3. Adequate loading and transportation facilities shall be provided,

4. The time required to deliver such materials to the required location in the event of fire shall not exceed two hours, and

5. At the time of a fire, these off–premises supplies shall be accumulated in sufficient quantities before placing the equipment in operation to ensure foam production at an adequate rate without interruption until extinguishment is accomplished.

7902.2.5 Inerting of Tanks with Boilover Liquids. Liquids with boilover characteristics shall not be stored in fixed roof tanks larger than 150 feet (45 720 mm) in diameter unless an approved inerting system is provided on the tank.

7902.2.6 Emergency Relief Venting for Stationary Tanks.

7902.2.6.1 General. Stationary tanks shall be provided with adequate additional venting that will relieve excessive internal pressure caused by exposure to fires. Such venting shall also be provided for each compartment of a compartmented tank, the interstitial space of a secondary containment–type tank, and the enclosed space of closed–top dike tank construction. Enclosed spaces, such as those intended for insulation, membranes, or weather shields, which can contain liquid because of a leak from the primary vessel, shall also comply with the venting requirement.

EXCEPTION: Tanks larger than 12,000–gallon (45 420 L) capacity storing Class III–B liquids and not within the diked area or the drainage path of Class I or II liquids do not require emergency relief venting.

Emergency relief vents shall not be modified, obstructed or otherwise altered such that the required area of opening for the required flow rate is reduced.

7902.2.6.2 Type of Venting Device. Aboveground storage tanks shall be provided with construction or devices that will relieve excessive internal pressure caused by exposure fires.

Construction methods such as floating roofs, lifter roofs, weak roof–to–shell seams or other approved pressure–relieving construction are allowed as methods providing emergency relief venting. Weak roof–to–shell seams shall be constructed to fail before any other seam.

Devices such as self–closing manhole covers, covers using long bolts that allow the cover to lift under internal pressure, an additional or larger relief valve or valves or rupture disks are allowed for emergency relief venting. Such devices shall be approved.

7902.2.6.3 Venting Sizing.

7902.2.6.3.1 General. Where emergency relief venting is provided solely by pressure–relieving devices, the total venting capacity of both normal and emergency vents shall be enough to prevent rupture of the shell or bottom of the tank, if vertical, or of the shell or heads, if horizontal. If unstable liquids are stored, the effects of heat or gas resulting from polymerization, decomposition, condensation or self–reactivity shall be taken into account.

The total capacity of both normal and emergency venting devices shall not be less than that derived from Table 7902.2–H, except as provided in Sections 7902.2.6.3.3 and 7902.2.6.3.4. The wetted area of the tank shall be calculated on the basis of 55 percent of the total exposed area of a sphere or spheroid, 75 percent of the total exposed area of a horizontal tank and the first 30 feet (9144 mm) above grade of the exposed shell area of a vertical tank.

7902.2.6.3.2 Tanks and Storage Vessels Over 1 psig (6.89 kPa). For tanks and storage vessels designed for pressures over 1 psig (6.89 kPa), the total rate of venting shall be determined in accordance with Table 7902.2–H, except that when the exposed wetted area of the surface is greater than 2,800 square feet (260.1 m^2), the total rate of venting shall be in accordance with Table 7902.2–I or calculated by the following formula:

$$CFH = 1{,}107\ A^{0.82}$$

For **SI:** $$CMH = 220\ A^{0.82}$$

WHERE:

A = exposed wetted surface, in square feet (m^2).

CFH = venting requirement, in cubic feet of free air per hour ($CMH = m^3/hr$).

The foregoing formula is based on $Q = 21{,}000\ A^{0.82}$ (For **SI:** $Q = 43{,}198\ A^{0.82}$).

7902.2.6.3.3 Emergency Relief Vents. The total emergency relief venting capacity for a specific stable liquid can be determined by the following formula:

$$CFH = \frac{1337\ V}{L\sqrt{M}}$$

For **SI:** $$CMH = \frac{743.4\ V}{L\sqrt{M}}$$

WHERE:

CFH = venting requirement, in cubic feet of free air per hour ($CMH = m^3/hr$).

L = latent heat of vaporization of specific liquid, in Btus per pound (cal/g).

M = molecular weight of specific liquids.

V = cubic feet (m^3) of free air per hour from Table 7902.2–H.

7902.2.6.3.4 Reductions in Required Venting for Stable Liquids. For tanks, other than protected aboveground tanks, containing stable liquids, a reduction in the required airflow rate in Sections 7902.2.6.3.1 and 7902.2.6.3.3 is allowed. Such reduction shall be calculated by multiplying the required airflow rate in Section 7902.2.6.3.1 or 7902.2.6.3.3 by the appropriate factor listed in the following schedule when protection is provided as indicated. Only one factor can be used for any one tank.

1. 0.5 For drainage in accordance with requirements for remote impounding in Section 7902.2.8.3 for tanks over 200 square feet (18.6 m^2) of wetted area.
2. 0.3 For water spray in accordance with Section 9002, UFC Standard 79–2 and drainage in accordance with requirements for remote impounding in Section 7902.2.8.3.
3. 0.3 For insulation in accordance with the following:

3.1 Remain in place under fire–exposure conditions,

3.2 Withstand dislodgement when subjected to hose stream impingement during fire exposure, and

EXCEPTION: The requirement may be waived by the chief where use of solid hose streams is not contemplated or would not be practical.

3.3 Maintain a maximum conductance value of 4 Btus per hour per square foot per degree Fahrenheit [81.8 kJ/(hr × m^2 × °C)] when the outer insulation jacket or cover is at a temperature of 1,660°F (904°C) and when the mean temperature of the insulation is 1,000°F (538°C).

4. 0.15 For water spray with insulation in accordance with Section 9002, UFC Standard 79–2 and drainage in accordance with requirements for remote impounding in Section 7902.2.8.3.

7902.2.6.4 Venting Device Capacity.

7902.2.6.4.1 Identification. Commercial tank–venting devices shall bear a stamp indicating the opening 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 (17.2 kPa) and the pressure at full–open position is greater than 2.5 psig (17.2 kPa), the flow capacity at 2.5 psig (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 and 14.7 psia (m^3 of air/hr at 15.6°C and 101.3 kPa).

7902.2.6.4.2 Determination of Capacity. The flow capacity of tank–venting devices under 8 inches (203 mm) in nominal pipe size shall be determined by actual test of each type and size of vent. These flow tests shall be conducted by a qualified impartial outside agency or by the manufacturer when certified by a qualified impartial observer. Calculation of the flow capacity of tank–venting devices 8 inches (203 mm) nominal pipe size and larger, including manhole covers with long bolts or equivalent, is allowed provided that the opening pressure is actually measured, the rating pressure and corresponding free orifice area are stated, the word "calculated" appears on the nameplate, and the computation is based on a flow coefficient of 0.5 applied to the rated orifice area.

Calculations shall be performed using the following formula:

$$CFH = 1.667 C_f A \sqrt{P_t - P_a}$$

For **SI:**

$$CMH = 0.1467 C_f A \sqrt{P_t - P_a}$$

WHERE:

A = the orifice area in square inches (mm^2).

CFH = venting requirement in cubic feet of free air per hour ($CMH = m^3/hr$).

C_f = 0.5 (the flow coefficient)

P_a = the absolute atmospheric pressure outside the tank in inches of water (kPa).

P_t = the absolute pressure inside the tank in inches of water (kPa).

7902.2.6.5 Termination of Vent Outlets.

7902.2.6.5.1 General. Emergency vents shall not discharge inside a building.

EXCEPTION: Emergency vents for stationary atmospheric tanks containing Class III–B liquids.

7902.2.6.5.2 Tanks with Pressures Exceeding 2.5 psig (17.2 kPa). The outlets of vents and vent drains on tanks equipped with emergency venting that allows pressures to exceed 2.5 psig (17.2 kPa) shall be arranged to discharge in a manner which prevents localized overheating of, or flame impingement on, any part of the tank if vapors from such vents are ignited.

7902.2.7 Tank Openings Other Than Vents.

7902.2.7.1 General. Connections to aboveground tanks through which liquid can normally flow shall be provided with internal or external valves located as close as practical to the shell of the tank. See also Section 7902.1.15.

Connections below the liquid level through which liquid does not normally flow shall be provided with a liquid–tight closure, such as a valve, plug or blind, or a combination of these.

7902.2.7.2 Fill Pipe Openings. For top–loaded tanks, metallic fill pipes shall be designed and installed to minimize the generation of static electricity by terminating the pipe within 6 inches (152.4 mm) of the bottom of the tank and shall be installed to avoid excessive vibration.

For Class I–B and I–C liquids, other than crude oils and asphalts, fill pipes shall be designed and installed in a manner which minimizes the possibility of generating static electricity.

Filling and withdrawal connections for Class I, II and III–A liquids which are made and broken shall be located outside of buildings at a location away from sources of ignition and not less than5 feet (1524 mm) away from building openings. Such connections for any liquid shall be closed, liquid tight when not in use and properly identified.

7902.2.7.3 Openings for Vapor Recovery. Vapor–recovery systems shall be in accordance with Section 5202.13.

7902.2.7.4 Piping, Valves and Fittings. Connections, fittings or other appurtenances shall be installed in accordance with Section 7901.11.

7902.2.8 Drainage Control and Diking.

7902.2.8.1 General. For aboveground tanks other than protected aboveground tanks, the area surrounding a tank or group of tanks shall be provided with drainage control or shall be diked to prevent accidental discharge of liquid from endangering adjacent tanks, adjoining property or reaching waterways.

EXCEPTIONS: 1. The chief is authorized to alter or waive these requirements based on a technical report in accordance with Section 103.1.1, which demonstrates that such tank or group of tanks does not constitute a hazard to other tanks, waterways or adjoining property, after consideration of special features such as topographical conditions, nature of occupancy and proximity to buildings on the same or adjacent property, capacity and construction of proposed tanks and character of liquids to be stored, and nature and quantity of private and public fire protection provided.

2. Drainage control and diking are not required for listed secondary containment tanks.

7902.2.8.2 Deleted

7902.2.8.3 Drainage System. Where protection of adjacent tanks, adjoining property or waterways is by means of a natural or constructed drainage system, such system shall comply with the following:

1. Drainage shall be provided at a slope of not less than 1 percent away from the tank toward an impounding basin or an approved means of disposal. This termination area and the route of the drainage system shall be so located that a fire occurring in the drainage system will not endanger pumps, manifolds, control valves, electrical equipment, public utilities, fire–protection equipment, tanks, adjoining property or fire apparatus access roads, and

2. Impounding basins and approved means of disposal shall be designed to retain a spill from the largest capacity tank draining into a basin plus the design discharge from fire–protection systems including monitor nozzles, as specified in Section 9002, UFC Standard 79–1, Chapter 3, which flow into a basin. Impounding basins and the route of a drainage system shall be located such that a fire occurring in a drainage system will not endanger pumps, manifolds, control valves, electrical equipment, public utilities, fire–protection equipment, tanks, adjoining properties or fire apparatus access roads.

7902.2.8.4 Diked Areas.

7902.2.8.4.1 General. Where protection of adjacent tanks, adjoining property or waterways is accomplished by retaining the liquid around the tank by means of a diked area, such diked areas shall comply with Section 7902.2.8.4.

7902.2.8.4.2 Volumetric Capacity. The volumetric capacity of the diked area shall not be less than the greatest amount of liquid that can be released from the largest tank within the diked area. The capacity of the diked area enclosing more than one tank shall be calculated by deducting the volume of the tanks other than the largest tank below the height of the dike.

7902.2.8.4.3 Walls. Walls of the diked area shall be of earth, steel, concrete or solid masonry designed to be liquid tight and to withstand a full hydrostatic head. Earthen walls 3 feet (914.4 mm) or more in height shall have a flat section at the top not less than2 feet (609.6 mm) wide. The slope shall be consistent with the angle of repose of the material of which the walls are constructed.

The walls of the diked area shall be restricted to an average height of 6 feet (1828.8 mm) above the interior grade, except when dikes are higher than an average of 6 feet (1828.8 mm) above interior grade, provisions shall be made for normal and necessary emergency access to tanks, valves and other equipment and safe egress from the diked enclosure, as follows:

1. Where the average height of the dike containing Class I liquids is over 12 feet (3657.6 mm) measured from interior grade or where the distance between a tank and the top inside edge of the dike wall is less than the height of the dike wall, provisions shall be made for normal operation of valves and for access to tank roofs without entering below the top of the dike. These provisions are allowed to be met through the use of remotely operated valves, elevated walkways or similar arrangements,

2. Piping passing through dike walls shall be designed to prevent excessive stresses as a result of settlement or fire exposure, and

3. The minimum distance between tanks and the toe of the interior dike walls shall be 5 feet (1524 mm), and diked areas containing two or more tanks shall comply with Section 7902.2.8.4.4.

7902.2.8.4.4 Diked Areas Containing Two or More Tanks. Diked areas containing two or more tanks shall be subdivided by drainage channels leading to an impounding basin or by intermediate curbs or spill dikes in order to prevent spills from endangering adjacent tanks within the diked area. Intermediate curbs and spill dikes shall not be less than 18 inches (457.2 mm) in height.

7902.2.8.4.5 Protection of Piping from Exposure Fires. Piping shall not pass through adjacent diked areas or impounding basins, unless provided with a sealed sleeve or otherwise protected from exposure to fire.

7902.2.8.4.6 Removing Water from Diked Area. Provision shall be made for draining or removing excess water from a drainage system or diked area. Such drains shall not discharge to adjoining property, natural water courses, public sewers or public drainage channels unless the drain is designed to prevent the release of flammable or combustible liquids. A valve operable from outside the dike shall be provided in the dike system and shall normally be kept closed. Control of drainage shall be accessible under fire conditions.

7902.2.8.4.7 Combustible Materials in Diked Areas. Diked areas shall be kept free of combustible materials, drums and barrels.

7902.2.8.4.8 Equipment, Controls and Piping in Diked Areas. Pumps, manifolds, and fire–protection equipment or controls shall not be located within diked areas or drainage basins or in a location where such equipment and controls would be endangered by fire in the diked area or drainage basin. Piping aboveground shall be minimized and located as close as practical to the shell of the tank in diked areas or drainage basins.

7902.2.9 Protection from Vehicles. When tanks are subject to vehicular damage, protection shall be in accordance with Section 8001.11.3.

7902.3 Container and Portable Tank Storage Outside of Buildings.

7902.3.1 General. Storage of flammable and combustible liquids in closed containers and portable tanks outside of buildings shall be in accordance with Sections 7902.1 and **7902.3.** See also Section 7902.1.8.1 for capacity limits for containers and portable tanks.

7902.3.2 Plans. See Section 7901.3.2. Storage shall be in accordance with approved plans.

7902.3.3 Location on Property.

7902.3.3.1 General. Outdoor storage of liquids in containers and portable tanks shall be in accordance with Table 7902.3–A. Storage of liquids near buildings located on the same property shall be in accordance with Section 7902.3.3.

When two or more classes of materials are stored in a single pile, the quantity in the pile shall not exceed the smallest of maximum quantities for the classes of material stored.

Storage of containers or portable tanks shall be provided with fire apparatus access roads in accordance with Section 902.2.

The storage area shall be protected against tampering or trespassers where necessary and shall be kept free of weeds, debris and other combustible materials not necessary to the storage.

7902.3.3.2 Storage Adjacent to Buildings. A maximum of 1,100 gallons (4163.5 L) of liquids stored in closed containers and portable tanks is allowed adjacent to a building located on the same premises and under the same management, provided that:

1. The building does not exceed one story in height. Such building shall be of fire–resistive construction with noncombustible exterior surfaces or noncombustible construction and shall be devoted principally to the storage of liquids, or

2. The exterior building wall adjacent to the storage area shall have a fire–resistance rating of not less than two hours, having no openings to abovegrade areas within 10 feet (3048 mm) horizontally of such storage and no openings to belowgrade areas within 50 feet (15 240 mm) horizontally of such storage.

The quantity of liquids stored adjacent to a building protected in accordance with Item 2 is allowed to exceed 1,100 gallons (4163.5 L), provided that the maximum quantity per pile does not exceed 1,100 gallons (4163.5 L) and each pile is separated by a 10–foot–minimum (3048 mm) clear space along the common wall.

Where the quantity stored exceeds 1,100 gallons (4163.5 L) adjacent to a building complying with Item 1, or the provisions of Item 1 cannot be met, a minimum distance in accordance with the column for distance to property line that can be built on in Table 7902.3–A shall be maintained between buildings and the nearest container or portable tank.

7902.3.4 Spill Control and Secondary Containment. Storage areas shall be provided with spill control and secondary containment as set forth in Section 7901.8.

EXCEPTION: Containers stored on approved containment pallets in accordance with Section 8003.1.3.4.

7902.3.5 Security. Storage areas shall be protected against tampering or trespassers by fencing or other control measures.

7902.3.6 Protection from Vehicles. Guard posts or other means shall be provided to protect exterior storage tanks from vehicular damage. When guard posts are installed, the posts shall be installed in accordance with Section 8001.11.3.

