NFPA 30

Underground Tank Installation

Chapter 4 Tank Storage

4.1 General

4.1.1 Scope. This chapter shall apply to the following:

(1) The storage of flammable and combustible liquids as defined in 1.7.3, in fixed underground tanks.

(2) The design, installation, testing, operation, and maintenance of such tanks.

1.7.3 Classification of Liquids. Any liquid within the scope of this code and subject to the requirements of this code shall be known generally as either a flammable liquid or a combustible liquid and shall be defined and classified in accordance with this subsection.

1.7.3.1 Combustible Liquid. Any liquid that has a closed-cup flash point at or above 100 degrees F (37.8 degrees C), as determined by the test procedures and apparatus set forth in 1.7.4. Combustible liquids are classifies as Class II or Class III as follows: (a) *Class II Liquid* – any liquid that has a flash point at or above 140 degrees F (37.8 C) and below 200 degrees F (93 C) (b) *Class IIIA* – any liquid that has a flash point at or above 140 degrees F (60 C), but below 200 degrees F (93 C); (c) *Class IIIB* – Any liquid that has a flash point at or above 200 degrees F (93 C)

1.7.3.2 Flammable Liquid. Any liquid that has a closed-cup flash point below 100 degrees F (37.8 C), as determined by the test procedures and apparatus set forth in 1.7.4. Flammable liquids are classified as Class I as follows: (a) *Class I Liquid* – any liquid that has a closed-cup flash point below 100 degrees F (37.8 C) and a Reid vapor pressure not exceeding 40 psia (2068.6 mm Hg) at 100 degrees F (37.8 C), as determined by ASTM D 323, *Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method).* Class I liquids are further classified as follows: Class IA liquids – those liquids that have flash points below 73 degrees F (22.8 C) and boiling points at or above 100 degrees F (37.8 C); (2) Class IB liquids – those liquids that have flash points below 73 degrees F (22.8 C) and boiling points at or above 100 degrees F (37.8 C); (3) Class IC liquids – those liquids that have flash points at or above 73 degrees F (22,8 C), but below 100 degrees F (37.8 C)

4.2 Design and Construction of Tanks

4.2.1 General Requirements: Tanks shall be permitted to be of any shape, size, or type consistent with sound engineering design. Metal tanks shall be welded

4.2.1.1 Tanks designed and intended for aboveground use shall not be used as underground tanks.

4.2.1.2 Tanks designed and intended for underground use shall not be used as aboveground tanks.

4.2.2 Materials of Construction: Tanks shall be designed and built in accordance with recognized good engineering standards for the material of construction being used. Tanks shall be of steel or other approved noncombustible material, with the limitations and exceptions:

(a) The materials of construction for tanks and their appurtenances shall be compatible with the liquid to be stored. In case of doubt about the properties of the liquid to be stored, the supplier, producer of the liquid, or other competent authority shall be consulted.

(b) Tanks shall be permitted to be constructed of combustible materials only when approved by the authority having jurisdiction. Tanks constructed of combustible materials shall be limited to any of the following:

(1) Underground installation

(2) Use where required by the properties of the liquid stored

(c) Unlined concrete tanks shall be permitted to be used for storing liquids that have a gravity of 40 degrees API or heavier. Concrete tanks with special linings shall be permitted to be used for other liquids provided they are designed and constructed in accordance with good engineering practice.

(d) Tanks shall be permitted to have combustible or non-combustible linings. The choice of the lining material and its required thickness shall depend on the properties of the liquid to be stored.

4.2.3 Design Standards

4.2.3.1 Design Standards for Atmospheric Tanks

4.2.3.1.1 Atmospheric tanks, including those incorporating secondary containment, shall be designed and constructed in accordance with recognized standards or approved equivalents. Atmospheric tanks that meet any of the following standards shall be deemed as meeting the requirements of 4.2.3.1:

(1) UL 58, *Standard for Steel Underground tanks for Flammable and Combustible Liquids.*

(2) UL 1316, *Standard for Glass-Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures*

