Code Requirements on Aboveground Storage Tanks Dispensing Fuels At Motor Vehicle Fuel-Dispensing Stations

What follows is a detailed chart developed by Steel Tank Institute's executive vice President, Wayne Geyer, P.E. Fire codes play a prominent role in tank purchase decisions. As such, it's important to know which codes apply to your particular situation and how you will be affected by these varied and complex codes. Mr. Geyer has boiled down the volumes of code details into the easy-to-use chart below.

Approval/General Provisions

NFPA 30A, 2000 Edition

The use of aboveground storage tanks at motor fuel dispensing facilities, fleet vehicle motor fuel dispensing facilities, and marine motor fuel dispensing facilities shall be permitted when installed in accordance with the requirements of Section 4.3 and with all applicable requirements of Chapters 2 and 3 of NFPA 30, and when the specific installation has been approved by the AHJ.

International Fire Code, 2000 Edition

When approved, aboveground tanks used for outside aboveground storage of motor fuels classified as Class I, II or III-A liquids shall be in accordance with Chapter 34 (Flammable and Combustible Liquids Chapter) and as provided by Section 2206.2.3. Requires listing and labeling for tank service. Aboveground steel tanks are allowed provided their location is approved or is in a zone or district established by the jurisdiction. Protected aboveground tank locations are restricted by Table 2206.2.3 separation requirements. Aboveground tanks are allowed in vaults aboveground or below grade. Special enclosures for tanks are allowed to overcome impractical conditions.

Uniform Fire Code, 2000 Edition

The dispensing of Class I and Class II liquids into motor vehicles from aboveground tanks is prohibited, except that dispensing from special enclosures and, when approved, from protected tanks and below grade vaults is allowed when underground tanks are impractical. However, Appendix II-K which establishes requirements for dispensing from non-protected tanks at private motor vehicle fuel dispensing stations is accepted when installed in districts or zones established by the jurisdiction or in approved locations.

Terminology

NFPA 30A, 2000 Edition

Fire-Resistant Tank. The listed construction that provides the required fire-resistive protection, prevents release of liquid, failure of the primary tank, failure of the supporting structure, and impairment of venting for not less than 2 hours when tested using a fire exposure that simulates a high-intensity pool fire, such as UL 2080 or equivalent.

Protected Aboveground Tank. The listed construction that provides the required fire-resistive protection, prevents the release of liquid, failure of the primary tank, failure of the supporting structure, and impairment of venting for not less than 2 hours, and shall limit the increase in temperature of liquid inside the tank when tested using the fire exposure specified in UL 2085.

Vault. The vault must be liquid tight and designed to withstand loading from soil, water, traffic, etc. Vaults shall be provided with approved vapor & liquid detection systems, including on-site audible & visual warning devices with battery backup. Vaults with Class I liquids require exhaust ventilation. (See 4-3.3.2)

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Protected Aboveground Tank: A listed tank system consisting of a primary tank provided with protection from physical damage and fire resistive protection from a high intensity liquid pool fire exposure. The tank system may provide these protection elements as a unit or may be an assembly of components or a combination thereof.

Special Enclosures: Enclosures constructed in accordance with Section 2206.2.6

Vaulted Tank: Vaults shall be listed in accordance with UL 2245 or, when approved, constructed on-site in accordance with the International Building Code, Section 1707. The design shall bear the stamp of a Professional Engineer. Special inspections are required. IFC Section 3404.2.8.2 sets out 17 conditions of vaulted tank compliance. Vaults with Class I liquid storage shall be ventilated at a rate greater than 1 cfm per square foot of floor area, but not less than 150 cfm.

Uniform Fire Code, 2000 Edition

Protected Tank. Tank system consisting of a primary tank protected from physical damage and from high intensity liquid pool fire exposure. The system must be listed, labeled, and meet requirements of UFC Standard 79.7, “Requirements for Protected Aboveground Tanks." Two hour fire exposure, average thermocouple not to exceed 2600F with 4000F individual thermocouple maximum. Structural integrity maintained and emergency venting operational. Post fire hose stream and leak test.