7902.3.7 Clearance from Combustibles. The storage area shall be kept free of weeds, debris and combustible materials not necessary to the storage. The area surrounding an exterior storage area shall be kept clear of such materials for a minimum distance of 15 feet (4572 mm).

7902.3.8 Weather Protection. For weather protection for outdoor storage, see Section 8003.1.14.

7902.3.9 Empty Containers and Tank Storage. The storage of empty tanks and containers previously used for the storage of flammable or combustible liquids, unless free from explosive vapors, shall be stored as required for filled containers and tanks. Tanks and containers when emptied shall have the covers or plugs immediately replaced in openings.

7902.4 Stationary Aboveground Tank Storage Inside Buildings.

7902.4.1 General. Storage of flammable and combustible liquids in stationary aboveground tanks inside of buildings shall be in accordance with Sections 7902.1 and 7902.4.

7902.4.2 Where Allowed. Stationary tanks for the storage of flammable and combustible liquids shall be in rooms or buildings complying with the Building Code.

Rooms or buildings used for storage of Class I, II or III liquids shall be in accordance with Section 7902.5.7.

Rooms or buildings used for dispensing, use, mixing and handling of Class I, II or III liquids shall be in accordance with Section 7903.2.1.6.

7902.4.3 Openings for Manual Gauging. Openings for manual gauging, if independent of the fill pipe, shall be provided with a liquid–tight cover. Covers shall be kept closed when not in use. Such openings shall be protected against liquid overflow and possible vapor release by means of a spring–loaded check valve or other approved devices.

7902.5 Container and Portable Tank Storage inside Buildings.

7902.5.1 General.

7902.5.1.1 Applicability. Storage of flammable and combustible liquids inside buildings in drums or other containers and portable tanks shall be in accordance with Sections 7902.1 and 7902.5.

EXCEPTIONS: 1. Liquids in the fuel tanks of motor vehicles, aircraft, boats, or portable or stationary engines.

2. The storage of distilled spirits and wines in wooden barrels or casks.

7902.5.1.2 Fire Protection.

7902.5.1.2.1 Portable Fire Extinguishers. Approved portable fire extinguishers shall be provided in accordance with Section 9002, UFC Standard 10–1, except as specified in Section 7902.5.11.5.2.

7902.5.1.2.2 Water Supply. The water supply shall be sufficient to deliver the specified fire–protection demand, including at least 500 gallons per minute (31.5 L/s) for inside and outside hose lines.

7902.5.2 Capacity Limits for Containers and Portable Tanks. Containers shall not exceed 60 gallons (227.1 L) capacity. Portable tanks shall not exceed 660 gallons (2498 L) capacity. See Section 7902.1.8.1. Tanks exceeding 660 gallons (2498 L) capacity shall be in accordance with Section 7902.2, 7902.4 or 7902.6.

7902.5.3 Empty Containers and Portable Tanks. Empty tanks and containers previously used for the storage of flammable or combustible liquids, unless free from explosive vapors, shall be stored as required for filled tanks and containers.

Tanks and containers, when emptied, shall have the covers or plugs immediately replaced in openings.

7902.5.4 Incompatible Materials. Materials which will react with water or other liquids to produce a hazard shall not be stored in the same room with flammable or combustible liquids. See also Section 7902.1.6.

7902.5.5 Storage Near Means of Egress. Class I, II or III–A liquids, including stock for sale, shall not be stored near or exit–access doorways, stairways or in a location that would impede egress.

7902.5.6 Shelf Storage.

7902.5.6.1 General. Shelving shall be of substantial construction, adequately braced and anchored. For seismic requirements, see the Building Code.

7902.5.6.2 Displacement Protection. Shelves shall be of sufficient depth and provided with a lip or guard to prevent individual containers from being easily displaced.

EXCEPTION: Shelves in storage cabinets or on laboratory furniture specifically designed for such use.

7902.5.6.3 Manner of Storage. Shelf storage of flammable and combustible liquids shall be maintained in an orderly manner.

7902.5.7 Quantity Limits for Storage.

7902.5.7.1 Exempt Amounts for Control Areas. For occupancies other than Group M Occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the exempt amounts set forth in Table 7902.5–A and shall not exceed the additional limitations set forth in Section 7902.5.7.2.

For Group M Occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the exempt amounts set forth in Table 7902.5–B.

See Article 51 for storage of hazardous production material flammable and combustible liquids in Group H, Division 6 Occupancies.

7902.5.7.2 Occupancy Quantity Limits. The following limits for quantities of stored flammable or combustible liquids shall not be exceeded:

1. Group A Occupancies:

Quantities in Group A Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5–A.

2. Group B Occupancies:

Quantities in drinking, dining, office and school uses within Group B Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5–A.

3. Group E Occupancies:

Quantities in Group E Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5–A.

4. Group F Occupancies:

Quantities in dining, office and school uses within Group F Occupancies shall not exceed amounts necessary for demonstration, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5–A.

5. Group I Occupancies:

Quantities in Group I Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5–A.

6. Group M Occupancies:

Quantities in dining, office and school uses within Group M Occupancies shall not exceed amounts necessary for demonstration, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5–A.

See Section 7902.5.7.1 for exempt amounts for wholesale and retail sales uses.

7. Group R Occupancies:

Quantities in Group R Occupancies shall not exceed amounts necessary for maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5–A.

8. Group S Occupancies:

Quantities in dining and office uses within Group S Occupancies shall not exceed amounts necessary for demonstration, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5–A.

7902.5.7.3 Quantities Exceeding Limits for Control Areas. Quantities exceeding quantities allowed in control areas set forth in Sections 7902.5.7.1 and 7902.5.7.2 shall be in liquid storage rooms or liquid storage warehouses in accordance with Sections 7902.5.11 and 7902.5.12.

7902.5.8 Special Provisions for Liquids Used for Maintenance and Operation of Equipment. In all occupancies, quantities of flammable and combustible liquids in excess of 10 gallons (37.85 L) used for maintenance purposes and the operation of equipment shall be stored in liquid storage cabinets in accordance with Section 7902.5.9. Quantities not exceeding 10 gallons (37.85 L) are allowed to be stored outside of a cabinet when in approved containers located in private garages or other approved locations.

In Groups A, B, E, F, I, M, R and S Occupancies, quantities of flammable and combustible liquids used for demonstration, treatment and laboratory work exceeding 10 gallons (37.85 L) shall be stored in liquid storage cabinets in accordance with Section 7902.5.9. Quantities not exceeding 10 gallons (37.85 L) shall be in approved locations.

7902.5.9 Liquid Storage Cabinets.

7902.5.9.1 General. When other sections of this code require that liquid containers are stored in storage cabinets, such cabinets and storage shall be in accordance with Section 7902.5.9.

7902.5.9.2 Quantities. The combined total quantity of all liquids in a cabinet shall not exceed 120 gallons (454.2 L).

7902.5.9.3 Construction.

7902.5.9.3.1 Labeling. Cabinets shall be provided with a conspicuous label in red letters on contrasting background which reads FLAMMABLE—KEEP FIRE AWAY.

7902.5.9.3.2 Doors. Doors shall be well fitted, self-closing and equipped with a latch.

7902.5.9.3.3 Bottom. The bottom of the cabinet shall be liquid tight to a height of at least 2 inches (50.8 mm).

7902.5.9.3.4 Materials. Cabinets shall be constructed of approved wood or metal. Cabinets shall be listed (See Section 9003, Standard u.1.22) or constructed in accordance with the following:

1. Unlisted metal cabinets shall be constructed of steel having a thickness of not less than 0.044 inch (1.12 mm) (18 gauge). The cabinet, including the door, shall be double walled with $1^1/_2$ inch (38.1 mm) airspace between the walls. Joints shall be riveted or welded and shall be tightfitting.

2. Unlisted wooden cabinets, including doors, shall be constructed of not less than 1–inch (25.4 mm) exterior grade plywood. Joints shall be rabbeted and shall be fastened in two directions with wood screws. Door hinges shall be of steel or brass. Cabinets shall be painted with an intumescent–type paint.

7902.5.9.4 Number of Cabinets. Group A Occupancies shall not contain more than one cabinet.

7902.5.10 Storage in Control Areas.

7902.5.10.1 General. Storage in control areas shall be in accordance with the following:

1. Class I liquids shall not be stored in basements,

2. Containers having less than 30–gallon (113.6 L) capacity shall not be stacked more than 3 feet (914.4 mm) or two containers high, whichever is greater, unless stacked on fixed shelving or otherwise satisfactorily secured. Containers having a capacity of 30 gallons (113.6 L) or more shall not be stored more than one container high. Containers shall be stored in an upright position,

3. Containers on shelves shall be stored in accordance with Table 7902.5–C. Combustible commodities shall not be stored above flammable or combustible liquids,

4. Piles shall not be closer than 3 feet (914.4 mm) to the nearest beam, chord, girder or other obstruction and shall be 3 feet (914.4 mm) below sprinkler deflectors or discharge orifices of water spray or other overhead fire–protection systems, and

5. In areas that are not accessible to the public, Class I, II and III–A liquids shall not be stored in the same pile or rack section as ordinary combustible commodities unless such materials are packaged together as kits.

7902.5.10.2 Group M Occupancy Wholesale and Retail Sales Uses.

7902.5.10.2.1 General. Flammable and combustible liquids in Group M Occupancy wholesale and retail sales uses shall be in accordance with Section 7902.5.10.2.

7902.5.10.2.2 Container Type. Containers for Class I liquids shall be metal.

> **EXCEPTION:** In sprinklered buildings an aggregate quantity of 120 gallons (454.2 L) of water–miscible Class I–B and I–C liquids is allowed in nonmetallic containers, each having a capacity of 16 ounces (0.473 L) or less.

See also Section 7902.1.8.1.3.

7902.5.10.2.3 Container Capacity. Containers for Class I liquids shall not exceed 5–gallon (18.9 L) capacity.

> **EXCEPTION:** Metal containers not exceeding 55 gallons (208.2 L) may be used to store up to 240 gallons (908.5 L) of the allowable exempt amount of Classes I–B and I–C liquids in a control area. The building shall be protected by an approved automatic sprinkler system in accordance with Table 7902.5–B. The containers shall be provided with plastic caps without cap seals and shall be stored upright. Containers shall not be stacked or stored in racks and shall not be located in areas accessible to the public.

7902.5.10.2.4 Fire Protection and Storage Arrangement. Fire protection and container storage arrangement shall be in accordance with NFPA 30, Section 4-4.3.3, 4-5.6.7, 4-8.2 and Table 4-8.2(a) through (f) and figures 4-8.2(a) through (c) or Table 7902.5-C and the following:

1. Combustible commodities shall not be stored above flammable or combustible liquids;

2. Storage on shelves shall not exceed 6 feet (1828.8 mm) in height, and shelving shall be metal;

3. Storage on pallets or in piles greater than 4 feet 6 inches (1371.6 mm) in height, or where the ceiling exceeds 18 feet (5486.4 mm) in height, shall be protected in accordance with Table 7902.5–F, and the storage heights and arrangements shall be limited to those specified in Table 7902.5–D;

4. Storage on racks greater than 4 feet 6 inches (1371.6 mm) in height, or where the ceiling exceeds 18 feet (5486.4 mm) in height, shall be protected in accordance with Tables 7902.5–H, 7902.5–I and 7902.5–J as appropriate, and the storage heights and arrangements shall be limited to those specified in Table 7902.5–E; and

5. Storage methods not in accordance with Item 3 or 4 shall be limited in height in accordance with Table 7902.5–C.

7902.5.10.2.5 Storage Plan. When required by the chief, aisle and storage plans shall be submitted in accordance with Section 8001.3.2.

7902.5.11 Liquid Storage Rooms.

7902.5.11.1 General. Quantities of liquids exceeding those set forth in Section 7902.5.7 for storage in control areas shall be stored in a liquid storage room complying with Section 7902.5.11 and constructed and separated as required by the Building Code.

7902.5.11.2 Quantities and Arrangement of Storage.

7902.5.11.2.1 General. The quantity limits and arrangements of liquid storage in liquid storage rooms shall be in accordance with Table 7902.5–D or 7902.5–E and Section 7902.5.11.2.

7902.5.11.2.2 Mixed Storage. When two or more classes of liquids are stored in a pile or rack section:

1. The quantity in that pile or rack shall not exceed the smallest of the maximum quantities for the classes of liquids stored in accordance with Table 7902.5–D or 7902.5–E, and

2. The height of storage in that pile or rack shall not exceed the smallest of the maximum heights for the classes of liquids stored in accordance with Table 7902.5–D or 7902.5–E.

7902.5.11.2.3 Separation and Aisles. Piles shall be separated from each other by at least 4–foot (1219.2 mm) aisles. Aisles shall be provided so that all containers are 12 feet (3657.6 mm) or less from an aisle. Where the storage of liquids is on racks, a minimum 4–foot–wide (1219.2 mm) aisle shall be provided between adjacent rows of racks and adjacent storage of liquids. Main aisles shall be a minimum of 8 feet (2438.4 mm) wide.

Additional aisles shall be provided for access to doors, required windows and ventilation openings, standpipe connections, mechanical equipment, and switches. Such aisles shall be at least 3 feet (914.4 mm) in width, unless greater widths are required for separation of piles or racks, in which case the greater width shall be provided.

7902.5.11.2.4 Stabilizing and Supports. Containers and piles shall be separated by pallets or dunnage to provide stability and to prevent excessive stress to container walls. Portable tanks stored over one tier high shall be designed to nest securely without dunnage. See Section 9002, UFC Standard 79–5 for requirements for portable tank design. Shelving, racks, dunnage, scuffboards, floor overlay and similar installations shall be of noncombustible construction or of wood not less than 1 inch (25.4 mm) nominal thickness. Adequate material–handling equipment shall be available to handle tanks safely at upper tier levels.

7902.5.11.3 Spill Control and Secondary Containment. Liquid storage rooms shall be provided with spill control and secondary containment in accordance with Section 7901.8.

7902.5.11.4 Ventilation. Liquid storage rooms shall be ventilated in accordance with Section 8003.1.4.

7902.5.11.5 Fire Protection.

7902.5.11.5.1 Fire–extinguishing Systems. Liquid storage rooms shall be protected by automatic sprinkler systems installed in accordance with Fire Code (see Section 9003, Standard 10-3) and Table 7902.5–F, 7902.5–G, 7902.5–H, 7902.5–I or 7902.5–J. In–rack sprinklers shall also comply with UFC Standard 81–2.

Automatic foam–water systems and automatic aqueous film forming foam (AFFF)–water sprinkler systems may be used only when approved.

Protection criteria developed from fire modeling or full–scale fire testing conducted at a nationally recognized fire testing laboratory is allowed in lieu of the protection as shown in Tables 7902.5–D through 7902.5–J when approved.

For guidelines in the evaluation of alternate materials and fire–protection designs based on fire testing, see Appendix VI–B.

7902.5.11.5.2 Portable Fire Extinguishers. One or more portable fire extinguisher having a rating of not less than 20–B shall be located not less than 10 feet (3048 mm) or more than 50 feet (15 240 mm) from any Class I or II liquid storage area located outside of a liquid storage room.

One or more portable fire extinguishers having a rating of not less than 20–B shall be located outside of, but not more than 10 feet (3048 mm) from, the door opening into a liquid storage room.

7902.5.11.6 Basement Storage. Class I liquids shall not be stored in basements.

7902.5.11.7 Explosion Control. See Section 7902.1.5.

7902.5.12 Liquid Storage Warehouses.

7902.5.12.1 General. Buildings used for storage of flammable or combustible liquids in quantities exceeding those set forth in Section 7902.5.7 for control areas and Section 7902.5.11.2 for liquid storage rooms shall comply with Section 7902.5.12 and shall be constructed and separated as required by the Building Code.

7902.5.12.2 Quantities and Storage Arrangement.

7902.5.12.2.1 General. The total quantities of liquids in a liquid storage warehouse are not limited. The arrangement of storage shall be in accordance with Table 7902.5–D or 7902.5–E.

7902.5.12.2.2 Mixed Storage. Mixed storage shall be in accordance with Section 7902.5.11.2.2.

7902.5.12.2.3 Separation and Aisles. Separation and aisles shall be in accordance with Section 7902.5.11.2.3.

7902.5.12.2.4 Stabilizing and Supports. Stabilizing and supports shall be in accordance with Section 7902.5.11.2.4.

7902.5.12.3 Spill Control and Secondary Containment. Liquid storage warehouses shall be provided with spill control and secondary containment as set forth in Section 7901.8.

7902.5.12.4 Ventilation. Liquid storage warehouses shall be ventilated in accordance with Section 8003.1.4.

7902.5.12.5 Fire Protection.

7902.5.12.5.1 Fire–extinguishing Systems. Liquid storage warehouses shall be protected by automatic sprinkler systems installed in accordance with NFPA 30, 2000 Edition, Section 4-8.2 and Tables 4-8.2(a) through (f) or the Fire Code (see Section 9002, Standard 10-3) and Table 7902.5–F, 7902.5–G, 7902.5–H, 7902.5–I or 7902.5–J. In–rack sprinklers shall also comply with UFC Standard 81–2.