(3) UL 1746, *Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks*

4.2.5.2.9 Each commercial tank venting device shall have stamped on it the start-to- open pressure, the pressure at which the valve reaches the full open position, and the flow capacity at the latter pressure. If the start-to-open pressure is less than 2.5 psig (gauge pressure of 17.2 kPa) and the pressure at the full open position is greater than 2.5 psig (gauge pressure of 17.2 kPa) the flow capacity at 2.5 psig (gauge pressure of 17.2 kPa) shall also be stamped on the venting device. The flow capacity shall be expressed in cubic feet per hour of air at 60°F (15.6°C) and 14.7 psia (760 mm Hg)

4.2.5.3 Normal Venting for Underground Storage Tanks. Tank venting systems shall be provided with sufficient capacity to prevent blowback of vapor or liquid at the fill opening while the tank is being filled. Vent pipes shall be sized in accordance with table 4.2.5.3, but shall not be less than 1.25 in. nominal inside diameter. Where tank-venting devices are installed in vent lines, their flow capacities shall be determined in accordance with 4.2.5.2.9

Table 4.2.5.3 Vent Line Diameters

	Pipe Length		
Maximum Flow (gpm)	**50 ft. (in.)**	**100 ft. (in.)**	**200 ft. (in.)**
100	1 ¼	1 ¼	1 ¼
200	1 ¼	1 ¼	1 ¼
300	1 ¼	1 ¼	1 ½
400	1 ¼	1 ¼	2
500	1 ½	1 ½	2
600	1 ½	2	2
700	2	2	2
800	2	2	3
900	2	2	3
1000	2	2	3

4.2.5.4 Vent Piping. Piping for normal and emergency relief venting shall be designed in accordance with chapter 5.

4.2.6 Design of Storage Tank system Corrosion Protection.

Metal used to fabricate the tank shall be thick enough to compensate for internal corrosion expected during the design life of the tank or other approved means of corrosion protection shall be provided.

4.2.6.1 External Corrosion Protection for Underground Tanks

4.2.6.1.1 Underground tanks and their piping shall be protected by either of the following:

(1) A properly engineered, installed and maintained cathodic protection system in accordance with recognized engineering standards of design.

(2) Approved or listed corrosion-resistant materials or systems.

4.3.3 Installation of Underground Tanks

4.3.3.1 Location. Excavation for underground tanks shall be made with due care to avoid undermining of foundations of existing structures. Underground tanks or tanks under buildings shall be so located with respect to existing building foundations and supports that the loads carried by the latter cannot be transmitted to the tank. The distance from any part of a tank storing Class I liquids to the nearest wall of any basement or pit shall be not less than 1 ft., and to any property line that can be built upon, not less than 3 ft. The distance from any part of a tank storing Class II or Class III liquids to the nearest wall of any basement, pit, or property line shall be not less than 1 ft, and to any property line that any part of a tank storing Class II or Class III liquids to the nearest wall of any basement, pit or property line shall not be less than 1 ft.

4.3.3.2 Burial Depth and Cover

4.3.3.2.1 All underground tanks shall be installed in accordance with the manufacture instructions and shall be set on firm foundation and surrounded with at least 6-in (150mm) of non corrosive inert material such as clean sand or gravel well tamped in placed. The tank shall be placed in the hole with care.

4.3.3.2.2 Underground tanks shall be covered with not less than 2 ft. (0.6 m) of earth, or with not less 1 ft. (0.3m) of earth on top of which shall be placed a slab of reinforced concrete not less than 4 in. ((100 mm) thick. Where they are, or are likely to be, subjected to traffic, they shall be protected against damage from vehicles passing over them by at least 3 ft. (0.9) of earth cover, or 18 in. (450 mm) of well-tamped earth plus either 6 in. (150 mm)of reinforced concrete or 8 in. (200 mm) of asphaltic concrete. When asphaltic or reinforced concrete paving is used as part of the protection, it shall extend at least 1 ft. (0.3 m) horizontally beyond the outline of the tank in all directions.

4.3.3.2.3 Maximum depth of cover shall be specified by the tank manufacture and marked on the tank. When the depth of cover is greater than the diameter of the tank or if the pressure at the bottom of the tank can exceed 10 PSIG (69 KPA), the manufacture of the tank shall be consulted to determine if reinforcement of the tank is required. The specific gravity of the liquid to be stored shall be a design factor.

4.3.3.3 Vent Piping for Underground Tanks. Vent pipes from underground tanks shall be installed in accordance with Chapter 5.