Special Enclosure. Tank enclosed by 6" of liquid tight, vapor tight concrete.

Nonprotected Tank. Tank systems must be listed, labeled, and designed in accordance with 7902.1.8.2 and UL 142 and Appendix II-K.

Vaulted Tank. Vaults shall be listed in accordance with UL 2245 or, when approved, constructed on-site, and the design shall bear the stamp of a PE. Vaults shall be constructed in accordance with the UBC and 7902.1.10.[3]

Installation

NFPA 30A, 2000 Edition

See Approval/General Provisions. NFPA 30 provides additional requirements on aboveground tank systems for the control of spillage, normal and emergency venting, corrosion control, tank construction, supports and foundation, flooding exposure, and testing and maintenance.

International Fire Code, 2000 Edition

Fuel dispensing systems are to be installed in accordance with Chapter 22, which incorporates all the motor vehicle service station controls. Tank installations are to be in accordance with Chapter 34 as modified by Chapter 22.

Uniform Fire Code, 2000 Edition

Fuel dispensing systems are to be installed in accordance with Article 52 which incorporates all the motor vehicle service station controls. However, nonprotected tank installation must comply with Appendix II-K requirements also.

Maximum Capacities

NFPA 30A, 2000 Edition

Tanks storing Class I and Class II liquids at an individual site: 12,000 gal individual and 40,000 gal aggregate[1]

Tanks storing Class II and Class III liquids at fleet vehicle motor fuel dispensing facilities: 20,000 gallon individual and 80,000 gallon aggregate

Individual tanks in vaults may store up to 15,000 gallons.

International Fire Code, 2000 Edition

Aboveground Steel Tanks: (Gallons) 6,000 individual, 18,000 aggregate for Class I liquids, with reduced separation requirements; 12,000 individual, 48,000 aggregate for Class I, II or III-A liquids.

Vaults at Public Service Stations: 5,000 individual, 48,000 aggregate. Vaults at Fleet Vehicle Service Stations: 20,000 individual, 80,000 aggregate. Special Enclosures: 6,000 individual, 18,000 aggregate. Protected Aboveground Tanks: 12,000 individual, 48,000 aggregate.

Uniform Fire Code, 2000 Edition

12,000 gal individual/public and private: protected tank

15,000 gal individual/public and private: vaulted tank (Each vault may contain only one tank, but may share common walls.)

48,000 gal aggregate protected tank [2]

6,000 gal individual/private nonprotected tank

18,000 gal aggregate nonprotected tank

Overfill / Spill Prevention

NFPA 30A, 2000 Edition

Overfill - alarm at 90%capacity. Automatic shut-off at 98% or restricted flow at 95% capacity.[4]

Means to determine liquid level shall be accessible to delivery operator.

International Fire Code, 2000 Edition

Spill Containers, 5 gallons. Protected and Vaulted Tanks: Overfill: Alarm at 90%, Shut-off at 95%, or reduce flow rate to not overfill for 30 minutes and provide auto-shut-off prior to wetting tank top fittings. Aboveground Steel Tanks: Overfill: an approved means or method shall be provided (such as Section 3404.2.9.6.8)

Uniform Fire Code, 2000 Edition

Containment - 5 gal capacity or greater.

Overfill - alarm at 85% capacity and shut-off at 90%.

Physical Protection

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6' high security fence located at least 10' from tank and a gate properly secured against unauthorized entry. When required, provide protection against vehicular collision by suitable barriers, such as 4” diameter steel pipe filled with concrete set 3’ deep in a concrete footing and spaced no more than 4’ apart.