Automatic foam–water systems and automatic aqueous film forming foam–water sprinkler systems may only be used when approved.

Protection criteria developed from fire modeling or full–scale fire testing conducted at a nationally recognized fire testing laboratory is allowed in lieu of the protection as shown in Tables 7902.5–D through 7902.5–J when approved.

7902.5.12.5.2 Warehouse Hose Lines. In liquid storage warehouses, either $1\frac{1}{2}$ inch (38.1 mm) lined or 1 inch (25.4 mm) hard rubber hand hose lines shall be provided in sufficient number to reach all liquid storage areas. See also Section 1001.9.

7902.5.12.6 Basement Storage. Class I liquids shall not be stored in basements.

7902.5.12.7 Explosion Control. See Section 7902.1.5.

7902.6 Underground Tank Storage.

7902.6.1 General. Underground storage of flammable and combustible liquids in tanks shall be in accordance with Sections 7902.1 and 7902.6.

7902.6.2 Contents. Underground tanks shall not contain petroleum products containing mixtures of a nonpetroleum nature, such as ethanol or methanol blends, without evidence of compatibility.

7902.6.3 Location. Flammable and combustible liquid storage tanks located underground, either outside or under buildings, shall be in accordance with the following:

1. Tanks shall be located with respect to existing foundations and supports such that the loads carried by the latter cannot be transmitted to the tank,

2. The distance from any part of a tank storing liquids to the nearest wall of a basement, pit, cellar or property line shall not be less than 3 feet (914.4 mm), and

3. A minimum distance of 1 foot (304.8 mm), shell to shell, shall be maintained between underground tanks.

7902.6.4 Depth and Cover. Excavation for underground storage tanks shall be made with due care to avoid undermining of foundations of existing structures. Underground tanks shall be set on firm foundations and surrounded with at least 6 inches (152.4 mm) of noncorrosive inert material such as clean sand or gravel well tamped in place or in accordance with the manufacturer's installation instructions. Tanks shall be covered with a minimum of 2 feet (609.6 mm) of earth or shall be covered by not less than 1 foot (304.8 mm) of earth, on top of which shall be placed a slab of reinforced concrete not less than 4 inches (101.6 mm) thick.

When underground tanks are, or are likely to be, subjected to traffic, they shall be protected against damage from vehicles passing over them by at least 3 feet (914.4 mm) of earth cover, or18 inches (457.2 mm) of well–tamped earth plus 6 inches (152.4 mm) of reinforced concrete, or 8 inches (203.2 mm) of asphaltic concrete. When asphaltic or reinforced concrete paving is used as part of the protection, it shall extend at least 1 foot (304.8 mm) horizontally beyond the outline of the tank in all directions.

For tanks built in accordance with Section 7902.1.8, the burial depth and the height of the vent line shall be such that the static head imposed at the bottom of the tank will not exceed 10 psig (68.9 kPa) if the fill or vent pipe is filled with liquid.

If the depth of cover exceeds 7 feet (2133.6 mm) or the manufacturer's specifications, reinforcements shall be provided in accordance with the tank manufacturer's recommendations.

Nonmetallic underground tanks shall be installed in accordance with the manufacturer's instructions. The minimum depth of cover shall be as specified above in Section 7902.6.4.

7902.6.5 Overfill Protection.

7902.6.5.1 General. Fill pipes shall be equipped with a spill container and an overfill prevention system as specified in Section 7902.6.5.

7902.6.5.2 Spill Containers. A spill container shall be provided for each fill pipe to collect liquids spilled by overfilling during tank–filling operations. Containers are allowed to be constructed of single–wall construction. Containers shall have a capacity of not less than 5 gallons (18.9 L) and shall be equipped with a drain valve which drains a spill into the primary tank.

7902.6.5.3 Overfill Prevention System. An overfill prevention system shall be provided for each tank. The system shall either:

1. Have an alarm which provides an audible and visual signal when the quantity of liquid in the tank reaches 90 percent of tank capacity,

2. Automatically shut off the flow when the quantity of liquid in the tank reaches 95 percent of tank capacity, or

3. Reduce the flow rate to not more than 15 gallons per minute (0.95 L/s) so that, at the reduced flow rate, the tank will not overfill for 30 minutes, and automatically shut–off flow into the tank so that none of the fittings on the top of the tank are exposed to product due to overfilling.

7902.6.6 Inventory Control. Daily inventory records shall be maintained for underground storage tank systems in accordance with Section 5202.3.11.

7902.6.7 Locations Subject to Flooding. Where a tank could become buoyant due to a rise in the level of the water table or due to location in an area that is subject to flooding, the tank shall be anchored in place.

7902.6.8 Leaking Tanks. Leaking tanks shall be promptly emptied and removed from the ground or abandoned in accordance with Section 7902.1.7.4 or 7902.1.7.2.4, respectively.

7902.6.9 Used Tanks. Reinstallation of used tanks is allowed when such tanks comply with the requirements of Sections 7902.1.8 and 7902.6.15. See also Section 7902.6.16.4.

7902.6.10 Tank Lining. Steel tanks are allowed to be lined only for the purpose of protecting the interior from corrosion or providing compatibility with a material to be stored. Only those liquids tested for compatibility with the lining material are allowed to be stored in lined tanks.

Tank opening, cleaning, preparation, inspection, lining, closing and testing shall be in accordance with Section 9002, UFC Standard 79–6.

For permits to alter a tank, see Section 105.

Interior–lined underground tanks shall be protected from corrosion in accordance with Section 7902.6.15.

7902.6.11 Secondary Containment. An approved method of secondary containment shall be provided for underground tank systems, including tanks, piping and related components, where a leak from such a system would pose an immediate hazard to persons or property, as determined by the chief.

7902.6.12 Leak Detection Required. Underground storage tank systems shall be provided with an approved method of detecting leaks from any component of the system which normally contains liquid.

7902.6.13 Leak–detection Installation and Maintenance. Leak–detection devices and methods shall be in accordance with nationally recognized standards. See Article 90, Standard u.3.2. Such devices shall be inspected and tested at least annually, and the test results maintained for at least one year.

7902.6.14 Leak Reporting. Any consistent or accidental loss of liquid, or other indication of a leak from a tank system, shall be reported immediately to the fire department.

7902.6.15 Corrosion Protection.

7902.6.15.1 General. Underground tanks and piping shall be properly designed, installed and maintained, and protected from corrosion in accordance with Section 7902.6.15.2 or 7902.6.15.3.

> **EXCEPTION:** If conditions, based on adequate proof, warrant the deletion of the corrosion–protection requirements, the chief may waive the corrosion–protection requirements.

See Section 9003, Standards a.3.10, n.1.2, s.1.1, u.1.14 and u.2.1.

7902.6.15.2 Cathodic Protection. Cathodic protection systems provided for corrosion protection shall be in accordance with nationally recognized standards.

7902.6.15.3 Corrosion–resistant Materials. Corrosion–resistant materials of construction, such as special alloys; nonmetallic, reinforced plastic coatings; composites; or equivalent systems, may be used when approved.

7902.6.15.4 Testing of Corrosion Protection. New underground steel tanks and piping shall be tested by the structure–to–soil–potential method after the system is in operation. The tank manufacturer shall provide a structure lead and a test station. The criteria for adequate corrosion protection shall be in accordance with recognized standards. Testing shall be done at installation and not less than once every five years thereafter by approved qualified persons.

EXCEPTION: Approved and listed composite fiberglass–reinforced plastic tanks.

7902.6.16 Testing of Underground Tanks.

7902.6.16.1 General. Before being covered or placed in use, tanks and piping connected to underground tanks shall be tested for tightness in the presence of the chief. For pipe testing, see Section 7901.11.10. The system shall not be covered until it has been approved.

7902.6.16.2 New Tanks. New underground tanks shall be tested for tightness hydrostatically or pneumatically at not less than3 pounds per square inch (20.7 kPa) and not more than 5 pounds per square inch (34.5 kPa) for 30 minutes. Pneumatic testing shall not be used on a tank containing flammable or combustible liquids or vapors.

When secondary containment tanks are required in accordance with Section 7902.6.11, they shall be tested in accordance with the manufacturer's instructions. Both the primary and secondary containment shall be tested.

7902.6.16.3 Existing Tanks and Piping. Existing underground storage tanks and piping shall be tested for leakage at the owner's or operator's expense when the chief has reasonable cause to believe that a leak exists. Orders by the chief requiring testing on underground tanks or piping shall indicate that the test be completed by a specified date. Tanks shall be emptied of flammable or combustible liquids, and piping and other equipment shall not be used if required tests are not completed within the specified time.

When testing is required, owners or operators shall provide the chief with data setting forth the method of testing that is to be used and shall submit the name of a qualified individual who will conduct the test. The method of testing to be used shall consider the effects of temperature, pressure and other variables and shall establish conclusively whether the tank or piping is leaking. Pneumatic testing shall not be used for tanks.

Devices used for final testing of tanks shall be capable of detecting leaks as small as 0.05 gallon per hour (0.19 L/hr). Leaking piping and equipment shall not be used until repaired or replaced.

The chief is authorized to require that the test be conducted in the chief's presence.

7902.6.16.4 Used Tanks. Used tanks intended for flammable or combustible liquid service shall be tested as required for new tanks.

TABLE 7902.1–A—MAXIMUM SIZE OF CONTAINERS AND PORTABLE TANKS
(See Section 7902.1.8.1)

CONTAINER TYPE	CLASS I–A	CLASS I–B	CLASS I–C	CLASS II	CLASS III
			× 3.785 for gal. to L		
1. Glass[1]	1 pt. (0.47 L)	1 qt. (0.95 L)	1 gal.	1 gal.	5 gal.
2. Metal or listed approved plastic[2]	1 gal.	5 gal.	5 gal.	5 gal.	5 gal.
3. Approved plastic[2]	0 gal.	0 gal.	0 gal.	0 gal.	5 gal.
4. Safety cans	2 gal.	5 gal.	5 gal.	5 gal.	5 gal.
5. Metal drum	60 gal.	60 gal.	60 gal.	60 gal.	60 gal.
6. Approved portable tanks	660 gal.	660 gal.	660 gal.	660 gal.	660 gal.
7. Polyethylene[3]		Footnote 4	Footnote 4	60 gal.	60 gal.

[1]Class I–A and I–B liquids are allowed to be stored in glass containers of not more than 1–gallon (3.785 L) capacity if the required liquid purity, such as American Chemical Society analytical reagent grade or higher, would be affected by storage in metal containers or if the liquid would cause excessive corrosion of a metal container.

[2]See Sections 7902.1.8.1.3 and 7902.5.10.2.2 for special limitations.

[3]Polyethylene containers in accordance with nationally recognized standards. See Article 90, Standard u.3.3.

[4]See Rows 2, 3 and 4.

TABLE 7902.1–B—VENT LINE DIAMETERS
(See Section 7902.1.13.7)

MAXIMUM FLOW (gpm)	PIPE LENGTH[1]					
× 3.785 for L/min	50 feet	15 240 mm	100 feet	30 480 mm	200 feet	60 960 mm
100	1 1/4 inch	31.75 mm	1 1/4 inch	31.75 mm	1 1/4 inch	31.75 mm
200	1 1/4 inch	31.75 mm	1 1/4 inch	31.75 mm	1 1/4 inch	31.75 mm
300	1 1/4 inch	31.75 mm	1 1/4 inch	31.75 mm	1 1/2 inch	38.1 mm
400	1 1/4 inch	31.75 mm	1 1/2 inch	38.1 mm	2 inch	50.8 mm
500	1 1/2 inch	38.1 mm	1 1/2 inch	38.1 mm	2 inch	50.8 mm
600	1 1/2 inch	38.1 mm	2 inch	50.8 mm	2 inch	50.8 mm
700	2 inch	50.8 mm	2 inch	50.8 mm	2 inch	50.8 mm
800	2 inch	50.8 mm	2 inch	50.8 mm	3 inch	76.2 mm
900	2 inch	50.8 mm	2 inch	50.8 mm	3 inch	76.2 mm
1,000	2 inch	50.8 mm	2 inch	50.8 mm	3 inch	76.2 mm

[1]Vent lines of 50 feet (15 240 mm), 100 feet (30 480 mm) and 200 feet (60 960 mm) of pipe, plus 7 ells.

TABLE 7902.2–A—STABLE LIQUIDS WITH OPERATING PRESSURE OF 2.5 PSIG (17.2 kPa) OR LESS (See Section 7902.2.2.2)

TYPE OF TANK	REQUIRED PROTECTION	MINIMUM DISTANCE IN FEET FROM PROPERTY LINE OF PROPERTY WHICH IS OR CAN BE BUILT UPON, INCLUDING THE OPPOSITE SIDE OF A PUBLIC WAY, AND SHALL NOT BE LESS THAN 5 FEET (1524 mm)	MINIMUM DISTANCE IN FEET FROM NEAREST SIDE OF ANY PUBLIC WAY OR FROM NEAREST IMPORTANT BUILDING ON THE SAME PROPERTY, AND SHALL NOT BE LESS THAN 6FEET (1624 mm)
Floating roof (See Section 7901.2.2)	Protection for exposures[1]	1/2 times diameter of tank	1/6 times diameter of tank
	None	Diameter of tank but need not exceed 175 feet (53 340 mm)	1/6 times diameter of tank
Vertical with weak roof–to–shell seam (See Sections 7902.2.2.2 and 7902.2.6.2)	Approved foam or inerting system on tanks not exceeding 150 feet (45 720 mm) in diameter[2]	1/2 times diameter of tank	1/6 times diameter of tank
	Protection for exposures[1]	Diameter of tank	1/3 times diameter of tank
	None	2 times diameter of tank but need not exceed 350 feet (106.7 mm)	1/3 times diameter of tank
Horizontal and vertical with emergency relief venting to limit pressures to 2.5 psig (17.2 kPa)	Approved inerting system on the tank or approved foam system on vertical tanks	1/2 times Table 7902.2–F	1/2 times Table 7902.2–F
	Protection for exposures[1]	Table 7902.2–F	Table 7902.2–F
	None	2 times Table 7902.2–F	Table 7902.2–F
Protected aboveground tank	See Section 7902.1.9	1/2 times Table 7902.2-F	1/2 times Table 7902.2-F

[1]Protection for exposure is protection by a public fire department or private fire brigade capable of providing cooling water streams on structures on property adjacent to liquid storage.

[2]For tanks over 150 feet (45 720 mm) in diameter, use "Protection for exposures" or "None," as applicable.

TABLE 7902.2–B—STABLE LIQUIDS WITH OPERATING PRESSURE GREATER THAN 2.5 PSIG (17.2 kPa) (See Section 7902.2.2.3)

TYPE OF TANK	REQUIRED PROTECTION	MINIMUM DISTANCE IN FEET FROM PROPERTY LINE OF PROPERTY WHICH IS OR CAN BE BUILT UPON, INCLUDING THE OPPOSITE SIDE OF A PUBLIC WAY	MINIMUM DISTANCE IN FEET FROM NEAREST SIDE OF ANY PUBLIC WAY OR FROM NEAREST IMPORTANT BUILDING ON THE SAME PROPERTY
Any type	Protection for exposures[1]	1 1/2 times Table 7902.2–F but shall not be less than 25 feet (7620 mm)	1 1/2 times Table 7902.2–F but shall not be less than 25 feet (7620 mm)
	None	3 times Table 7902.2–F but shall not be less than 50 feet (15 240 mm)	1 1/2 times Table 7902.2–F but shall not be less than 25 feet (7620 mm)

[1]Protection for exposure is protection by a public fire department or private fire brigade capable of providing cooling water streams on structures on property adjacent to liquid storage.

TABLE 7902.2–C—BOILOVER LIQUIDS (See Section 7902.2.2.4)

TYPE OF TANK	REQUIRED PROTECTION	MINIMUM DISTANCE IN FEET FROM PROPERTY LINE OF PROPERTY WHICH IS OR CAN BE BUILT UPON, INCLUDING THE OPPOSITE SIDE OF A PUBLIC WAY AND SHALL NOT BE LESS THAN 5 FEET (1524 mm)	MINIMUM DISTANCE IN FEET FROM NEAREST SIDE OF ANY PUBLIC WAY OR FROM NEAREST IMPORTANT BUILDING ON THE SAME PROPERTY AND SHALL NOT BE LESS THAN 5 FEET (1524 mm)
Floating roof (See Section 7901.2.2)	Protection for exposures[1]	1/2 times diameter of tank	1/6 times diameter of tank
	None	Diameter of tank	1/6 times diameter of tank
Fixed roof	Approved foam or inerting system[2]	Diameter of tank	1/3 times diameter of tank
	Protection for exposures[1]	2 times diameter of tank	2/3 times diameter of tank
	None	4 times diameter of tank but need not exceed 350 feet (106.7 m)	2/3 times diameter of tank

[1]Protection for exposure is protection by a public fire department or private fire brigade capable of providing cooling water streams on structures on property adjacent to liquid storage.

[2]See Section 7902.2.5.