4.3.3.4 Tank Openings Other than Vents for Underground Tanks.

4.3.3.4.1 Connections for all tank openings shall be liquid tight.

4.3.3.4.2 Opening for manual gauging, if independent of fill pipe, shall be provided with a liquid tight cap or cover. Covers shall be kept closed when not gauging. If inside a building, each such opening shall be protected against liquid over-flow and possible vapor release by means of a spring-loaded check-valve or other approved device

4.3.3.4.3 Fill and discharge lines shall enter tanks only through the top. Fill lines shall be sloped towards the tank. Underground tanks for Class I liquids having a capacity of more than 1000 gallons (3785L) shall be equipped with a light fill device for connecting the fill hose to the tank

4.3.3.4.4 Fill pipe that enter the top of a tank shall terminate within six in (150mm) of the bottom of the tank. Fill pipes shall be installed or arranged so that vibration is minimized.

Exception No. 1:Fill pipes in tanks whose vapor space under the expected range of normal operating conditions is not in the flammable range or is inerted need not meet this requirement.

Exception No. 2: Fill pipes in tanks handling liquids with minimal potential for accumulation of static electricity of static electricity need not meet this requirement provided that the fill line is designed and the system operated to avoid mist generation and an adequate level of residence time is provided downstream of filters or screens such that the charge generated is dissipated. (See A.2.3.2.5.4)

4.3.3.4.5 Filling and emptying and vapor recovery connections for Class I, Class II or Class IIIA liquids that are connected and disconnected shall be located outside of building at a location free from any source of ignition and not less than 5 ft (1.5m) away from any building opening. Such connection shall be closed and liquid tight when not in used and shall be properly identified.

4.3.3.5 Requirements for Underground Tanks Located in Areas Subject to Flooding

4.3.3.5.1 At locations where an ample and dependable water supply is available underground tanks containing flammable or combustible liquids, so placed that more than 70 percent of their storage capacity will be submerged at the maximum flood stage, shall be so anchored, weight, or secured as to prevent movement when filled or loaded with water and submerged by flood water to the established flood stage. Tank vents or other opening that are not liquid tight shall be extended above maximum flood stage water level.

4.3.3.5.2 At locations where an ample and dependable water supply is not available or where filling of underground tanks with water is impractical because of the contents, each tank shall be safeguarded against movement when emptying and submerged by high groundwater or floodwater by anchoring or by securing by other means. Each tank shall be so constructed and installed that it will safely resist external pressures if submerged.

4.4 Testing Requirements for Tanks.

4.4.1 Initial Testing. All tanks, whether shop built or field erected, shall be tested before they are placed in service in accordance with the applicable requirements of the code under which they were built.

4.4.1.1 An approved listing mark on a tank shall be considered to be evidence of compliance with this requirement. Tanks not marked in accordance with this subsection shall be tested before they are placed in service in accordance with good engineering principles or in accordance with the requirements for testing in the codes listed in 4.2.3.1.1, 4.2.3.2.1, or 4.2.3.3.1.

4.4.2 Tightness Testing. In addition to the tests called for in 4.4.1, all tanks and connections shall be tested for tightness after installation and before being placed in service in accordance with 2.4.2.2 and 2.4.2.3, as applicable. Except for underground tanks, this test shall be made at operating pressure with air, inert gas, or water. Air pressure shall not be used to test tanks that contain flammable or combustible liquids or vapors.

4.4.2.2 Single wall underground tanks and piping, before being covered, enclosed, or placed in use, shall be tested for tightness either hydrostatically or with air pressure at not less than 3 psig and not more than 5 psig.

4.4.2.3 Underground secondary containment tanks and horizontal aboveground secondary containment tanks shall have the primary (inner) tank tested for tightness either hydrostatically or with air pressure at not less than 3 psig and not more than 5 psig. The interstitial space (annulus) of such tanks shall be tested either hydrostatically or with air pressure at 3 to 5 psig, by vacuum at 5.3 in., or in accordance with the tanks listing or manufacturer's instructions. The pressure or vacuum shall be held for 1 hour without evidence of leaks. Care shall be taken to ensure that the interstitial space is not over pressured or subjected to excessive vacuum.

