices shall be sealed.

112.32: Transfer System Valves

Each shutoff valve on any transfer system shall be located and equipped for ready access, operation, and maintenance.

112.40: Fire Prevention and Control -- Fire Study and Prevention Plan

- (1) Each LNG plant or facility shall have a written fire prevention plan that includes the determinations and supporting documentation for those determinations to

substantiate compliance with 49 C.F.R. Part 193.2805 - Fire Prevention Plan, 49 C.F.R. Part 193.2817 - Fire Equipment, and 220 CMR 112.00. The operator shall review the plan at least once every two years and shall review the plan whenever any major change occurs in the plant's design, operations, or neighboring environment.

- (2) The plan shall include, but not be limited to:
 - (a) determination of potential sources of flammable fluids (e.g., natural gas, propane, gasoline) and flammable materials (e.g., insulation, wood);
 - (b) determination of potential ignition sources within the plant;
 - (c) determination of potential ignition sources in the area around the plant that could be covered by a vapor cloud if any single component containing LNG within the plant failed;
 - (d) determination of the areas within the plant or facility where the potential exists for the leakage of flammable fluids, including, but not limited to, those areas described in the National Fire Protection Association NFPA 70 (National Electrical Code), Section 500-4, Class I Locations;
 - (e) determination of the types, sizes and foreseeable consequences of LNG and other cryogenic or hazardous liquid spills that may reasonably be expected to occur within the plant (including the extent vapor clouds travel outside the plant);
 - (f) determination of the types, sizes and consequence of fires that may reasonably be expected to occur inside or within a reasonable distance of the LNG facility or plant; and
 - (g) a training program prepared with cooperating local police, fire, and civil defense departments, including, but not limited to, training on controls, piping, and fire equipment, procedures, and emergency drills. Such training program may be augmented by local fire department requirements. An annual report outlining the training program for the preceding year shall be submitted to the Department no later than January 30th of each year. The report shall include the name and job title of operating and maintenance personnel and any appropriate official public personnel that have participated in the program.

- (3) In developing the fire prevention plan, each operator shall analyze and consider the benefits, estimated cost, and feasibility of installing the following fire prevention, safety, and operating equipment at the plant:
 - (a) sumps, grading, and open drainage trenches to confine and mitigate the effects of LNG spills including, but not limited to vaporizer, liquefaction, and storage tank dike areas;
 - (b) automatic or motorized valves, capable of local or remote operation, located at flammable fluid cargo transfer areas, and designated for use during an emergency;
 - (c) existing fire-fighting equipment and revisions of fire-fighting procedures;
 - (d) use of high-expansion foam systems for fire-fighting and vapor control;

- (e) adequacy of existing control and alarm systems, including, but not limited to control panel layout and instrumentation, location of controls, emergency shutdown systems, and fail-safe design of control systems;
 - (f) location, construction, and protection of LNG plant control rooms;
 - (g) location and protection of each auxiliary generator and related fuel supplies;
 - (h) protection of pipe supports and equipment foundations from cryogenic fluid spills;
 - (i) protection of LNG cargo transfer station piping, valves, and hoses from damage caused by vehicles;
 - (j) prevention of valve freeze-up caused by icing;
 - (k) controls, equipment, and procedures to keep LNG from entering lines that run outside the plant (e.g., internal condensate lines from vaporizers, surface water drainage lines);
 - (l) adequacy of existing fire detection and gas detection systems;
 - (m) removal of existing copper or copper-alloy tubing and piping carrying hazardous or cryogenic fluids and replacement with stainless steel tubing and piping;
 - (n) location and distribution of relief valve vents to eliminate hazards to personnel and equipment; and
 - (o) replacement or modification of buildings constructed with combustible materials with buildings made primarily of non-combustible materials.
- (4) Each operator shall file a copy of the written fire study and prevention plan and all updates with the Department's Pipeline Engineering and Safety Division or its successor division.