TABLE 7902.2–D—UNSTABLE LIQUIDS
(See Section 7902.2.2.5)

TYPE OF TANK	REQUIRED PROTECTION	MINIMUM DISTANCE IN FEET FROM PROPERTY LINE OF PROPERTY WHICH IS OR CAN BE BUILT UPON, INCLUDING THE OPPOSITE SIDE OF A PUBLIC WAY	MINIMUM DISTANCE IN FEET FROM NEAREST SIDE OF ANY PUBLIC WAY OR FROM NEAREST IMPORTANT BUILDING ON THE SAME PROPERTY
Horizontal and vertical tanks with emergency relief venting to permit pressure not in excess of 2.5 psig (17.2 kPa)	Tank protected with any one of the following: approved water spray, approved inerting, approved insulation and refrigeration, approved barricade	Table 7902.2–F but not less than 25 feet (7620 mm)	25 feet (7620 mm)
	Protection for exposures[1]	2½ times Table 7902.2–F but not less than 50 feet (15 240 mm)	50 feet (15 240 mm)
	None	5 times Table 7902.2–F but not less than 100 feet (30 480 mm)	100 feet (30 480 mm)
Horizontal and vertical tanks with emergency relief venting to permit pressure over 2.5 psig (17.2 kPa)	Tank protected with any one of the following: approved water spray, approved inerting, approved insulation and refrigeration, approved barricade	2 times Table 7902.2–F but not less than 50 feet (15 240 mm)	50 feet (15 240 mm)
	Protection for exposures[1]	4 times Table 7902.2–F but not less than 100 feet (30 480 mm)	100 feet (30 480 mm)
	None	8 times Table 7902.2–F but not less than 150 feet (45 720 mm)	150 feet (45 720 mm)

[1]Protection for exposure is protection by a public fire department or private fire brigade capable of providing cooling water streams on structures on property adjacent to liquid storage.

TABLE 7902.2–E—CLASS III–B LIQUIDS
(See Section 7902.2.2.6)

TANK CAPACITY (gallons)	MINIMUM DISTANCE FROM PROPERTY LINE OF PROPERTY WHICH IS OR CAN BE BUILT UPON, INCLUDING THE OPPOSITE SIDE OF A PUBLIC WAY (feet)	MINIMUM DISTANCE FROM NEAREST SIDE OF ANY PUBLIC WAY OR FROM NEAREST IMPORTANT BUILDING ON THE SAME PROPERTY (feet)
x 3.785 for L	x 304.8 for mm	
12,000 or less	5	5
12,001 to 30,000	10	5
30,001 to 50,000	10	10
50,001 to 100,000	15	10
100,001 or more	15	15

TABLE 7902.2–F—REFERENCE TABLE FOR USE IN TABLES 7902.2–A, 7902.2–B AND 7902.2–D

TANK CAPACITY (gallons)	MINIMUM DISTANCE FROM PROPERTY LINE OF PROPERTY WHICH IS OR CAN BE BUILT UPON, INCLUDING THE OPPOSITE SIDE OF A PUBLIC WAY (feet)	MINIMUM DISTANCE FROM NEAREST SIDE OF ANY PUBLIC WAY OR FROM NEAREST IMPORTANT BUILDING ON THE SAME PROPERTY (feet)
x 3.785 for L	x 304.8 for mm	
275 or less	5	5
276 to 750	10	5
751 to 12,000	15	5
12,001 to 30,000	20	5
30,001 to 50,000	30	10
50,001 to 100,000	50	15
100,001 to 500,000	80	25
500,001 to 1,000,000	100	35
1,000,001 to 2,000,000	135	45
2,000,001 to 3,000,000	165	55
3,000,001 or more	175	60

TABLE 7902.2–G—MINIMUM SEPARATION (SHELL–TO–SHELL) OF TANKS CONTAINING STABLE LIQUIDS[1,2]
(See Section 7902.2.3.1)

TANK DIAMETER (feet)	MINIMUM SEPARATION		
		Fixed Roof Tanks	
× 304.8 for mm	Floating Roof Tanks	Class I or II Liquids	Class III Liquids
Not over 150	1/6 sum of adjacent tank diameters but not less than 3 feet (914.4 mm)	1/6 sum of adjacent tank diameters but not less than 3 feet (914.4 mm)	1/6 sum of adjacent tank diameters but not less than 3 feet (914.4 mm)
More than 150 If remote impounding is in accordance with Section 7902.2.8.3 If impounding is within dikes around tanks in accordance with Section 7902.2.8.4	1/6 sum of adjacent tank diameters 1/4 sum of adjacent tank diameters	1/4 sum of adjacent tank diameters 1/3 sum of adjacent tank diameters	1/6 sum of adjacent tank diameters 1/4 sum of adjacent tank diameters

[1]Crude petroleum tanks having individual capacities not exceeding 126,000 gallons (3,000 barrels) (476 910 L), when located at production facilities in isolated locations, need not be separated by more than 3 feet (914.4 mm).

[2]Tanks used for storing Class III–B liquids are allowed to be spaced 3 feet (914.4 mm) apart unless within a diked area or drainage path for a tank storing Class I or II liquid.

TABLE 7902.2–H—WETTED AREA VERSUS VENT CAPACITY[1]
(14.7 psia and 60°F) (101.3 kPa and 15.6°C)
(See Sections 7902.2.6.3.1 and 7902.2.6.3.2)

WETTED AREA (square feet)	VENT CAPACITY (CFH)	WETTED AREA (square feet)	VENT CAPACITY (CFH)	WETTED AREA (square feet)	VENT CAPACITY (CFH)
× 0.0929 for m^2	× 0.0283 for m^3/hr.	× 0.0929 for m^2	× 0.0283 for m^3/hr.	× 0.0929 for m^2	× 0.0283 for m^3/hr.
20	21,100	200	211,000	1,000	524,000
30	31,600	250	239,000	1,200	557,000
40	42,100	300	265,000	1,400	587,000
50	52,700	350	288,000	1,600	614,000
60	63,200	400	312,000	1,800	639,000
70	73,700	500	354,000	2,000	662,000
80	84,200	600	392,000	2,400	704,000
90	94,800	700	428,000	2,800	742,000
100	105,000	800	462,000	and over	
120	126,000	900	493,000		
140	147,000				
160	168,000				
180	190,000				

[1]Interpolate for intermediate values.

TABLE 7902.2–I—WETTED AREA OVER 2,800 SQ. FT. (260.1 m^2) AND PRESSURES OVER 1 PSIG (6.89 kPa)
(See Section 7902.2.6.3.2)

WETTED AREA (square feet)	VENT CAPACITY (CFH)	WETTED AREA (square feet)	VENT CAPACITY (CFH)
× 0.0929 for m^2	× 0.0283 for m^3/hr.	× 0.0929 for m^2	× 0.0283 for m^3/hr.
2,800	742,000	9,000	1,930,000
3,000	786,000	10,000	2,110,000
3,500	892,000	15,000	2,940,000
4,000	995,000	20,000	3,720,000
4,500	1,100,000	25,000	4,470,000
5,000	1,250,000	30,000	5,190,000
6,000	1,390,000	35,000	5,900,000
7,000	1,570,000	40,000	6,570,000
8,000	1,760,000		

TABLE 7902.3–A—OUTDOOR LIQUID STORAGE IN CONTAINERS AND PORTABLE TANKS
(See Sections 7902.3.3.1 and 7902.3.3.2)

CLASS OF LIQUID	CONTAINER STORAGE—MAXIMUM PER PILE		PORTABLE TANK STORAGE—MAXIMUM PER PILE		MINIMUM DISTANCE BETWEEN PILES OR RACKS (feet)	MINIMUM DISTANCE TO PROPERTY LINE OF PROPERTY THAT CAN BE BUILT UPON[3,4] (feet)	MINIMUM DISTANCE TO STREET, ALLEY OR A PUBLIC WAY[4] (feet)
	Quantity[1, 2] (gallons)	Height (feet)	Quantity[1, 2] (gallons)	Height (feet)			
	× 3.785 for L	× 304.8 for mm	× 3.785 for L	× 304.8 for mm			
I–A	1,100	10	2,200	7	5	50	10
I–B	2,200	12	4,400	14	5	50	10
I–C	4,400	12	8,800	14	5	50	10
II	8,800	12	17,600	14	5	25	5
III	22,000	18	44,000	14	5	10	5

[1]For mixed class storage, see Section 7902.3.3.1.

[2]For storage in racks, the quantity limits per pile do not apply, but the rack arrangement shall be limited to a maximum of 50 feet (15 240 mm) in length and two rows or 9 feet (30 480 mm) in depth.

[3]If protection by a public fire department or private fire brigade capable of providing cooling water streams is not available, the distance shall be doubled.

[4]When the total quantity stored does not exceed 50 percent of the maximum allowed per pile, the distances are allowed to be reduced 50 percent, but not less than3 feet (914.4 mm).

TABLE 7902.5–A—EXEMPT AMOUNTS OF FLAMMABLE AND COMBUSTIBLE LIQUIDS—MAXIMUM QUANTITIES STORED PER CONTROL AREA[1,2,3]
(See Section 7902.5.7)

TYPE OF LIQUID	EXEMPT AMOUNT (gallons)
	× 3.785 for L
Flammable	30
Class I–A	60
Class I–B	90
Class I–C	120[4]
Combination I–A, I–B, I–C	
Combustible	120
Class II	330
Class III–A	13,200[5]
Class III–B	

[1]Control areas shall be separated from each other by not less than a one–hour fire–resistive occupancy separation. The number of control areas within a building used for retail or wholesale sales shall not exceed two. The number of control areas in buildings with other uses shall not exceed four. See Sections 204 and 8001.10.2.

[2]Quantities are allowed to be increased 100 percent when stored in approved storage cabinets. When Footnote 3 applies, the increase for each footnote is allowed.

[3]Quantities are allowed to be increased 100 percent in buildings equipped with an approved automatic sprinkler system. When Footnote 2 applies, the increase for each footnote is allowed.

[4]Combinations shall not contain more than the exempt amounts of any individual class.

[5]Quantities permitted in a building equipped with an approved automatic sprinkler system are not limited.

TABLE 7902.5–B—EXEMPT AMOUNTS OF FLAMMABLE AND COMBUSTIBLE LIQUIDS IN WHOLESALE AND RETAIL SALES USES—MAXIMUM QUANTITIES STORED PER CONTROL AREA[1]
(See Section 7902.5.7.1)

TYPE OF LIQUID	EXEMPT AMOUNTS (gallons) × 3.785 for L		
	Sprinklered[2] per Footnote Densities and Arrangements	Sprinklered per Tables 7902.5–F through 7902.5–K	Unsprinklered
Flammable: Class I–A	60	60	30
Flammable and combustible: Combination Class I–B, I–C, II and III–A	7,500[3]	15,000[3]	1,600
Combustible: Class III–B	Unlimited	Unlimited	13,200

[1]Control areas shall be separated from each other by not less than a one–hour fire–resistive occupancy separation. The number of control areas within a building used for retail or wholesale sales shall not exceed two. The number of control areas in buildings with other uses shall not exceed four. See Sections 204 and 8001.10.2.

[2]To be considered as sprinklered, buildings shall be protected with approved automatic sprinkler systems with designs providing minimum densities as follows:

For uncartoned commodities on shelves 6 feet (1829 mm) or less in height where the ceiling height does not exceed 18 feet (5486 mm), quantities are those permitted with a minimum sprinkler design density of Ordinary Hazard Group 2.

For cartoned, palletized or racked commodities where storage is 4 feet 6 inches (1372 mm) or less in height and where the ceiling height does not exceed 18 feet (5486 mm), quantities are those permitted with a minimum sprinkler design density of 0.21 gpm per square foot [8.56 L/(min•m^2)] over the most remote 1,500–square–foot (139 m^2) area.

[3]When wholesale and retail sales or storage areas exceed 50,000 square feet (4645 m^2) in area, exempt amounts are allowed to be increased by 2 percent for each 1,000 square feet (92.9 m^2) of area in excess of 50,000 square feet (4645 m^2), up to a maximum of 100 percent of the table amounts. A control area separation is not required. The cumulative amounts, including amounts attained by having an additional control area, shall not exceed 30,000 gallons (113 562 L).

TABLE 7902.5–C—MAXIMUM STORAGE HEIGHT IN CONTROL AREA
(See Sections 7902.5.10.1 and 7902.5.10.2.4)

TYPE OF LIQUID	UNSPRINKLERED AREA (feet)	SPRINKLERED AREA (feet)	SPRINKLERED WITH IN–RACK PROTECTION (feet)
	× 304.8 for mm		
Flammable liquids:	4	4	4
Class I–A	4	8	12
Class I–B	4	8	12
Class I–C			
Combustible liquids:	6	8	12
Class II	8	12	16
Class III–A	8	12	20
Class III–B			

TABLE 7902.5–D—STORAGE ARRANGEMENTS FOR PALLETIZED OR SOLID–PILE STORAGE IN LIQUID STORAGE ROOMS AND WAREHOUSES
(See Sections 7902.5.10.2.4, 7902.5.11.2.1, 7902.5.11.2.2 and 7902.5.12.2.1)

CLASS	STORAGE LEVEL	MAXIMUM STORAGE HEIGHT			MAXIMUM QUANTITY PER PILE (gallons) × 3.785 for L		MAXIMUM QUANTITY PER ROOM[1] (gallons) × 3.785 for L	
		Drums	Containers[2] (feet)	Portable Tanks (feet)	Containers	Portable Tanks	Containers	Portable Tanks
			× 304.8 for mm					
I–A	Ground floor	1	5	Not allowed	3,000	Not allowed	12,000	Not allowed
	Upper floors	1	5	Not allowed	2,000	Not allowed	8,000	Not allowed
	Basements	0	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
I–B	Ground floor	1	6 1/2	7	5,000	20,000	15,000	40,000
	Upper floors	1	6 1/2	7	3,000	10,000	12,000	20,000
	Basements	0	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
I–C	Ground floor	1	6 1/2[3]	7	5,000	20,000	15,000	40,000
	Upper floors	1	6 1/2[3]	7	3,000	10,000	12,000	20,000
	Basements	0	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
II	Ground floor	3	10	14	10,000	40,000	25,000	80,000
	Upper floors	3	10	14	10,000	40,000	25,000	80,000
	Basements	1	5	7	7,500	20,000	7,500	20,000
III	Ground floor	5	20	14	15,000	60,000	50,000	100,000
	Upper floors	5	20	14	15,000	60,000	50,000	100,000
	Basements	3	10	7	10,000	20,000	25,000	40,000

[1]See Section 7902.5.12.2.1 for unlimited quantities in liquid storage warehouses.

[2]Storage heights are allowed to be increased for Class I–B, I–C, II and III liquids in metal containers of 5–gallon (18.9 L) or less capacity when an automatic AFFF–water protection system is provided in accordance with Table 7902.5–G.

[3]These height limitations are allowed to be increased to 10 feet (3048 mm) for containers having a capacity of 5 gallons (18.9 L) or less.

TABLE 7902.5–E—STORAGE ARRANGEMENTS FOR RACK STORAGE IN LIQUID STORAGE ROOMS AND WAREHOUSES
(See Sections 7902.5.10.2.4, 7902.5.11.2.1, 7902.5.11.2.2 and 7902.5.12.2.1)

CLASS	TYPE RACK	STORAGE LEVEL	MAXIMUM STORAGE HEIGHT (feet)	MAXIMUM QUANTITY PER ROOM (gallons)
			× 304.8 for mm	× 3.785 for L
			Containers	Containers
I–A	Double row	Ground floor	25	7,500
	or	Upper floors	15	4,500
	Single row	Basements	Not allowed	Not allowed
I–B	Double row	Ground floor	25	15,000
I–C	or	Upper floors	15	9,000
	Single row	Basements	Not allowed	Not allowed
II	Double row	Ground floor	25	24,000
	or	Upper floors	25	24,000
	Single row	Basements	15	9,000
III	Multirow,	Ground floor	40	48,000
	Double row or	Upper floors	20	48,000
	Single row	Basements	20	24,000

TABLE 7902.5–F—AUTOMATIC SPRINKLER PROTECTION FOR SOLID–PILE AND PALLETIZED STORAGE OF LIQUIDS IN CONTAINERS AND PORTABLE TANKS[1]
(See Sections 7902.5.10.2.4, 7902.5.11.5.1 and 7902.5.12.5.1)

STORAGE CONDITIONS		CEILING SPRINKLER DESIGN AND DEMAND				MINIMUM HOSE STREAM DEMAND (gpm)	MINIMUM DURATION SPRINKLERS AND HOSE STREAMS (hrs.)
Class Liquid	Container Size and Arrangement	Density gpm/sq. ft.	Area (sq. ft.)		Maximum Spacing (sq. ft.)		
			× 0.0929 for m^2				
		× 40.75 for L/min./m^2	High Temp. Sprinklers	Ordinary Temp. Sprinklers	× 0.0929 for m^2	× 3.785 for L/min.	
I–A	5 gal. (18.9 L) or less, with or without cartons, palletized or solid pile[2]	0.30	3,000	5,000	100	750	2
	Containers greater than 5 gal. (18.9 L), on end or side, palletized or solid pile	0.60	5,000	8,000	80	750	
I–B, I–C and II	5 gal. (18.9 L) or less, with or without cartons, palletized or solid pile[2]	0.30	3,000	5,000	100		2
	Containers greater than 5 gal. (18.9 L) on pallets or solid pile, one high	0.25	5,000	8,000	100	500	
II	Containers greater than 5 gal. (18.9 L) on pallets or solid pile, more than one high on end or side	0.60	5,000	8,000	80	750	2
I–B, I–C, II	Portable tanks, one high	0.30	3,000	5,000	100	500	2
II	Portable tanks, two high	0.60	5,000	8,000	80	750	2
III	5 gal. (18.9 L) or less, with or without cartons, palletized or solid pile	0.25	3,000	5,000	120	500	1
III	Containers greater than 5 gal. (18.9 L) on pallets or solid pile, on end or sides, up to three high	0.25	3,000	5,000	120	500	1
	Containers greater than 5 gal. (18.9 L), on pallets or solid pile, on end or sides, up to 18 feet (5486 mm) high	0.35	3,000	5,000	100	750	2
	Portable tanks, one high	0.25	3,000	5,000	120	500	1
	Portable tanks, two high	0.50	3,000	5,000	80	750	2

[1]The design area contemplates the use of Class II standpipe systems. Where Class I standpipe systems are used, the area of application shall be increased by 30 percent without revising density.