4.4.3 Additional Testing. Tanks that have been relocated, structurally damaged, repaired, or are suspected of leaking shall be tested in a manner acceptable to the authority having the jurisdiction.

4.6 Operation and Maintenance of Tanks.

4.6.1 Prevention of Overfilling of Tanks

4.6.2.1 An underground tank shall be equipped with overfill prevention equipments that will operate as follow.

(1) Automatically shut off the flow of liquid into the tank when the tank is more than 95 percent full

(2) Alert the transfer operator when the tank is no more than 90 percent full by restricting the flow of liquid into the tank or triggering the high-level alarm.

(3) Other method approved by the authorized having jurisdiction.

4.6.5 Temporary or Permanent Removal from Service of Underground Tanks

4.6.5.1 General The procedures outlined in this 4.6.5 section shall be followed when taking underground tanks temporarily out of service, closing them in place permanently, or removing them. All applicable safety procedures associated with working in proximity to flammable and combustible materials shall be strictly adhered to. *(See Appendix C for additional information)*

4.6.5.2 Temporary Closure. Tanks shall be rendered temporarily out of service only when it is planned that they will be returned to active service, closed in place permanently, or removed within a reasonable period not exceeding 1 year. The following requirements shall be met:

(1) Corrosion protection and release detection systems shall be maintained in operation.

(2) The vent line shall be left open and functioning.

(3) The tank shall be secured against tampering

(4) All other lines shall be capped or plugged.

4.6.5.3 Tanks remaining temporarily out of service for more than 1 year shall be permanently closed in place or removed in accordance with 2.6.5.3 or 2.6.5.4, as applicable.

4.6.5.34Permanent Closure in Place. Tanks shall be permitted to be permanently closed in place if approved by the authority having jurisdiction. All of the following requirements shall be met:

(a) All applicable authorities having jurisdiction shall be notified.

(b) A safe workplace shall be maintained throughout the prescribed activities.

(c) All flammable and combustible liquids and residues shall be removed from the tank, appurtenances, and piping and shall be properly disposed of.

(d) The tank shall be made safe by either purging it of flammable vapors or inerting the potential explosive atmosphere in the tank. Confirmation that the atmosphere in the tank is safe shall be by periodic testing of the atmosphere using a combustible gas indicator, if purging, or an oxygen meter, if inerting.

(e) Access to the tank shall be made by careful excavation to the top of the tank.

(f) All exposed piping, gauging and tank fixtures, and other appurtenances, except the vent, shall be disconnected and removed.

(g) The tank shall be completely filled with an inert solid material.

(h) The tank vent and remaining underground piping shall be capped or removed.

(i) The tank excavation shall be backfilled.

4.6.5.4 Removal and Disposal. Underground tanks shall be removed in accordance with the following requirements:

(1) The steps described in 4.6.5.3(1) through (5) shall be followed.

(2) All exposed piping, gauging and tank fixtures, and other appurtenances, including the vent, shall be disconnected and removed.

(3) All openings shall be plugged, leaving a ¼-in. opening to avoid buildup of pressure in the tank.

(4) The tank shall be removed from the excavated site and shall be secured against movement.

(5) Any corrosion holes shall be plugged

(6) The tank shall be labeled with its former contents, present vapor state, vapor-freeing method, and a warning against reuse.

(7) The tank shall be removed from the site promptly, preferably the same day.

4.6.5.6 Temporary Storage of Removed Tanks. If it is necessary to temporarily store that has been removed, it shall be placed in a secure area where public access is restricted. A ¼-in. opening shall be maintained to avoid buildup of pressure in the tank.

2.6.5.7 Disposal of Tanks. Disposal of tanks shall meet the following requirements:

(1) Before a tank is cut up for scrap or landfill, the atmosphere in the tank shall be tested in accordance 4.6.5.4(4) to ensure that it is safe.

(2) The tank shall be made unfit for further use by cutting holes in the tank heads and shell.

4.6.5.8 Documentation. All necessary documentation shall be prepared and maintained in accordance with all local rules and regulations.