International Fire Code, 2000 Edition

Impact protection required by system design, barriers or posts. Steel posts of 4" diameter, concrete filled, spaced 4' on centers, 3' deep in concrete, protruding 3' above grade, set 5' from the protected object. Barriers a minimum of 3' high, resisting 12,000 pounds of force.

Uniform Fire Code, 2000 Edition

No security fence required. Guard posts within 5' of tank, spaced no more than 4' on center, not less than 3' in height, constructed of not less than 4" diameter steel and concrete filled.

Secondary Containment

NFPA 30A, 2000 Edition

Secondary containment tanks may be used to provide spill control, in addition to diking or remote imponding. Section 2-3.2.3 of NFPA 30 limits such tanks to 12,000 gallons or less. Means shall be provided to prevent release of liquid by siphon flow, and with all openings at the top of the tank. Means to determine the level of liquid during deliveries, and to meet spill prevention requirements are noted herein. Enclosed secondary containment shall be provided with emergency vents.[5] The interstitial space shall be tested with air pressure or vacuum to assure integrity.

International Fire Code, 2000 Edition

Aboveground Tanks: Section 2206.5 refers to Chapter 34 for drainage control or diking. Not required for listed secondary containment tanks. Enclosed secondary containment required to have emergency venting. Section 3404.2.10 Drainage and Diking: Required around a tank or group of tanks to prevent accidental discharge from endangering adjacent tanks, adjoining property or waterways. Waivers allowed for special features. Protected Tanks: Section 3404.2.9.6.4. Protected aboveground tanks shall be provided with secondary containment, drainage control or diking. A means shall be provided to establish the integrity of the secondary containment in accordance with NFPA 30.

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ASTs shall be provided with drainage or diking per Section 7901.8 & 7902.2.8 or with secondary containment that is a component of the listed protected or nonprotected aboveground tank. Enclosed secondary containment shall be provided with emergency relief vents.[5]

Separation Distance

NFPA 30A, 2000 Edition

Protected Tank, less than 6000 gallons:
- 15’ from property line
- 5’ from building or public way
- 3’ between each tank
- 25’ from fuel dispensers[6]

Protected Tank, more than 6,000 gallons:
- 25’ from property line
- 15’ from building or public way
- 3’ between each tank
- 25’ from fuel dispensers6

Vaulted Tank:[7]

Fire-Resistant Tank:
- 50’ from property line
- 25’ from building or public way
- 3’ between each tank
- 25’ from fuel dispensers6

Other tanks:
- 100’ from property line
- 50’ from building or public way
- 3’ between each tank
- 50’ from fuel dispensers

International Fire Code, 2000 Edition

Aboveground Tank: 100' to property line which can be built upon; 50' to building on same property, dispenser, or nearest side of public way.

Protected or Vaulted Tank, less than or equal to 6,000 gallons: 5' to building on same property, or public way; 15' to property line which can be built upon; 25' to fuel dispenser; 0' to fuel dispenser at fleet vehicle station.

Protected or Vaulted Tank, greater than 6000 gallons: 15' to building on same property, or public way; 25' to property line which can be built upon, or to fuel dispenser; 0' to fuel dispenser at fleet vehicle station.

All tanks: 3' between tanks; 100' between maximum allowable aggregate capacity groups.

Uniform Fire Code, 2000 Edition

Protected Tank, less than 6,000 gallons:
- 15' from property line
- 5' from building or public way
- 3' between each tank

Protected Tank, more than 6,000 gallons:
- 25' from property line
- 25' from building or public way
- 3' between each tank
- 100' between 40,000 gallon aggregates

Dispensing devices can be mounted directly atop any protected tank, regardless of size.

Nonprotected Tank
- 100' from property line
- 100' from building or public way
- 3' between each tank
- 100' between 18,000 gallon aggregates
- 50' from dispensing devices

Vaulted tanks shall be located no less than 3' from property lines, walls of basements, and may not be located under buildings.