[2]For storage heights above 4 feet (1219 mm) or ceiling heights greater than 18 feet (5486 mm), an approved engineering design shall be provided. See Section 103.1.1.

TABLE 7902.5–G—AUTOMATIC AFFF–WATER PROTECTION REQUIREMENTS FOR SOLID PILE AND PALLETIZED STORAGE OF LIQUIDS IN METAL CONTAINERS OF 5–GALLON (18.9 L) CAPACITY OR LESS[1,2]
(See Sections 7902.5.11.5.1 and 7902.5.12.5.1)

PACKAGE TYPE	CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND					STORAGE HEIGHT (feet)	HOSE DEMAND (gpm)[3]	DURATION AFFF SUPPLY (min.)	DURATION WATER SUPPLY (hours)
		Density gpm/sq. ft.	Area (sq. ft.)	Temperature Rating	Maximum Spacing	Orifice Size (inch)				
		× 40.75 for L/(min•m²)	× 0.0929 for m²			× 25.4 for mm	× 304.8 for mm	× 3.785 for L/min.		
Cartoned	I–B, I–C, II and III	0.40	2,000	286°F (141°C)	100 sq. ft./hd. (9.29 m²/hd.)	$^{17}/_{32}$	11	500	15	2
Uncartoned	I–B, I–C, II and III	0.30	2,000	286°F (141°C)	100 sq. ft./hd. (9.29 m²/hd.)	$^{1}/_{2}$ or $^{17}/_{32}$	12	500	15	2

[1]System shall be a closed–head wet system with approved devices for proportioning aqueous film–forming foam.

[2]Maximum ceiling height of 30 feet (9144 mm).

[3]Hose stream demand includes $1^{1}/_{2}$–inch (38.1 mm) inside hand hose, when required.

TABLE 7902.5–H—AUTOMATIC SPRINKLER PROTECTION REQUIREMENTS FOR RACK STORAGE OF LIQUIDS IN CONTAINERS OF 5–GALLON (18.9 L) CAPACITY OR LESS WITH OR WITHOUT CARTONS ON CONVENTIONAL WOOD PALLETS[1]
(See Sections 7902.5.10.2.4, 7902.5.11.5.1 and 7902.5.12.5.1)

CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND			IN–RACK SPRINKLER ARRANGEMENT AND DEMAND					MIN. HOSE STREAM DEMAND (gpm)	MIN. DURATION SPRINKLER AND HOSE STREAM (hrs.)
	Density gpm/sq.ft.	Area (sq. ft.)		Max. Spacing	Racks up to 9 ft. (2744 mm) deep	Racks over 9 ft. (2744 mm) to 12 ft. (3658 mm) deep	30 psi (206.8 kPa) (standard orifice)	Number of Sprinklers Operating		
		× 0.0929 for m²								
	× 40.75 for L/(min•m²)	High Temp. Sprinklers	Ord. Temp. Sprinklers				14 psi (96.5 kPa) (large orifice)		× 3.785 for L/min.	
I [max. 25 ft. (7620 mm) height] Option 1	0.40	3,000	5,000	80 sq. ft./hd. (7.4 m²/hd.)	1. Ord. temp., quick–response sprinklers, maximum 8 feet 3 inches (2515 mm) horizontal spacing 2. One line sprinklers above each level of storage 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	1. Ord. temp., quick–response sprinklers, maximum 8 feet 3 inches (2515 mm) horizontal spacing 2. One line sprinklers above each level of storage 3. Locate in transverse flue spaces, staggered vertical and within 20 in. (508 mm) of aisle 4. Shields required where multilevel	30 psi (206.8 kPa) [$^{1}/_{2}$–inch (13.5 mm) orifice]	1. Eight sprinklers if only one level 2. Six sprinklers each on two levels if only two levels 3. Six sprinklers each on top 3 levels, if 3 or more levels 4. Hydraulically most remote	750	2
I [max. 25 ft. (7620 mm) height] Option 2	0.55	2,000[2]	N/A	100 sq. ft./hd. (9.29 m²/hd.)	1. Ord. temp., quick–response sprinklers, maximum 8 feet 3 inches (2515 mm) horizontal spacing 2. See 2 above 3. See 3 above 4. See 4 above	1. Ord. temp, quick–response sprinklers, maximum 8 feet 3 inches (2515 mm) horizontal spacing 2. See 2 above 3. See 3 above 4. See 4 above	14 psi (96.5 kPa) [$^{17}/_{32}$–inch (13.5 mm) orifice]	See 1 through 4 above	500	2
I and II [max. 14–ft. (4267 mm) storage ht.] (max. three tiers)	0.55[3]	2,000[2,4]	N/A	100 sq. ft./hd. (9.29 m²/hd.)	N/A None for max. 6 ft. (1829 mm) deep racks	N/A	N/A	N/A	500	2

(Continued)

TABLE 7902.5–H—AUTOMATIC SPRINKLER PROTECTION REQUIREMENTS FOR RACK STORAGE OF LIQUIDS IN CONTAINERS OF 5–GALLON (18.9 L) CAPACITY OR LESS WITH OR WITHOUT CARTONS ON CONVENTIONAL WOOD PALLETS[1]—Continued
(See Sections 7902.5.10.2.4, 7902.5.11.5.1 and 7902.5.12.5.1)

II [max. 25 ft. (7620 mm) height]	0.30	3,000	5,000	100 sq. ft./hd. (9.29 m^2/hd.)	1. Ord. temp. sprinklers 8 feet (2438 mm) apart horizontally 2. One line sprinklers between levels at nearest 10–foot (3048 mm) vertical intervals 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	1. Ord. temp. sprinklers 8 feet (2438 mm) apart horizontally 2. Two lines between levels at nearest 10 foot (3048 mm) vertical intervals 3. Locate in transverse flue spaces, staggered vertical and within 20 inches (508 mm) of aisle 4. Shields required where multilevel	30 psi (206.8 kPa)	1. Hydraulically most remote—6 sprinklers at each level, up to max. of three levels	750	2
III [40 ft. (12 192 mm) height]	0.25	3,000	5,000	120 sq. ft./hd. (11.15 m^2/hd.)	Same as for Class II liquids	Same as for Class II liquids	30 psi (206.8 kPa)	Same as for Class II liquids	500	2

[1]The design area contemplates the use of Class II standpipe systems. Where Class I standpipe systems are used, the area of application shall be increased by 30 percent without revising density.

[2]Using listed or approved extra–large orifices, high–temperature quick–response or standard element sprinklers under a maximum 30 foot (9144 mm) ceiling with minimum $7^1/_2$ foot (2286 mm) aisles.

[3]For friction lid cans and other metal containers equipped with plastic nozzles or caps, the density shall be increased to 0.65 gpm per square foot [26.5 L/(min•m^2)] using listed or approved extra–large orifice, high–temperature quick–response sprinklers.

[4]Using listed or approved extra–large orifice, high–temperature quick–response or standard element sprinklers under a maximum 18 foot (5486 mm) ceiling with minimum $7^1/_2$ foot (2286 mm) aisles and metal containers.

TABLE 7902.5–I—AUTOMATIC SPRINKLER PROTECTION FOR RACK STORAGE OF LIQUIDS IN CONTAINERS GREATER THAN 5–GALLON (18.9 L) CAPACITY[1]
(See Sections 7902.5.10.2.4, 7902.5.11.5.1 and 7902.5.12.5.1)

CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND			IN–RACK SPRINKLER ARRANGEMENT AND DEMAND					MIN. HOSE STREAM DEMAND (gpm)	MIN. DURATION SPRINKLER AND HOSE STREAM (hrs.)
	Density (gpm/sq.ft.)	Area (sq. ft.)		Max. Spacing	On–side Storage Racks up to 9–foot (2744 mm) Deep Racks	On–end Storage (on pallets) up to 9 foot (2744 mm) Deep Racks	Min. Nozzle Pressure	Number of Sprinklers Operating		
		× 0.0929 for m^2								
	× 40.75 for L/(min•m^2)	High Temp. Sprinklers	Ord. Temp. Sprinklers						× 3.785 for L/min.	
I–A [max. 25 ft. (7620 mm) height]	0.60	3,000	5,000	80 sq. ft./hd. (7.4 m^2/hd.)	1. Ord. temp. sprinklers 8 feet (2438 mm) apart horizontally 2. One line sprinklers above each tier of storage 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	1. Ord. temp. sprinklers 8 feet (2438 mm) apart horizontally 2. One line sprinklers above each tier of storage 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	30 psi (206.8 kPa)	1. Hydraulically most remote—6 sprinklers at each level	1,000	2
I–B, I–C and II [max. 25 ft. (7620 mm) height]	0.60	3,000	5,000	100 sq. ft./hd. (9.29 m^2/hd.)	1. See 1 above 2. One line sprinklers every three tiers of storage 3. See 3 above 4. See 4 above	1. See 1 above 2. See 2 above 3. See 3 above 4. See 4 above	30 psi (206.8 kPa)	1. See 1 above	750	2

(Continued)

TABLE 7902.5–I—AUTOMATIC SPRINKLER PROTECTION FOR RACK STORAGE OF LIQUIDS IN CONTAINERS GREATER THAN 5–GALLON (18.9 L) CAPACITY[1]—Continued
(See Sections 7902.5.10.2.4, 7902.5.11.5.1 and 7902.5.12.5.1)

III [max. 40 ft. (12 192 mm) height]	0.25	3,000	5,000	120 sq. ft./hd. (11.15 m^2/hd.)	1. See 1 above 2. One line sprinklers every sixth level (maximum) 3. See 3 above 4. See 4 above	1. See 1 above 2. One line sprinklers every third level (maximum) 3. See 3 above 4. See 4 above	15 psi (103.4 kPa)	1. See 1 above	500	1

[1]The design assumes the use of Class II standpipe systems. Where a Class I standpipe system is used, the area of application shall be increased by 30 percent without revising density.

TABLE 7902.5–J—AUTOMATIC AFFF–WATER PROTECTION REQUIREMENTS FOR RACK STORAGE OF LIQUIDS IN CONTAINERS[1,2]
(See Sections 7902.5.10.2.4, 7902.5.11.5.1 and 7902.5.12.5.1)

CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND			IN–RACK SPRINKLER ARRANGEMENT AND DEMAND[3]				DURATION AFFF SUPPLY (min.)	DURATION WATER SUPPLY (hrs.)
	Density (gpm/sq. ft.)	Area (sq. ft.)			Minimum Nozzle Pressure (psi)	Number of Sprinklers Operating	Hose Stream Demand[4] (gpm)		
		× 0.0929 for m^2							
	× 40.75 for L/(min•m^2)	High Temp. Sprinklers	Ord. Temp. Sprinklers	On–end Storage of Drums on Pallets, up to 25 ft. (7620 mm)	× 6.895 for kPa		× 3.785 for L/min		
I–A, I–B, I–C, II	0.30	1,500	2,500	1. Ord. temp. sprinkler up to 10 feet (3048 mm) apart horizontally 2. One line sprinklers above each level of storage 3. Locate in longitudinal flue space, staggered vertically 4. Shields required for multilevel	30	Three sprinklers per level	500	15	2

[1]System shall be a closed–head wet system with approved devices for proportioning aqueous film–forming foam.

[2]Except as modified herein, in–rack sprinklers shall be installed in accordance with Section 9002, UFC Standard 81–2.

[3]The height of storage shall not exceed 25 feet (7620 mm).

[4]Hose stream demand includes $1^1/_2$ inch (38.1 mm) inside hand hose, when required.

TABLE 7902.5–K—AUTOMATIC SPRINKLER PROTECTION REQUIREMENTS FOR CLASS I LIQUID STORAGE IN METAL CONTAINERS OF 1 GALLON (3.79 L) CAPACITY OR LESS WITH UNCARTONED OR CASE–CUT SHELF DISPLAY UP TO $6^1/_2$ FEET (1981 mm), AND PALLETIZED STORAGE ABOVE IN A DOUBLE ROW RACK ARRAY[1]

CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND				IN–RACK SPRINKLER ARRANGEMENT AND DEMAND					
	Density (gpm/sq.ft.)	Area (sq. ft.) 0.0929 for m^2		Maximum Spacing	Racks up to 9 Feet (2743 mm) Deep	Racks 9 to 12 Feet (2743 to 3658 mm)	Minimum Nozzle Pressure	Number of Sprinklers Operating	Minimum Hose Stream Demand (gpm)	Minimum Duration Sprinklers and Hose Stream (hours)
	40.75 for (L/min•m^2)	High Temp.	Ord. Temp.						3.785 for L/m	
Maximum 20 ft. (6096 mm) storage height	0.60	2,000[2]	N/A	100 sq. ft./hd. (9.29 m^2/hd.)	1. Ord. temp. quick response sprinklers, max. 8 ft. 3 in. (2515 mm) horizontal spacing 2. One line of sprinklers at the 6 ft. (1829 mm) level and the $11^1/_2$ ft. (3505 mm) level of storage 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	N/A	30 psi (206.8 kPa) (standard orifice) or 14 psi (96.5 kPa) (large orifice)	1. Six sprinklers each on two levels 2. Hydraulically most remote 12 sprinklers	500	2

[1]This table shall not apply to racks with solid shelves.

[2]Using extra–large orifice sprinklers under a ceiling 30 feet (9144 mm) or less in height. Minimum aisle width is $7^1/_2$ feet (2286 mm).

SECTION 7903 — DISPENSING, USE, MIXING AND HANDLING

7903.1 General.

7903.1.1 Applicability. Dispensing, use, mixing and handling of flammable and combustible liquids shall be in accordance with Sections 7901 and 7903. See Section 7904 for tank vehicle and tank car loading and unloading and other special operations.

> **EXCEPTION:** Containers of organic coatings having no fire point when tested in accordance with nationally recognized standards (see Section 9003, Standard a.4.5) when opened for pigmentation need not comply with Section 7903.

7903.1.2 Sale of Class I or II Liquids for Domestic Cleaning. Class I and II liquids with a flash point of 110°F (43.3°C) or less shall not be sold or offered for sale for the express purpose of domestic cleaning.

7903.1.3 Liquid Transfer.

7903.1.3.1 General. Liquid transfer equipment and methods for transfer of Class I, II and III–A liquids shall be approved and in accordance with Section 7903.1.3.

7903.1.3.2 Pumps. Positive displacement pumps shall be provided with pressure relief discharging back to the tank, pump suction or other suitable location, or shall be provided with interlocks to prevent overpressure.

7903.1.3.3 Pressured Systems. When gases are introduced to provide for liquid transfer by pressure, only inert gases shall be used, and controls, including pressure–relief devices, shall be provided to limit the pressure so that it cannot exceed the maximum working pressure of tanks, containers and piping systems. When devices operating through pressure within a tank or container are used, the tank or container shall be a pressure vessel approved for the intended use. Air or oxygen shall not be used for pressurization.

7903.1.3.4 Piping, Hoses and Valves. Piping, hoses and valves used in liquid transfer operations shall be approved or listed for the intended use.

7903.1.3.5 Class I and II Liquids. Class I and II liquids shall be transferred by one of the following methods:

> **EXCEPTION:** Liquids in containers not exceeding 5.3–gallon(20 L) capacity.

1. From safety cans,

2. Through an approved closed piping system,

3. From containers or tanks by an approved pump taking suction through an opening in the top of the container or tank,

4. For Class I–B, I–C, II or III liquids, from containers or tanks by gravity through an approved self– or automatic–closing valve when the container or tank and dispensing operations are provided with spill control and secondary containment (see Section 7901.8). Class I–A liquids shall not be dispensed by gravity from tanks, or

5. Approved engineered liquid transfer systems.

7903.1.4 Container–filling Facilities for Class I Liquids.

7903.1.4.1 Manual Operations. Class I liquids shall not be run into containers unless the nozzle and containers are electrically interconnected. Acceptable methods of electrical interconnection include:

1. Metallic floor plates on which containers stand while filling, when such floor plates are electrically connected to the fill stem, or

2. Where the fill stem is bonded to the container during filling by means of a bond wire.

7903.1.4.2 Automatic Operations. Container–filling operations for Class I liquids involving conveyor belts or other automatic–feeding operations shall be adequately designed to prevent static accumulations.