4.6.5.9 Reuse of Underground Tanks. Only those used tanks that comply with the applicable sections of this code and are approved by the authority having jurisdiction shall be installed for flammable or combustible liquids service

4.6.5.10 Change of Service of Underground Tanks. Tanks that undergo any change of stored product shall meet the requirements of Section 4.2

4.6.6 Leak Detection and Inventory Records for Underground Tanks. Accurate inventory records or a leak detection program shall be maintained on all Class I liquid storage tanks for indication of possible leakage from the tanks or associated piping

4.6.7 Tank Maintenance

4.6.7.1 Each tank shall be inspected and maintained to ensure compliance with the requirements of this code. Testing requirements for tanks shall be in accordance with Section 4.4

4.6.7.2 Each tank shall be maintained liquid tight. Each tank that is leaking shall be emptied of liquid or repaired in a manner acceptable to the authority having jurisdiction.

4.6.7.3 Tanks that have been structurally damaged, have been repaired or reconstructed, or are suspected of leaking shall be tested in accordance with 4.4.1 or in a manner acceptable to the authority having jurisdiction.

2.6.7.4 Tanks and all tank appurtenances, including normal vents and emergency vents and related devices, shall be properly maintained to ensure that they function as intended

2.6.7.5 Openings for gauging on tanks storing Class I liquids shall be provided with a vapor tight cap or cover. Such covers shall be closed when not gauging.

Chapter 5 Piping Systems

5.1 Scope

5.1.1 This chapter shall apply to piping systems consisting of pipe, tubing, flanges, bolting, gaskets, valves, fittings, flexible connectors, the pressure-containing parts of other components such as expansion joints and strainers, and devices that serve such purposes as mixing, separating, snubbing, distribution, metering, controlling flow, or secondary containment of liquids and associated vapors.

5.2 General Requirements

5.2.1 Performance Standards The design, fabrication, assembly, test, and inspection of piping systems shall be suitable for the expected working pressures and structural stresses. Compliance

with applicable sections of ASME B31, *Code for Pressure Piping*, and the provisions of this chapter shall be considered prima facie evidence of compliance with the foregoing provisions.

5.2.2 Tightness of Piping. Piping systems shall be maintained liquid tight. A piping system that has leaks that constitute a hazard shall be emptied of liquid or repaired in a manner acceptable to the authority having the jurisdiction.

5.3 Materials for Piping Systems

5.3.1 Material Specifications. Pipe, valves, faucets, couplings, flexible connectors, fittings, and other pressure-containing parts shall meet the material specifications and pressure and temperature limitations of ASME B31, *Code for Pressure Piping*, except as provided for in 5.3.2, 5.3.3, and 5.3.4.

5.3.2 Ductile Iron. Ductile (nodular) iron shall meet the specifications of ASTM A 395, *Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.*

5.3.3 Materials of Construction of Valves. Valves at storage tanks, as required by 4.3.2.5.1 and 4.3.4.7.3 and their connections to the tank shall be of steel or ductile iron, except as provided for in 5.3.3.1, 5.3.3.2, or 5.3.4

5.3.3.1 Valves at storage tanks shall be permitted to be other than steel or ductile iron where the chemical characteristics of the liquid stored are not compatible with steel or where the valves are installed internally to the tank. Valves installed externally to the tank shall be permitted to be other than steel or ductile iron if the material of construction has a ductility and melting point comparable to steel or ductile iron and is capable of withstanding the stresses and temperatures involved in fire exposure or the valves are otherwise protected from fire exposures, such as by materials having a fire resistance rating of not less than 2 hours.

5.3.4 Low Melting Point Materials. Low melting point materials such as aluminum, copper, and brass; materials that soften on fire exposure such as plastics; or nonductile material such as cast iron shall be permitted to be used underground within the pressure and temperature limitations of ASME B31, *Code for Pressure Piping*.

5.3.4.2 The piping materials chosen shall be compatible with the liquids being handled. Piping systems of these materials shall be designed and built in accordance with recognized standards of design for the particular materials chosen or with acceptable equivalent standards or shall be listed.

5.3.6 Nonmetallic Piping Piping systems of nonmetallic materials, including piping systems incorporating secondary containment, shall be designed and built in accordance with recognized

standards of design or approved equivalents and shall be installed in accordance with 5.3.4. Nonmetallic piping shall be built and used within the scope of their approvals or within the scope of UL 971, *Standard for Nonmetallic Underground Piping for Flammable Liquids*. Nonmetallic piping systems and components shall be installed in accordance with manufacturers' instructions.