112.41: Emergency Plan: Equipment and Procedures

In making determinations required by 220 CMR 112.40 and 49 C.F.R. 193.2805 and 193.2817, the operator shall provide the following emergency equipment and supplies:

- (1) fire-fighting and control equipment, supplies and materials;
- (2) components including impounding systems, to control flammable fluid leakage, spill and release;
- (3) procedures to be followed by the operator's personnel and appropriate local public officials and their personnel in the event of an emergency and the manual required by 49 C.F.R. Part 193, Section 193.2509 - Emergency Procedures;
- (4) protective clothing, safety and communications equipment, first-aid supplies, and tools necessary for the operator's personnel to perform emergency duties.

112.42: Evacuation Plan

In association with cooperating local police, fire, civil defense, and other public officials, each operator of an LNG facility or plant shall prepare a written evacuation plan to protect the public in the event of a determined controllable or uncontrollable emergency. Each operator shall review evacuation plans at least annually and revise plans as circumstances warrant. Each operator shall file a copy of the written evacuation plan and all updates with the Department's Pipeline Engineering and Safety Division or its successor division.

112.43: Accessibility to Plant Site

All plant sites shall be designed, maintained, and operated to provide ease of access and egress for personnel, equipment, and materials of the operator and public authorities in controlling leakage, spill or release of flammable and hazardous fluids, fire-fighting, and evacuating and rescuing personnel.

112.44: Fire Detection System

Each building that contains flammable fluids shall have a fixed fire detection system that provides an audible and visible alarm at an attended control room and an audible or visible alarm outside the building.

112.45: Dike Penetrations

- (1) No dike penetrations for piping or other purposes may be added after the effective date of 220 CMR 112.00.
- (2) Any dike penetrations in place as of the effective date of 220 CMR 112.00 shall be constructed of or lined with pipe capable of withstanding cryogenic temperature and any dike penetration in place as of the effective date of 220 CMR 112.00 shall be equipped with a valve designed to close automatically on exposure to cryogenic temperatures. Such valve shall also be capable of being closed remotely from outside the dike and capable of withstanding cryogenic temperatures. Such valve shall be closed except when in use for its intended purpose.

112.46: Sumps and Grading

- (1) Grading, drainage, impounding systems, and separation distances shall be provided to the extent determined practicable by the operator, consistent with good engineering practice, at plants existing as of the effective date of 220 CMR 112.00 and at all plants constructed after the effective date of 220 CMR 112.00, to ensure that accidental hazardous liquid spills from the following areas do not endanger other areas, adjacent property, or enter navigable waterways. This

requirement applies to the following five areas:

- (a) liquefaction and other process areas;
 - (b) vaporizer areas;
 - (c) cargo transfer system areas;
 - (d) tank truck or tank car parking areas; and
 - (e) areas for handling or storing portable containers.
- (2) Each LNG cargo transfer station shall have an associated sump to contain spilled liquid. A system of trenches shall be used to conduct spilled liquid from the transfer station.
- (a) The sump volume shall be at least 10,000 gallons for transfer stations designed to handle one or two trucks. The sump volume shall be at least 15,000 gallons for transfer stations handling three or more trucks.
 - (b) The sump shall be located so as to minimize the vapor concentration and thermal radiation at the transfer station and plant boundaries. A truck station sump shall be so located that the thermal radiation from a fire may not exceed 3,700 Btu/sq. ft./hour at an LNG storage tank.
- (3) When determined by the operator to be practicable, each diked storage tank area shall have a sump and trenches to reduce the vaporization and thermal radiation from a ten minute spill. The spill rate shall be determined according to the following formula:

$$q = (4/3) (d^2) \sqrt{h}$$

where:

q = Liquid flow rate, cubic feet per minute

d = Diameter of largest tank penetration below LNG liquid level (expressed in inches); and

h = Maximum liquid height above the penetration (expressed in feet).

112.47: Transfer Piping Protection

- (1) LNG cargo transfer piping, valves, and hoses shall be protected from damage by vehicles, as follows:
 - (a) Piping and valves shall be shielded by steel and/or concrete barriers (e.g., highway guardrails, Jersey barriers).
 - (b) A hose rack or other protective structure shall be provided at the transfer stations. Transfer hoses may not be stored on the ground.
 - (c) Barriers and racks shall, however, permit ready escape by personnel in an emergency.
- (2) Sources of ignition (e.g., welding, flames, unclassified electrical equipment) may not be permitted within 50 feet of tank trucks or tank cars during transfer.