7903.2 Use, Dispensing and Mixing Inside of Buildings.

7903.2.1 General.

7903.2.1.1 Applicability. Indoor use, dispensing and mixing of flammable and combustible liquids shall be in accordance with Sections 7903.1 and 7903.2.

7903.2.1.2 Closure of Mixing or Blending Vessels. Vessels used for mixing or blending of Class I liquids shall be provided with self–closing, tightfitting, noncombustible lids that will control a fire within such vessel.

> **EXCEPTION:** Where such devices are impractical, approved automatic or manually controlled fire–extinguishing devices shall be provided.

7903.2.1.3 Bonding of Vessels. Where differences of potential could be created, vessels containing Class I liquids or liquids handled at or above their flash points shall be electrically connected by bond wires, ground cables, piping or similar means to a static grounding system to maintain equipment at the same electrical potential to prevent sparking.

7903.2.1.4 Heating, Lighting and Cooking Appliances. Heating, lighting and cooking appliances which utilize Class I liquids shall not be operated within a building or structure.

> **EXCEPTION:** Operation in single–family dwellings.

7903.2.1.5 Location of processing vessels. Processing vessels shall be located with respect to distances to lines of adjoin–ing property which can be built on in accordance with Table 7903.2–A.

> **EXCEPTION:** When the exterior wall facing the adjoining property line is a blank wall having a fire–resistance rating of not less than four hours, the chief is authorized to modify the distances. The distance shall not be less than that set forth in the Building Code, and when Class I–A or unstable liquids are involved, explosion control shall be provided in accordance with Section 8003.1.7.

7903.2.1.6 Quantity Limits for Use.

7903.2.1.6.1 Exempt Amounts for Control Areas. Indoor use, dispensing and mixing of flammable and combustible liquids shall not exceed the exempt amounts set forth in Table 7903.2–B and shall not exceed the additional limitations set forth in Section 7903.2.1.6.2.

> **EXCEPTION:** Cleaning with Class I, II or III–A liquids shall be in accordance with Section 7903.2.2.

See Article 51 for use of hazardous production material flammable and combustible liquids in Group H, Division 6 Occupancies.

7903.2.1.6.2 Occupancy Quantity Limits. The following limits for quantities of flammable or combustible liquids used,

dispensed or mixed based on occupancy classification shall not be exceeded.

EXCEPTION: Cleaning with Class I, II or III–A liquids shall be in accordance with Section 7903.2.2.

1. **Group A Occupancies:**

Quantities in Group A Occupancies shall not exceed amounts necessary for maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7903.2–B.

Quantities in Group A Occupancies used as classrooms or laboratories shall not exceed amounts necessary for demonstration, treatment or laboratory work and shall not exceed quantities set forth in Table 7903.2–B.

2. **Group B Occupancies:**

Quantities in drinking, dining, office and school uses within Group B Occupancies shall not exceed amounts necessary for maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7903.2–B.

Quantities in offices, classrooms or laboratories within Group B Occupancies shall not exceed amounts necessary for demonstration, treatment or laboratory work and shall not exceed quantities set forth in Table 7903.2–B.

3. **Group E Occupancies:**

Quantities in Group E Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7903.2–B.

4. **Group F Occupancies:**

Quantities in dining, office and school uses within Group F Occupancies shall not exceed amounts necessary for maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7903.2–B.

Quantities in offices, classrooms or laboratories within Group F Occupancies shall not exceed amounts necessary for demonstration or laboratory work and shall not exceed quantities set forth in Table 7903.2–B.

5. **Group I Occupancies:**

Quantities in Group I Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7903.2–B.

6. **Group M Occupancies:**

Quantities in dining, office and school uses within Group M Occupancies shall not exceed amounts necessary for maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7903.2–B.

Quantities in offices or classrooms within Group M Occupancies shall not exceed amounts necessary for demonstration or laboratory work and shall not exceed quantities set forth in Table 7903.2–B.

7. **Group R Occupancies:**

Quantities in Group R Occupancies shall not exceed amounts necessary for maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7903.2–B.

8. **Group S Occupancies:**

Quantities in dining and office uses within Group S Occupancies shall not exceed amounts necessary for maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7903.2–B.

Quantities in offices within Group S Occupancies shall not exceed amounts necessary for demonstration or laboratory work and shall not exceed quantities set forth in Table 7903.2–B.

7903.2.1.6.3 Quantities Exceeding Limits for Control Areas. Quantities exceeding quantities allowed in control areas set forth in Sections 7903.2.1.6.1 and 7903.2.1.6.2 shall be in accordance with the following:

1. For open systems, indoor use, dispensing and mixing of flammable and combustible liquids shall be within a room or building complying with the Building Code and Sections 7903.2.3.1 through 7903.2.3.4.

2. For closed systems, indoor use, dispensing and mixing of flammable and combustible liquids shall be within a room or building complying with the Building Code and Sections 7903.2.3.1 through 7903.2.3.3 and 7903.2.3.5.

7903.2.2 Cleaning with Flammable and Combustible Liquids.

7903.2.2.1 General. Cleaning with Class I, II and III–A liquids shall be in accordance with Section 7903.2.2.

EXCEPTIONS: 1. For dry cleaning, see Article 36.
2. For spray nozzle cleaning, see Article 45.

7903.2.2.2 Cleaning Operations. Class I–A liquids shall not be used for cleaning. Cleaning with Class I–B, I–C, II, or III–A liquids shall be conducted:

1. In a room or building complying with Section 7903.2.3,

2. In a machine listed and approved for the purpose as set forth in Section 7903.2.2.3, or

3. Using methods set forth in Section 7903.2.2.4.

7903.2.2.3 Listed and Approved Machines.

7903.2.2.3.1 General. Parts cleaning and degreasing conducted in listed and approved machines in accordance with Section 7903.2.2.2 shall be in accordance with Section 7903.2.2.3.

7903.2.2.3.2 Solvents. Solvents shall be classified and shall be compatible with the machines within which they are used.

7903.2.2.3.3 Machine Capacities. The quantity of solvent used in a machine shall not exceed the listed design capacity of the machine.

7903.2.2.3.4 Quantity Limits. Quantities shall be limited as follows:

1. Machines without remote solvent reservoirs shall be limited to quantities set forth in Section 7903.2.1.6.

2. Machines with remote solvent reservoirs using Class I liquids shall be limited to quantities set forth in Section 7903.2.1.6.

Machines with remote solvent reservoirs using Class II liquids shall be limited to 35 gallons (132.5 L) per machine. The total quantities shall not exceed an aggregate of 240 gallons (908.4 L) per control area in buildings not protected by an approved automatic sprinkler system and an aggregate of 480

gallons (1817 L) per control area in buildings protected by an approved automatic sprinkler system.

Machines with remote solvent reservoirs using Class III–A liquids shall be limited to 80 gallons (302.8 L) per machine.

7903.2.2.3.5 Immersion Soaking of Parts. Work areas of machines with remote solvent reservoirs shall not be used for immersion soaking of parts.

7903.2.2.3.6 Separation. Multiple machines shall be separated from each other by a distance of not less than 30 feet (9144 mm) or by a one–hour occupancy separation.

7903.2.2.3.7 Ventilation. Machines shall be located in areas adequately ventilated to prevent accumulation of vapors.

7903.2.2.3.8 Installation. Machines shall be installed in accordance with their listings.

7903.2.2.4 Cleaning Operations Conducted Outside of Listed and Approved Machines or Designated Rooms or Buildings. The amount of Class I–B, I–C, II or III–A liquids in use outside of listed and approved machines or a room or building complying with Section 7903.2.3 shall not exceed that necessary to facilitate maintenance cleaning operations. Quantities in use shall not exceed 5 gallons (18.9 L) of Class I–B or I–C liquids or 25 gallons (94.6 L) of Class II or III–A liquids.

7903.2.3 Construction of Rooms or Buildings for Use, Dispensing and Mixing of Liquids in Quantities Exceeding Exempt Amounts.

7903.2.3.1 General. When required by Section 7903.2.1.6.3 or 7903.2.2.2, rooms or buildings used for use, dispensing and mixing of flammable and combustible liquids shall be in accordance with Section 7903.2.3.

7903.2.3.2 Construction, Location and Fire Protection.

7903.2.3.2.1 General. Rooms or buildings which are classified in accordance with the Building Code as Group H, Division 2 or 3 Occupancies based on use, dispensing or mixing of flammable or combustible liquids shall be constructed in accordance with the Building Code.

7903.2.3.2.2 Basements. Rooms or buildings classified in accordance with the Building Code as Group H, Division 2 or 3 Occupancies based on use, dispensing or mixing of flammable or combustible liquids shall not be in basements.

7903.2.3.2.3 Fire Protection. Rooms or buildings classified in accordance with the Building Code as Group H, Division 2 or 3 Occupancies shall be protected by an approved automatic fire–extinguishing system in accordance with the Fire Code (see Section 9002, Standard 10-3). See also Section 1003.2.6.

7903.2.3.3 Doors. Interior doors to rooms or portions of such buildings shall be self–closing and fire resistive in accordance with the Building Code.

7903.2.3.4 Open Systems.

7903.2.3.4.1 General. Use, dispensing and mixing of flammable and combustible liquids in open systems shall be in accordance with Section 7903.2.3.4.

7903.2.3.4.2 Ventilation. Continuous mechanical ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot (5.1 L/s per m^2) of floor area over the design area. Provisions shall be made for introduction of makeup air in such a manner to include all floor areas or pits where vapors can collect. Local or spot ventilation shall be provided when needed to prevent the accumulation of hazardous vapors. For ventilation system design, see the Building and Mechanical Codes.

EXCEPTION: Where natural ventilation can be shown to be effective for the materials used, dispensed or mixed.

7903.2.3.4.3 Explosion Control. Explosion control shall be provided for Class I liquids or where explosive vapor–air mixtures can develop under normal operating conditions. Explosion control shall be designed in accordance with the Building Code.

7903.2.3.4.4 Spill Control and Secondary Containment. Spill control shall be provided in accordance with Section 7901.8 when flammable or combustible liquids are dispensed into containers exceeding 1.1–gallon (4 L) capacity or mixed or used in open containers or systems exceeding 5.3–gallon (20 L) capacity. Spill control and secondary containment shall be provided in accordance with Section 7901.8 when the capacity of an individual container exceeds 55 gallons (208 L) or the aggregate capacity of multiple containers or tanks exceeds 100 gallons (378.5 L).

7903.2.3.5 Closed Systems.

7903.2.3.5.1 General. Use or mixing of flammable or combustible liquids in closed systems shall be in accordance with Section 7903.2.3.5.

7903.2.3.5.2 Ventilation. Closed systems designed to be opened as part of normal operations shall be provided with ventilation in accordance with Section 7903.2.3.4.2.

7903.2.3.5.3 Explosion Control. Explosion control shall be provided when an explosive environment can occur as a result of the dispensing, mixing or use process. Explosion control shall be designed in accordance with the Building Code.

EXCEPTION: When process vessels are designed to fully contain the worst–case explosion anticipated within the vessel under process conditions considering the most likely failure.

7903.2.3.5.4 Spill Control and Secondary Containment. Spill control shall be provided in accordance with Section 7901.8 when flammable or combustible liquids are dispensed into or used or mixed in containers exceeding 55–gallon (208 L) capacity. Spill control and secondary containment shall be provided in accordance with Section 7901.8 when the aggregate capacity of multiple containers or tanks exceeds 1,000 gallons (3785 L).

7903.3 Use, Dispensing, Mixing and Handling Outside of Buildings.

7903.3.1 General. Outside dispensing operations shall be in accordance with Section 7903.3.

Dispensing of liquids into motor vehicle fuel tanks at motor vehicle fuel–dispensing stations shall be in accordance with Article 52.

7903.3.2 Spill Control and Drainage Control. Outside dispensing areas shall be provided with spill control and drainage control as set forth in Section 7901.8.

7903.3.3 Location on Property. Dispensing activities that exceed the amounts set forth in Table 7903.3–A shall not be conducted within 15 feet (4572 mm) of buildings or combustible materials or within 25 feet (7620 mm) of building openings, property lines, streets, alleys or public ways. Dispensing activities that exceed the amounts set forth in Table 7903.3–A shall not be conducted within 15 feet (4572 mm) of storage of Class I, II or III liquids unless such liquids are stored in protected aboveground tanks in accordance with Section 7902.1.9.

7903.3.4 Location of Processing Vessels. Processing vessels shall be located with respect to distances to lines of adjoin–ing property which can be built on in accordance with Table 7903.2–A.

EXCEPTION: In refineries and distilleries.

7903.4 Solvent Distillation Units.

7903.4.1 General. Solvent distillation units used to recycle Class I, II or III–A liquids having a distillation chamber capacity of 60 gallons (227.1 L) or less shall be listed, labeled and installed in accordance with Section 7903.4 and nationally recognized standards. See Article 90, Standard u.1.17.

EXCEPTIONS: 1. Solvent distillation units installed in dry–cleaning plants in accordance with Section 3603.

2. Solvent distillation units used in continuous throughput industrial processes where the source of heat is remotely supplied using steam, hot water, oil or other heat–transfer fluids, the temperature of which is below the auto–ignition point of the solvent(s).

3. Solvent distillation units listed for and used in laboratories.

4. Approved research, testing and experimental processes.

Solvent–distillation units used to recycle Class I, II or III–A liquids, having a distillation chamber capacity exceeding 60 gallons (227.1 L) shall be used in locations that comply with the use and mixing requirements of Section 7903 and other applicable provisions in Article 79.

Classes I, II and III–A liquids also classified as unstable (reactive) shall not be processed in solvent–distillation units.

EXCEPTION: Appliances listed for the distillation of unstable (reactive) solvents.

7903.4.2 Labeling. A permanent label shall be affixed to the unit by the manufacturer. The label shall indicate the capacity of the distillation chamber, the distance the unit shall be placed away from sources of ignition and the products for which the unit has been listed for use. The label may refer to the instruction manual for a list of the products.

7903.4.3 Manufacturer's Instruction Manual. An instruction manual shall be provided. The manual shall be readily available for the user and the chief. The manual shall include installation, use and servicing instructions. It shall identify the liquids for which the unit has been listed for distillation purposes along with each liquid's flash point and auto–ignition temperature. For units with adjustable controls, the manual shall include directions for setting the heater temperature for each liquid to be distilled.

7903.4.4 Location. Solvent distillation units shall be used in locations in accordance with the listing. Units shall not be used in basements.

7903.4.5 Storage of Liquids. Distilled liquids and liquids awaiting distillation shall be stored in accordance with Section 7902.

7903.4.6 Storage of Residues. Hazardous residue from the distillation process shall be stored in accordance with Articles 79 and 80.

7903.4.7 Portable Fire Extinguishers.

7903.4.7.1 Type. Approved portable fire extinguishers shall be provided in accordance with UFC Standard 10–1, except as specified in Section 7903.4.7.2.

7903.4.7.2 Size and Location. At least one portable fire extinguisher having a rating of not less than 40–B shall be located not less than 10 feet (3048 mm) or more than 30 feet (9144 mm) from any solvent distillation unit.

TABLE 7903.2–A—SEPARATION OF PROCESSING VESSELS FROM PROPERTY LINES
(See Sections 7903.2.1.5 and 7903.3.4)

PROCESSING VESSELS WITH EMERGENCY RELIEF VENTING TO ALLOW PRESSURE	LOCATION[1]	
× 6.895 for kPa	Stable Liquids	Unstable Liquids
Not in excess of 2.5 psig	Table 7902.2–F	2 1/2 times Table 7902.2–F
Over 2.5 psig	1 1/2 times Table 7902.2–F	4 times Table 7902.2–F

[1]Double distances where protection of exposure is not provided.

TABLE 7903.2–B—EXEMPT AMOUNTS FOR USE, DISPENSING AND MIXING OF FLAMMABLE AND COMBUSTIBLE LIQUIDS—MAXIMUM QUANTITIES PER CONTROL AREA[1,2]
(See Section 7903.2.1.6)

CLASS OF LIQUID	QUANTITY (gallons) × 3.785 for L	
	Use—Closed[3,4,5]	Use—Open, Dispensing and Mixing[3,4,5]
Flammable	30	10
Class I–A	60	15
Class I–B	90	20
Class I–C	120[6]	30[6]
Combination Class I–A, I–B and I–C		
Combustible	120	30
Class II	330	80
Class III–A	13,200[7]	3,300[7]
Class III–B		

[1]Control areas shall be separated from each other by not less than a one–hour fire–resistive occupancy separation. The number of control areas within a building used for retail or wholesale sales shall not exceed two. The number of control areas in buildings with other uses shall not exceed four. See Sections 204 and 8001.10.2.

[2]Special conditions may be imposed by the chief regarding locations, types of containers, dispensing units, fire–control measures and other factors involving fire safety.