5.4 Pipe Joints

5.4.1 Tightness of Pipe Joints. Joints shall be made liquid tight and shall be welded, flanged, threaded, or mechanically attached. They shall be designed and installed so that the mechanical strength of the joint will not be impaired if exposed to fire. Listed flexible connectors shall be permitted to be used where installed in accordance with 3.4.2. Threaded joints shall be made with a suitable thread sealant or lubricant. Joints in piping systems handling Class I liquids shall be welded when located in concealed spaces within buildings.

5.4.2 Flexible Connectors. Listed flexible connectors shall be permitted to be used where installed in accordance with 5.4.3.

5.4.3 Friction Joints. Pipe joints dependent upon the friction characteristics or resiliency of combustible materials for mechanical continuity or liquid tightness of piping shall only be used outside of buildings above ground or below ground. Where used above ground, either the piping shall be secured to prevent disengagement at the fitting, or the piping system shall so be designed that any spill resulting from disengagement could not unduly expose persons, important buildings, or structures and could be readily controlled by remote valves.

5.5.5 Underground Piping

5.5.5.1 Underground piping shall be installed on a bedding of at least 6 in. of well-compacted backfill material.

5.5.5.3 In areas subject to vehicle traffic, the pipe trench shall be of sufficient depth to permit a cover of at least 6 in. of well-compacted backfill material. A greater burial depth shall be provided when required by the manufacturer's instructions or when frost conditions are present.

5.5.5.4 Piping in the same trench shall be separated by two pipe diameters. Piping shall not need to be separated horizontally by more than 9 inches.

5.5.5.5 Two or more levels of pipes within the same trench shall be separated vertically by a minimum 6 inches of well compacted backfill.

3.5.5.5 Two or more levels of pipes within the same trench shall be separated vertically by a minimum 6 in. well-compacted backfill.

5.5.6 Valves. Piping systems shall contain a sufficient number of valves to operate the system properly and to protect the equipment. Piping systems in connection with pumps shall contain a sufficient number of valves to properly control the flow of liquid both in normal operation and in the event of physical damage. Each connection to a piping system by which equipment such as, tank cars, tank vehicles, or marine vessels discharges liquids into storage tanks shall be provided with a check valve for automatic protection against back-flow if the piping arrangement is such that back-flow from the system is possible. *(See also 4.3.2.5.1.)*

3.5.7 Common Loading and Unloading Piping. If loading and unloading is done through a common pipe system, a check valve shall not be required. However, an isolation valve shall be provided. This valve shall be located so that it is readily accessible or shall be remotely operable.

5.6 Testing

3.6.1 Initial Testing. Unless tested in accordance with the applicable sections of ASME B31, *Code for Pressure Piping,* all piping shall be tested before being covered, enclosed or placed in use. Testing shall be done hydrostatically to 150 percent of maximum anticipated pressure of the system or pneumatically to 110 percent of the maximum anticipated pressure of the system, and the test pressure shall be maintained for a sufficient time to conduct a complete visual inspection of all joints and connections. In no case shall the test pressure be less than 5 psig measured at the highest point of the system, and in no case shall the test pressure be maintained for less than 10 minutes.

5.6.2 Initial Testing of Secondary Containment Piping. The interstitial (annular) space of secondary containment-type piping shall be tested hydrostatically or with air pressure at 5 psig or shall be tested in accordance with its listing or with the manufacturer's instructions. The pressure source shall be disconnected from the interstitial space to ensure that the test is being conducted on a closed system. The pressure shall be maintained for 1 hour.

5.6.2 Testing During Maintenance. Existing piping shall be tested in accordance with this subsection if there is indication that the piping is leaking. Piping that could contain a Class I, Class II, or Class IIIA liquid or vapor shall not be tested using air.

5.7.2. Vent Piping for Underground Tanks.

3.7.2.1 Vent pipes from underground tanks storing Class I liquids shall be located so that the discharge point is outside of buildings, higher than the fill pipe opening, and not less than 12 ft. above the adjacent ground level. Vent pipe outlets shall be located and directed so that vapors will not accumulate or travel to an unsafe location, enter building openings, or be trapped under

eaves, and shall be at least 5 ft. from building openings and at least 15 ft. from powered ventilation or intake devices.