Piping

NFPA 30A, 2000 Edition
Openings in tank top only Provide means to prevent release of liquid by syphon flow Elevated tanks producing a gravity head on dispenser shall be equipped with device at tank outlet to prevent gravity flow, such as a solenoid valve. Shut-off and check valves require pressure relief devices generated by thermal expansion Pipe shall be protected from physical damage Provide listed shut-off shear valve under dispenser. With remote pressure pump systems, pump shall have a listed leak detection device.
International Fire Code, 2000 Edition
All Aboveground Tanks: Openings in tank top only. Anti-siphon device required. Corrosion and galvanic protection. Supports, joints, FRP provisions
Uniform Fire Code, 2000 Edition
Openings in tank top only. Anti-siphon devices required. Guard posts for connected piping subject to vehicle impact. Installed in accordance with Article 52 & 79 which addresses construction, corrosion, supports, joints, etc.

Tank Filling Operations

NFPA 30A, 2000 Edition

Separation of delivery vehicle by 25' for Class I and 15' for Class II or Class III liquids. No minimum separation required for tanks that are filled by gravity. Liquid tight connections required. Delivery must meet applicable requirements of NFPA 385.

International Fire Code, 2000 Edition

Fill pipe provided with a means of direct, closed connection.

Delivery vehicles positioned a minimum of 25’ from the receiving tank during delivery of Class I liquids and 15’ for Class II or III-A Liquids.

Uniform Fire Code, 2000 Edition

Separation of 25' from parked tank vehicles except when the tank is being filled from the vehicle, except 0' separation from vaulted tanks using gravity feed.

Fill pipe shall be provided with a means of making a direct connection.

Miscellaneous

NFPA 30A, 2000 Edition

Requirements for fuel dispensing devices, electrical equipment, vapor recovery and processing systems, and operational requirements.

Testing provisions for secondary containment are given.

Listed automatic-close nozzles required.

Accurate inventory control records shall be maintained and reconciled.

International Fire Code, 2000 Edition

Detailed construction documents and site plan required. Requirements for listed pumps, fuel dispenser, installment, nozzle, hose length, emergency disconnect switch and valves, breakaway devices, vapor recovery and electrical equipment. Operational requirements and signage.

Corrosion protection requirements for tanks and piping subject to external corrosion.

Uniform Fire Code, 2000 Edition

Requirements for fuel dispensing, electrical equipment, vapor recovery, operation, labeling, signage, and permits. When subject to external corrosion, ASTs must be coated, provided with corrosion protection, or made from non-corrosive materials.

Footnotes

(1) Section 4-3.2.7 of NFPA 30A enables existing tanks up to 6,000 gallon to be used at private fleet facilities, provided the tank complies with NFPA 30. New installations must follow section 4.3 of NFPA 30A.

(2) Special enclosures maximum capacities are 6,000 gallons individual and 18,000 gallons aggregate.

(3) Vaults with Class I liquid storage shall be ventilated at a rate greater than 1 cfm per square foot of floor area, but not less than 150 cfm.

(4) This provision is required on ASTs dispensing fuels and on secondary containment type tanks when provisions of 2-3.4.1 of NFPA 30 are met for control of spillage.

(5) Emergency vents are also required for each a) tank compartment, b) an enclosed space of a closed top dike construction, and c) other spaces or enclosed volumes, such as those intended for insulation, membranes or weather shields, that can contain liquid because of a leak from the primary vessel and can inhibit venting during exposure.

(6) At fleet vehicle motor fuel dispensing facilities, no minimum separation is required between the dispensing device and protected tank or fire-resistant tank.

(7) 0’ separation distances for vaults. Separate vaulted compartments are required for each tank. Adjacent vaults are permitted to share a common wall.

NFPA National Fire Protection Association Standard 30A, 2000 Edition (based on STI interpretation of results from final code development hearings).

UFC Uniform Fire Code, 2000 Edition

IFC International Fire Code, 2000 Edition