[3]Quantities are allowed to be increased 100 percent in buildings protected by an approved automatic sprinkler system.

[4]The use of Class I, II and III–A liquids for cleaning, including the allowance of increased quantities in listed and approved remote reservoir parts–cleaning machines, shall be in accordance with Section 7903.2.2.

[5]The amounts in use shall be considered as contributing to the exempt amounts for storage in accordance with Section 7902.5.7.

[6]Containing not more than the exempt amounts of each individual class.

[7]The quantities allowed in a sprinklered building are not limited.

TABLE 7903.3–A—EXEMPT AMOUNTS FOR DISPENSING OF FLAMMABLE AND COMBUSTIBLE LIQUIDS—MAXIMUM QUANTITIES ALLOWED IN OUTDOOR AREA PER SINGLE PROPERTY UNDER SAME OWNERSHIP OR CONTROL[1,2]
(See Section 7903.3.3)

CLASS OF LIQUID	QUANTITY (gallons) × 3.785 for L
Flammable	
Class I–A	10
Class I–B	15
Class I–C	20
Combination Class I–A, I–B and I–C	30[3]
Combustible	
Class II	30
Class III–A	80
Class III–B	3,300

[1]For definition of OUTDOOR AREA, see Section 7901.2.2.

[2]Special conditions may be imposed by the chief regarding locations, types of containers, dispensing units, fire–control measures and other factors involving fire safety.

[3]Containing not more than the exempt amounts of each individual class.

SECTION 7904 — SPECIAL OPERATIONS

7904.1 General. The following special operations shall be in accordance with Sections 7901, 7902 and 7903 except as provided in Section 7904 and Appendix II-M.

1. Storage and dispensing of flammable and combustible liquids on farms and construction sites.

2. Well drilling and operating.

3. Bulk plants or terminals.

4. Loading and unloading of tank vehicles and tank cars.

5. Tank vehicles and tank vehicle operation.

6. Refineries.

7. Mobile Fleet Fueling at commercial, industrial and governmental sites.

7904.2 Storage and Dispensing of Flammable and Combustible Liquids at Special Operational Sites.

7904.2.1 General. Permanent and temporary storage and dispensing of Class I and II liquids for private use on farms and rural areas and at construction sites, earth–moving projects, gravel pits or borrow pits shall be in accordance with Section 7904.2. For dispensing requirements of flammable and combustible liquids from tank vehicles at commercial, industrial and governmental sites, see Appendix II-M.

EXCEPTION: Storage and use of fuel–oil and containers connected with oil–burning equipment regulated by Article 61 and the Mechanical Code.

7904.2.2 Combustibles and Open Flames Near Tanks. Storage areas shall be kept free of weeds and extraneous

combustible material. Open flames and smoking are prohibited in flammable or combustible liquid storage areas.

7904.2.3 Marking of Tanks and Containers. Tanks and containers for the storage of liquids aboveground shall be conspicuously marked with the name of the product which they contain and FLAMMABLE—KEEP FIRE AND FLAME AWAY. Tanks shall bear the additional marking KEEP 50 FEET (15.2 METERS) FROM BUILDINGS.

7904.2.4 Containers for Storage and Use. Metal containers used for storage of Class I or II liquids shall be in accordance with DOT requirements or shall be of an approved design.

Discharge devices shall be of a type that does not develop an internal pressure on the container. Pumping devices or approved self–closing faucets used for dispensing liquids shall not leak and shall be well maintained. Individual containers shall not be interconnected and shall be kept closed when not in use.

Containers stored outside and inside of buildings shall be in accordance with Section 7902 and the Building Code.

7904.2.5 Permanent and Temporary Tanks for Storage and Use.

7904.2.5.1 General. The capacity of permanent aboveground tanks containing Class I or II liquids shall not exceed 1,100 gallons (4163.9 L). The capacity of temporary aboveground tanks containing Class I or II liquids shall not exceed 10,000 gallons (37 854 L). Tanks shall be of single–compartment design, constructed in accordance with Section 7902.1.8.2.

7904.2.5.2 Fill Opening Security. Fill openings shall be equipped with a locking closure device. Fill openings shall be separate from vent openings.

7904.2.5.3 Vents. Tanks shall be provided with a method of normal and emergency venting. The diameter of normal vents shall be in accordance with Table 7904.2–A. Normal vents shall also be in accordance with Section 7902.1.13.

Emergency vents shall be in accordance with Section 7902.2.6. Emergency vents shall be arranged to discharge in a manner which prevents localized overheating or flame impingement on any part of the tank in the event vapors from such vents are ignited.

7904.2.5.4 Location.

7904.2.5.4.1 General. Tanks containing Class I or II liquids shall be kept outside of and at least 50 feet (15 240 mm) from buildings and combustible storage. Additional distance shall be provided when necessary to ensure that vehicles, equipment and containers being filled directly from such tanks will not be less than 50 feet (15 240 mm) from structures, haystacks or other combustible storage.

7904.2.5.4.2 Locations Where Aboveground Tanks are Prohibited. The storage of Class I and II liquids in aboveground tanks is prohibited within the limits established by law as the limits of districts in which such storage is prohibited. (See sample adoption ordinance, Section 4.)

7904.2.5.5 Type of Tank.

7904.2.5.5.1 General. Tanks shall be provided with top openings only or shall be elevated for gravity discharge.

7904.2.5.5.2 Tanks with Top Openings Only. Tanks with top openings only shall be mounted as follows:

1. On well–constructed metal legs connected to shoes or runners designed so that the tank is stabilized and the entire tank and its supports can be moved as a unit, or

2. For stationary tanks, on a stable base of timbers or blocks approximately 6 inches (152.4 mm) in height which prevents the tank from contacting the ground.

Tanks with top openings only shall be equipped with a tightly and permanently attached, approved pumping device having an approved hose of sufficient length for filling vehicles, equipment or containers to be served from the tank. Either the pump or the hose shall be equipped with a padlock to its hanger to prevent tampering. An effective antisiphoning device shall be included in the pump discharge unless a self–closing nozzle is provided. Siphons or internal pressure discharge devices shall not be used.

7904.2.5.5.3 Tanks for Gravity Discharge. Tanks with a connection in the bottom or the end for gravity dispensing liquids shall be mounted and equipped as follows:

1. Supports to elevate the tank for gravity discharge shall be of adequate strength and designed to provide stability, and

2. Bottom or end openings for gravity discharge shall be equipped with a valve located adjacent to the tank shell which will close automatically in the event of fire through the operation of an effective heat–actuated releasing device. If this valve cannot be operated manually, it shall be supplemented by a second manually operated valve. The gravity discharge outlet shall be provided with an approved hose equipped with a self–closing valve at the discharge end of a type that can be padlocked to its hanger.

7904.2.6 Spill Control, Drainage Control and Diking. Indoor storage and dispensing areas shall be provided with spill control and drainage control as set forth in Section 7901.8. Outdoor storage areas shall be provided with drainage control or diking as set forth in Section 7902.2.8.

7904.2.7 Portable Fire Extinguishers. Portable fire extinguishers with a minimum rating of 20–B:C shall be provided when required by the chief.

7904.2.8 Dispensing from Tank Vehicles.

7904.2.8.1 General. When approved, liquids used as fuels may be transferred from tank vehicles into the tanks of motor vehicles or special equipment, provided:

1. The tank vehicle's specific function is that of supplying fuel to motor vehicle fuel tanks,

2. The dispensing line does not exceed 50 feet (15 240 mm) in length,

3. The dispensing nozzle is an approved type,

4. The dispensing hose is properly placed on the approved reel or in a compartment provided before the tank vehicle is moved,

5. Signs prohibiting smoking or open flame within 25 feet (7620 mm) of a tank vehicle or the point of refueling are prominently posted on the tank vehicle,

6. Electrical devices and wiring in areas where fuel dispensing is conducted are in accordance with the Electrical Code,

7. Vapor–recovery systems are provided in accordance with Section 5202.13,

8. Tank vehicle dispensing equipment is operated only by designated personnel who are trained to handle and dispense motor fuels, and

9. Provisions are made for controlling and mitigating unauthorized discharges.

7904.2.8.2 Location. Dispensing from tank vehicles shall be conducted at least 50 feet (15 240 mm) from structures or combustible storage.

7904.3 Well Drilling and Operating.

7904.3.1 General. Wells for oil and natural gas shall be drilled and operated in accordance with Section 7904.3.

7904.3.2 Location.

7904.3.2.1 Storage Tanks and Sources of Ignition. Well heads shall not be located within 25 feet (7620 mm) of storage tanks or boilers, fired heaters, open–flame devices or other sources of ignition. Smoking is prohibited at wells or tank locations except as designated and in approved posted areas.

EXCEPTION: Engines used in the drilling, production and serving of wells.

7904.3.2.2 Streets and Railways. Wells shall not be drilled within 75 feet (22 860 mm) of any dedicated public street, highway or nearest rail of an operating railway.

7904.3.2.3 Buildings. Wells shall not be drilled within 100 feet (30 480 mm) of buildings not necessary to the operation of the well.

Wells shall not be drilled within 300 feet (91 440 mm) of buildings used as a place of assembly, institution or school.

When wells are existing, buildings shall not be constructed within the distances set forth in Section 7904.3 for separation of wells and buildings.

7904.3.3 Waste Control.

7904.3.3.1 Discharge on a Street or Water Channel. Liquids containing crude petroleum or its products shall not be discharged into or on streets, highways, drainage canals or ditches, storm drains, or flood–control channels.

7904.3.3.2 Discharge and Combustible Materials on Ground. The surface of the ground under, around or near wells, pumps, boilers, oil storage tanks or buildings shall be kept free of oil, waste oil, refuse or waste material.

EXCEPTION: Material within an oil sump or tank.

7904.3.3.3 Clearing Around Wells and Tanks. Land within25 feet (7620 mm) of wells, flammable or combustible liquid tanks, or other appurtenances to such wells shall be kept free of dry weeds, grass, rubbish or other combustible material at all times. When, in the opinion of the chief, the distance is not sufficient to provide reasonable fire safety, a greater distance may be required, not to exceed the height of a derrick or greatest dimension of a tank.

7904.3.4 Sumps.

7904.3.4.1 Maximum Width. Sumps or other basins for the retention of oil or petroleum products shall not exceed 12 feet (3658 mm) in width.

7904.3.4.2 Backfilling. Sumps or other basins for the retention of oil or petroleum products larger than 6 feet by 6 feet by 6 feet (1829 mm by 1829 mm by 1829 mm) shall not be maintained longer than 60 days after the cessation of drilling operations.

7904.3.4.3 Security. Sumps, diversion ditches and depressions used as sumps shall be securely fenced or covered.

7904.3.5 Prevention of Blowouts. Adequate protection shall be provided to control and prevent the blowout of a well. Protection equipment shall meet federal, state and other applicable jurisdiction requirements.

7904.3.6 Storage Tanks. Storage of flammable or combustible liquids in tanks shall be in accordance with Section 7902. Each oil storage tank or group of tanks shall have posted in a conspicuous place on or near such tank or tanks an approved sign with the name of the owner or operator, name or number of lease and the telephone number where a responsible person can be reached at any time.

7904.3.7 Soundproofing. Where soundproofing material is required during field operations, such material shall be noncombustible.

EXCEPTION: Fire–retardant treated material may be used and maintained when approved.

7904.3.8 Signs. Well locations shall have posted in a conspicuous place an approved sign with the name of the owner or operator, name or number of the lease, and number of the well. Such signs shall be maintained on the premises from the time materials are delivered for drilling purposes until the well is abandoned.

7904.3.9 Field Loading Racks. Field loading racks shall be in accordance with Section 7904.5.

7904.4 Bulk Plants or Terminals.

7904.4.1 General. Portions of properties where flammable and combustible liquids are received by tank vessels, pipelines, tank cars or tank vehicles and are stored or blended in bulk for the purpose of distributing such liquids by tank vessels, pipelines, tank cars, tank vehicles or containers shall be in accordance with Section 7904.4.

7904.4.2 Buildings.

7904.4.2.1 Construction. Buildings shall be constructed in accordance with the Building Code.

7904.4.2.2 Means of Egress. Rooms in which liquids are stored, used or transferred by pumps shall have means of egress arranged to prevent occupants from being trapped in the event of fire.

7904.4.2.3 Heating. Rooms in which Class I liquids are stored or used shall be heated only by means not constituting a source of ignition, such as steam or hot water. Rooms containing heating appliances involving sources of ignition shall be located and arranged to prevent entry of flammable vapors.

7904.4.3 Ventilation.

7904.4.3.1 General. Ventilation shall be provided for rooms, buildings and enclosures in which Class I liquids are pumped, used or transferred. Design of ventilation systems shall consider the relatively high specific gravity of the vapors. When natural ventilation is used, adequate openings in outside walls at floor level, unobstructed except by louvers or coarse screens, shall be provided. Where natural ventilation is inadequate, mechanical ventilation shall be provided in accordance with the Mechanical Code.

7904.4.3.2 Basements and Pits. Class I liquids shall not be stored or used within a building having a basement or pit into which flammable vapors can travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

7904.4.3.3 Dispensing of Class I Liquids. Containers of Class I liquids shall not be drawn from or filled within buildings unless a provision is made to prevent the accumulation of flammable vapors in hazardous concentrations. Where mechanical ventilation is required, it shall be kept in operation while flammable vapors could be present.

7904.4.4 Storage. Storage of Class I, II and III–A liquids in bulk plants shall be in accordance with the applicable provisions of Article 79.

7904.4.5 Overfill Protection of Class I Liquids. Manual and automatic systems shall be provided to prevent overfill during the transfer of Class I liquids from mainline pipelines and marine vessels in accordance with nationally recognized standards. See Section 9003, Standard a.3.19.

7904.4.6 Wharves.

7904.4.6.1 General. Wharves, including piers, bulkheads and other structures over or contiguous to navigable water having a primary function of transferring liquid cargo in bulk between shore installations and tank vessels, ships, barges, lighter boats or other mobile floating craft, shall be in accordance with Section 7904.4.6.

EXCEPTION: Marine motor vehicle fuel–dispensing stations. See Section 5202.11.

7904.4.6.2 Transferring Times. Package cargo of liquids, including full and empty drums, bulk fuel and stores, shall only be transported over a wharf during cargo transfer at such times and places as agreed on by the wharf superintendent and the senior deck officer on duty.

7904.4.6.3 Transferring Locations. Wharves at which liquid cargoes are to be transferred in bulk quantities to or from tank vessels shall be at least 100 feet (30 480 mm) from bridges over a navigable waterway, or from an entrance to or superstructure of vehicular or railroad tunnels under a waterway. The termination of fixed piping used for loading or unloading at a wharf shall be at least 200 feet (60 960 mm) from bridges or from entrances to or superstructures of tunnels.

7904.4.6.4 Cargo Vessels and Transfer Equipment. Substructure and decking shall be substantially designed for the use intended. Decking shall be constructed of materials which will afford the desired combination of flexibility, resistance to shock, durability, strength and fire resistance. Heavy timber construction is acceptable.

Installation of tanks used exclusively for ballast water or Class II or III liquids on suitably designed wharves is allowed.

Loading pumps capable of building up pressures in excess of the safe working pressure of cargo hose or loading arms shall be provided with bypasses, relief valves or other arrangements to protect the loading facilities against excessive pressure. Relief devices shall be tested at not more than yearly intervals to determine that they function satisfactorily at the pressure at which they are set.

Pressure hoses and couplings shall be inspected at intervals appropriate to the service. With the hose extended, hose and couplings shall be tested using in–service maximum operating pressures. Hoses showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings shall be withdrawn from service and repaired or discarded.

7904.4.6.5 Piping, Valves and Fittings. Piping, valves and fittings shall be in accordance with Section 7901.11, except as follows:

1. Flexibility of piping shall be assured by appropriate layout and arrangement of piping supports so that motion of the wharf structure resulting from wave action, currents, tides or the mooring of vessels will not subject the pipe to repeated strain above the elastic limit.

2. Pipe joints depending on the friction characteristics of combustible materials or grooving of pipe ends for mechanical continuity of piping shall not be used.

3. Swivel joints are allowed in piping to which hoses are connected and for articulated swivel–joint transfer systems. Swivel joints shall be designed such that the mechanical strength of the joint will not be impaired if the packing material were to fail.

4. Piping systems shall contain a sufficient number of valves to operate the system properly and to control the flow of liquid in normal operation and in the event of physical damage.

5. In addition to the requirements of Item 4, each line conveying Class I and II liquids leading to a wharf shall be provided with a readily accessible block valve located on shore near the approach to the wharf and outside of any diked area. Where more than one line is involved, the valves shall be grouped in one location.

6. Means of easy access shall be provided for cargo line valves located below the wharf deck.

7. Piping on wharves shall be adequately bonded and grounded if Class I and II liquids are transported. If excessive stray currents are encountered, insulating joints shall be installed. Bonding and grounding connections on all piping shall be located on the wharf side of hose riser insulating flanges, if used, and shall be accessible for inspection.

8. Hose or articulated swivel–joint pipe connections used for cargo transfer shall be capable of accommodating the combined effects of change in draft and maximum tidal range, and mooring lines shall be kept adjusted to prevent surge of the vessel from placing stress on the cargo transfer system.