5.7.2.2 Vent pipes shall not be obstructed by devices provided for vapor recovery or other purposes unless the tank and associated piping and equipment are otherwise protected to limit back-pressure development to less than the maximum working pressure of the tank and equipment by the provision of pressure-vacuum vents, rupture discs, or other tank-venting devices installed in the tank vent lines. Vent outlets and devices shall be protected to minimize the possibility of blockage from weather, dirt, or insect nests.

5.7.2.3 Vent piping shall be sized in accordance with 4.2.5.3.

5.7.2.4 Vent pipes from tanks storing Class II or Class IIIA liquids shall terminate outside of the building and higher than the fill pipe opening. Vent outlets shall be fitted with return bends, coarse screens, or other devices to minimize ingress of foreign material.

5.7.2.5 Vent pipes and vapor return piping shall be installed without sags or traps in which liquid can collect. Condensate tanks, if utilized, shall be installed and maintained so that blocking of the vapor return piping by liquid is prevented. Vent pipes and condensate tanks shall be located so that they will not be subjected to physical damage. The tank end of the vent pipe shall enter the tank through the top.

5.7.2.6 Where tank vent piping is manifolded, pipe sizes shall be such as to discharge, within the pressure limitations of the system, the vapors they can be required to handle when manifolded tanks are filled simultaneously. Float-type check valves installed in tank openings connected to manifold vent piping to prevent product contamination shall be permitted to be used provided that the tank pressure will not exceed that permitted by 4.3.3.2.3 when the valves close

5.7.2.7 Vent piping for tanks storing Class I liquids shall not be manifolded with vent piping for tanks storing Class II or Class III liquids unless positive means are provided to prevent the following:

(1) Vapors of Class I liquids from entering tanks storing Class II or Class III liquids

(2) Contamination

(3) Possible change in classification of the less volatile liquid

5.8 Static Electricity. Piping systems shall be bonded and grounded in accordance with 4.5.3.4

5.9 Identification. Each loading and unloading riser shall be marked to identify the product for which it is to be used.

Chapter 6 Electrical Equipment and Installations

8.1 Scope. This chapter shall apply to areas where Class I liquids are stored or handled and to areas where Class II or Class III liquids are stored or handled at or above their flash points.

8.2 General. Any electrical equipment provided shall not constitute a source of ignition for the flammable vapor that might be present under normal operation or during a spill. Compliance with 6.2.1 through 6.2.4 shall be deemed as meeting the requirements of section 6.2

8.2.1 All electrical equipment and wiring shall be of a type specified by and installed in accordance with NFPA 70, *National Electric Code* (NEC).

8.2.2 So far as it applies, table 8.2.2 shall be used to delineate and classify areas for the purpose of installation of electrical equipment under normal conditions. In the application of classified areas, a classified area shall not extend beyond a floor, wall, roof, or other solid partition that has no openings within the classified area. The designation of classes, divisions, and zones shall be as defined in NFPA 70, *National Electric Code,* Chapter 5, Article 500.

NEC Class I

Location	Division	Zone	Extent of Classified Area
Underground tank fill opening	1	1	Any pit, box or space below grade Level, if any part is a Division I or 2 or zone 1 or 2 classified location
	2	2	Up to 18 in. above grade level within a horizontal radius of 10 ft. from a loose fill connection and within a horizontal radius of 5 ft. from a tight fill connection
Vent – discharging upward	1	0	Area inside of vent piping or Opening
	1	1	Within 3 ft. of open end of vent, extending in all directions

2	2	Area between 3 ft. and 5 ft of open end of vent, extending in all directions

8.2.3 The area classifications listed in Table 8.2.2 are based on the premise that the installation shall meet the applicable requirements of this code in all respects. Should this not be the case, the authority having jurisdiction shall have the authority to classify the extent of the area.

8.2.4 Where the provisions of 8.2.1 through 8.2.4 require the installation of electrical equipment suitable for Class I, Division 1 or 2 or Zone 1 or 2 locations, ordinary electrical equipment, including switchgear, shall be permitted to be used if installed in a room or enclosure that is maintained under positive pressure with respect to the classified area. Ventilation make-up air shall not be contaminated.

Referenced publications are in Chapter 7 of NFPA 30.