112.48: Control Room Warning Devices

Each operator shall install warning devices in the control room to warn of hazardous conditions detected by all sensing devices required by 220 CMR 112.00 and by the applicable sections of 49 C.F.R. Part 193. The warning devices shall:

- (1) provide audible and visible alarms designed to gain the attention of personnel; and
- (2) indicate the location and type of hazard detected.

112.49: High Expansion Foam Systems

Each LNG plant shall have a high expansion foam system. The size, location, and type shall be determined as part of the fire study and prevention plan required by 220 CMR 112.40.

112.50: Cargo Transfer System Valves

- (1) All cryogenic or hazardous fluid cargo transfer systems shall have at least one remotely operated valve at the cargo transfer station. Emergency shut-off valves for LNG and other cryogenic or hazardous fluid cargo transfer systems shall be designed to be:
 - (a) manually operable at the valve, and
 - (b) power operable at the valve, and
 - (c) power operable at a remote location at least 50 feet from the valve.
- (2) Cargo transfer systems equipped with a check valve to prevent backflow from the storage tank are exempt from the requirements of 220 CMR 112.50(1).

112.60: Notification of Plant Modifications

Each operator shall notify the Department of any modifications of, or change in, a component or facility at an LNG plant estimated to cost \$50,000 or more. Except in an emergency, notification shall include a written detailed description and shall be submitted to the Department at least 30 days before the modification or change may be made. In other, non-emergency situations where 30 days notice is impracticable, the Department may allow work effecting the modification or change to begin after the elapse of at least 24 hours or some other period of less than 30 days following its receipt of notification. In the event of a bona fide emergency, the operator may, without prior notice to the Department, commence such modifications as circumstances require but shall notify the Department as soon as is practicable.

112.61: Piping Materials

Piping made of cast iron, malleable iron, ductile iron, copper, or copper alloys, may not be used to carry cryogenic or hazardous fluids, except that copper or copper-alloy tubing and piping two inches or less in diameter and installed as of the effective date of 220 CMR 112.00 may be used to carry cryogenic or hazardous fluids.

112.62: Welding

- (1) After the effective date of 220 CMR 112.00, welding of pressurized piping for LNG or other cryogenic or hazardous fluids shall comply with 49 C.F.R. Part 192, Subpart E - Welding of Steel in Pipelines. Such welding shall conform to the restrictions expressed in the 220 CMR 112.62 in addition to other sound engineering and work practices.
- (2) Materials to be qualified by impact testing shall be welded using procedures that preserve the low temperature properties of the material.
- (3) Piping attachments shall be welded using procedures to prevent burn-through and stress intensification.
- (4) Oxygen-fuel gas welding is prohibited.
- (5) Marking materials used to identify pipe welds shall be compatible with the basic pipe material.
- (6) Any permitted die-stamping must be done with a die with edges blunted to minimize stress concentrations. Surfaces of components less than 0.25 inches thick may not be field die-stamped.

112.63: Threaded Joints

- (1) Threaded joints shall be free of stress from external loading.
- (2) All threaded joints, except those requiring removal for regular maintenance, such as relief valve connections, shall be seal-welded or sealed by other means that have been tested and proven reliable and acceptable in industry practice.
- (3) Threaded pipe and fittings installed after the effective date of 220 CMR 112.00 and used in cryogenic or hazardous fluid piping shall be designated as at least extra-strong (Schedule 80).

112.64: Bolted Connections

Care shall be taken to ensure the tightness of all bolted connections. All bolted

connections made after the effective date of 220 CMR 112.00 shall be tightened to the proper torque, as determined by the relevant equipment specification or by sound industry practice, with a torque wrench. Spring washers or similar devices designed to compensate for expansion and contraction shall be used in all new or replacement bolted connections. Potential fire exposure shall be considered when selecting gaskets.

REGULATORY AUTHORITY

220 CMR 112.00: M.G.L. c. 164, § 76