9. Hoses shall be supported to avoid kinking and damage from chafing.

7904.4.6.6 Loading and Unloading. Loading or discharging shall not commence until the wharf superintendent and officer

in charge of the tank vessel agree that the tank vessel is properly moored and connections are properly made.

7904.4.6.7 Mechanical Work. Mechanical work shall not be performed on the wharf during cargo transfer, except under special authorization by the chief based on a review of the area involved, methods to be employed and precautions necessary.

7904.4.7 Sources of Ignition. Class I, II or III–A liquids shall not be used, drawn or dispensed where flammable vapors can reach a source of ignition. Smoking is prohibited except in designated locations. NO SMOKING signs shall be conspicuously posted where a hazard from flammable vapors is normally present.

7904.4.8 Drainage Control. Loading and unloading areas shall be provided with drainage control in accordance with Section 7901.8.

7904.4.9 Fire Protection.

7904.4.9.1 General. Fire protection shall be in accordance with Articles 9 and 10 and Section 7904.4.9.

7904.4.9.2 Portable Fire Extinguishers. Suitable portable fire extinguishers with a rating of not less than 20–B shall be located within 75 feet (22 860 mm) of those portions of the facility where fires are likely to occur, such as hose connections, pumps and separator tanks.

7904.4.9.3 Fire Hoses. Where piped water is available, ready–connected fire hose in a size appropriate for the water supply shall be provided so that manifolds where connections are made and broken can be reached by at least one hose stream.

7904.4.9.4 Obstruction of Equipment. Material shall not be placed on wharves in such a manner which would obstruct access to firefighting equipment or important pipeline control valves.

7904.4.9.5 Fire Apparatus Access. Where the wharf is accessible to vehicle traffic, an unobstructed roadway to the shore end of the wharf shall be maintained for access of firefighting apparatus. See Section 902.

7904.5 Transfer Operations.

See also Code Enforcement Policy G-3, Policy & Procedures Manual. Code Enforcement Policies are not part of this code but are referenced here for the reader's convenience.

7904.5.1 General. Bulk transfer and process transfer operations and the dispensing of fuel into the fuel tanks of motor vehicles and special equipment shall be approved and shall be in accordance with Section 7904.5. For motor vehicle fuel–dispensing stations, see Article 52.

7904.5.1.1 Location. Bulk transfer and process transfer operations shall be in approved locations. Tank cars shall be unloaded only on private sidings or railroad siding facilities equipped for transferring flammable or combustible liquids. Tank vehicle and tank car transfer facilities shall be separated from buildings, aboveground tanks, combustible materials, property lines, streets, alleys or public ways by a distance of 25 feet (7620 mm) for Class I liquids and 15 feet (4572 mm) for Class II and III liquids measured from the nearest position of any loading or unloading valve.

7904.5.1.2 Weather Protection Canopies. When weather protection canopies are provided, they shall be constructed in accordance with Section 8003.1.14. Weather protection canopies shall not be located within 15 feet (4572 mm) of a building or combustible material or within 25 feet (7620 mm) of building openings, property lines, streets, alleys or public ways.

7904.5.1.3 Ventilation. Ventilation shall be provided to prevent accumulation of vapors. See Section 7903.2.3.4.2.

7904.5.1.4 Sources of Ignition. Sources of ignition shall be controlled or eliminated. See Section 7901.10.

7904.5.1.5 Spill Control and Secondary Containment. Areas where transfer operations are located shall be provided with spill control and secondary containment. The spill control and secondary containment system shall have a design capacity capable of containing the capacity of the largest tank compartment located in the area where transfer operations are conducted. Containment of the rainfall volume specified in Section 8003.1.3.3 is not required.

7904.5.1.6 Fire Protection. Fire protection shall be in accordance with Section 7901.5.

7904.5.1.7 Static Protection. Static protection shall be provided to prevent the accumulation of static charges during transfer operations. Bonding facilities shall be provided during the transfer through open domes where Class I liquids are transferred, or where Class II and III liquids are transferred into tank vehicles or tank cars that could contain vapors from previous cargoes of Class I liquids.

Protection shall consist of a metallic bond wire permanently electrically connected to the fill stem. The fill pipe assembly shall form a continual electrically conductive path downstream from the point of bonding. The free end of such bond wire shall be provided with a clamp or equivalent device for convenient attachment to some metallic part in electrical contact with the cargo tank of the tank vehicle or tank car. For tank vehicles, protection shall consist of a flexible bond wire of adequate strength for the intended service and the electrical resistance shall not exceed 1 megohm. For tank cars, bonding shall be provided where the resistance of a tank car to ground through the rails is 25 ohms or greater.

Such bonding connection shall be fastened to the vehicle, car or tank before dome covers are raised and shall remain in place until filling is complete and all dome covers have been closed and secured.

EXCEPTIONS: 1. Where vehicles and cars are loaded exclusively with products not having a static–accumulating tendency, such as asphalt, cutback asphalt, most crude oils, residual oils and water–soluble liquids.

2. When Class I liquids are not handled at the transfer facility and the tank vehicles are used exclusively for Class II and III liquids.

3. Where vehicles and cars are loaded or unloaded through closed top or bottom connections whether the hose is conductive or nonconductive.

Filling through open domes into the tanks of tank vehicles or tank cars that contain vapor–air mixtures within the flammable range or where the liquid being filled can form such a mixture, shall be by means of a downspout that extends near the bottom of the tank.

7904.5.1.8 Stray Current Protection. Tank car loading facilities where Class I, II or III–A liquids are transferred through open domes shall be protected against stray currents by permanently bonding the pipe to at least one rail and to the transfer apparatus. Multiple pipes entering the transfer areas shall be permanently electrically bonded together. In areas where excessive stray currents are known to exist, all pipes entering the transfer area shall be provided with insulating sections to electrically isolate the transfer apparatus from the pipelines.

7904.5.1.9 Top Loading. When top loading a tank vehicle with Class I and II liquids without vapor control, valves used for the final control of flow shall be of the self–closing type and shall be manually held open, except where automatic means are provided for shutting off the flow when the tank is full. When used, automatic shutoff systems shall be provided with a manual shutoff valve located at a safe distance from the loading nozzle to stop the flow if the automatic system fails.

When top loading a tank vehicle with vapor control, flow control shall be in accordance with Section 7904.5.1.10. Self–closing valves shall not be tied or locked in the open position.

7904.5.1.10 Bottom Loading. When bottom loading a tank vehicle or tank car with or without vapor control, a positive means shall be provided for loading a predetermined quantity of liquid, together with an automatic secondary shutoff control to prevent overfill. The connecting components between the transfer equipment and the tank vehicle or tank car required to operate the secondary control shall be functionally compatible.

When bottom loading a tank vehicle, the coupling between the liquid loading hose or pipe and the truck piping shall be a dry disconnect coupling.

When bottom loading a tank vehicle or tank car that is equipped for vapor control and vapor control is not used, the tank shall be vented to the atmosphere to prevent pressurization of the tank. Such venting shall be at a height equal to or greater than the top of the cargo tank.

Connections to the plant vapor–control system shall be designed to prevent the escape of vapor to the atmosphere when not connected to a tank vehicle or tank car.

Vapor–processing equipment shall be separated from aboveground tanks, warehouses, other plant buildings, transfer facilities or the nearest line of adjoining property that can be built on by a distance of at least 25 feet (7620 mm). Vapor–processing equipment shall be protected from physical damage by remote location, guardrails, curbs or fencing.

7904.5.1.11 Switch Loading. Tank vehicles or tank cars that have previously contained Class I liquids shall not be loaded with Class II or III liquids until such vehicles and all piping, pumps, hoses and meters connected thereto have been completely drained and flushed.

7904.5.1.12 Loading Racks. When provided, loading racks, stairs or platforms shall be constructed of noncombustible materials. Buildings for pumps or for shelter of loading personnel are allowed to be part of the loading rack. Wiring and electrical equipment located within 25 feet (7620 mm) of any portion of the loading rack shall be in accordance with the requirements of Section 7901.4.

7904.5.1.13 Transfer Apparatus. Bulk and process transfer apparatus shall be of an approved type.

7904.5.1.14 Inside Buildings. Tank vehicles and tank cars shall not be located inside a building while transferring Class I, II or III–A liquids, unless approved.

> **EXCEPTION:** Tank vehicles are allowed under weather protection canopies and canopies of automobile motor vehicle fuel–dispensing stations. See Sections 7904.5.1 and 7904.5.1.2.

7904.5.1.15 Tank Vehicle and Tank Car Certification. Certification shall be maintained for tank vehicles and tank cars in accordance with nationally recognized standards. See Article 90, Standard u.3.3.

7904.5.1.16 Stability.

7904.5.1.16.1 Tank Vehicles. When the vehicle is parked for loading or unloading, the cargo trailer portion of the tank vehicle shall be secured in a manner that will prevent unintentional movement.

7904.5.1.16.2 Chock Blocks. At least two chock blocks not less than 5 inches by 5 inches by 12 inches (127 mm by 127 mm by 304.8 mm) in size and dished to fit the contour of the tires shall be used during transfer operations of tank vehicles.

7904.5.1.16.3 Tank Cars. Brakes shall be set and the wheels shall be blocked to prevent rolling.

7904.5.1.17 Monitoring. Transfer operations shall be monitored by an approved monitoring system or by an attendant. When monitoring is by an attendant, the operator or other competent person shall be present at all times.

7904.5.1.18 Security. Transfer operations shall be surrounded by a noncombustible fence not less than 5 feet (1524 mm) in height. Tank vehicles and tank cars shall not be loaded or unloaded unless such vehicles are entirely within the fenced area.

> **EXCEPTIONS:** 1. Motor vehicle fuel–dispensing stations complying with Article 52.
>
> 2. Installations where adequate public safety exists due to isolation, natural barriers or other factors as determined appropriate by the chief.

7904.5.2 Bulk Transfer. Bulk transfer shall be in accordance with Section 7904.5.1 and this section.

7904.5.2.1 Vehicle Motor. Motors of tank vehicles or tank cars shall be shut off during the making and breaking of hose connections and during the unloading operation.

> **EXCEPTION:** When unloading is performed with a pump deriving its power from the tank vehicle motor.

7904.5.3 Process Transfer. Process transfer shall be in accordance with Section 7904.5.1 and this section.

7904.5.3.1 Piping, Valves, Hoses and Fittings. Piping, valves, hoses and fittings that are not a part of the tank vehicle or tank car shall be in accordance with Sections 7901.11 and 7904.5.3.2. Caps or plugs that prevent leakage or spillage shall be provided at all points of connection to transfer piping.

7904.5.3.1.1 Shutoff Valves. Approved thermally activated automatic–closing shutoff valves and manual valves shall be provided where the transfer hose connects to the process piping, and on both sides of any exterior fire–rated wall through which the piping passes. Manual shutoff valves shall be arranged so

that they are accessible from grade. Valves shall not be locked in the open position.

7904.5.3.1.2 Hydrostatic Relief. Hydrostatic pressure limiting or relief devices shall be provided where pressure buildup in trapped sections of the system could exceed the design pressure of the components of the system. Devices shall relieve to another portion of the system or to another approved location.

7904.5.3.1.3 Anti–siphon Valves. Anti–siphon valves shall be provided when the system design would allow siphonage.

7904.5.3.2 Vents. Normal and emergency vents shall be maintained operable at all times.

7904.5.3.3 Motive Power. Motive power shall be disconnected and removed from the area of the process transfer operation prior to connecting the tank vehicle or tank car to the process piping.

7904.5.4 Dispensing Fuel from Tank Vehicles and Tank Cars. Class I and II liquids shall not be dispensed from tank vehicles or tank cars into the fuel tanks of motor vehicles and special equipment except as provided in, and conducted in accordance with, Section 7904.5.4.

7904.5.4.1 Pumps. Positive displacement pumps shall be provided with pressure relief discharging back to the tank, pump suction or other suitable location, or shall be provided with interlocks to prevent overpressure.

7904.5.4.2 Pressured Systems. When gases are introduced to provide for liquid transfer by pressure, only inert gases shall be used, and controls, including pressure–relief devices, shall be provided to limit the pressure so that it cannot exceed the maximum working pressure of tanks, containers and piping systems. When devices operating through pressure within a tank or container are used, the tank or container shall be a pressure vessel approved for the intended use. Air or oxygen shall not be used for pressurization.

7904.5.4.2.1. See also Appendices II-L and II-M.

7904.5.4.3 Marine Craft and Special Equipment. When approved, dispensing of fuels from tank vehicles into the fuel tanks of marine craft and special equipment is allowed in accordance with the following:

1. The tank vehicle's specific function is that of supplying fuel to fuel tanks.

2. The operation is not performed where the public has access or where there is unusual exposure to life and property.

3. The dispensing line does not exceed 50 feet (15 240 mm) in length.

4. The dispensing nozzle is approved.

7904.5.4.4 Emergency Refueling. When approved, dispensing of fuel from tank vehicles into the fuel tanks of motor vehicles is allowed during emergencies in accordance with Sections 7904.2.8 and 7904.6.

7904.5.4.5 Aircraft Fueling. Dispensing of fuel from tank vehicles into the fuel tanks of aircraft is allowed in accordance with Section 2402.

7904.5.4.6 Fueling of Vehicles at Farms, Construction Sites and Similar Areas. Dispensing fuel from tank vehicles into the fuel tanks of motor vehicles for private use on farms and rural areas and at construction sites, earth–moving projects, gravel pits and borrow pits is allowed in accordance with Section 7904.2.8.

7904.6 Tank Vehicles and Vehicle Operation.

7904.6.1 General. Tank vehicles shall be designed, constructed, equipped and maintained in accordance with UFC Standard 79–4 and Section 7904.6.

7904.6.2 Full trailers and Semitrailers.

7904.6.2.1 Attachments. Trailers shall be firmly and securely attached to the vehicle drawing them in a manner conforming with accepted engineering practice.

7904.6.2.2 Brakes. Full trailers and semitrailers shall be equipped with reliable brakes on all wheels, and adequate provisions shall be made for their efficient operation from the driver's seat of the vehicle drawing the trailer or semitrailer.

7904.6.2.3 Trailer Connections. Trailer connections shall prevent the towed vehicle from whipping or swerving from side to side dangerously or unreasonably and shall cause the trailer to follow substantially in the path of the towing vehicle.

7904.6.3 Operation of Tank Vehicles.

7904.6.3.1 Vehicle Maintenance. Tank vehicles shall not be operated unless they are in proper repair and free of accumulation of grease, oil or other flammables, and leaks.

7904.6.3.2 Leaving Vehicle Unattended. The driver, operator or attendant of a tank vehicle shall not leave the vehicle while it is being filled or discharged. The delivery hose, when attached to a tank vehicle, shall be considered to be a part of the tank vehicle.

7904.6.3.3 Vehicle Motor Shutdown. Motors of tank vehicles or tractors shall be shut down during the making or breaking of hose connections. If loading or unloading is performed without the use of a power pump, the tank vehicle or tractor motor shall be shut down throughout such operations.

7904.6.3.4 Bonding. Bonding shall be in accordance with Section 7904.5.1.7.

7904.6.3.5 Outage. A cargo tank or compartment thereof used for the transportation of flammable or combustible liquids shall not be loaded to absolute capacity. The vacant space in a cargo tank or compartment thereof used in the transportation of flammable or combustible liquids shall not be less than 1 percent. Sufficient space shall be left vacant to prevent leakage from or distortion of such tank or compartment by expansion of the contents due to rise in temperature in transit.

7904.6.3.6 Overfill Protection. The driver, operator or attendant of a tank vehicle shall, before making delivery to a tank, determine the unfilled capacity of such tank by a suitable gauging device. To prevent overfilling, the driver, operator or attendant shall not deliver in excess of that amount.

7904.6.3.7 Securing Hatches. During loading, hatch covers shall be secured on all but the receiving compartments.

7904.6.3.8 Simultaneous Delivery. Simultaneous delivery to underground tanks from two or more discharge hoses shall be made by means of mechanically tight connections between the hose and fill pipe.

7904.6.3.9 Covers Closed in Transit. Dome covers shall be closed and latched while the tank vehicle is in transit.

7904.6.3.10 Liquid Temperature. Materials shall not be loaded into or transported in a tank vehicle at a temperature above the material's ignition temperature unless safeguarded in an approved manner.

7904.6.3.11 Low Vapor–pressure Liquids. Flammable and combustible liquids with a vapor pressure of 40 psi (275.8 kPa) absolute or less at 100°F (37.8°C) shall be loaded into cargo tanks designed and constructed in accordance with Section 7904.6.1.

7904.6.3.12 Bonding of Fill Stem. Cargo tanks shall be bonded to the fill stem or some part of the rack structure which is electrically interconnected with the fill–stem piping.

EXCEPTIONS: 1. Tank vehicles used for asphalt.

2. Tank vehicles loading flammable or combustible liquids through bottom connections.

3. Tank vehicles used exclusively for transporting Class III liquids when loaded at locations where Class I and II liquids are not handled.

7904.6.3.13 Bonding to Underground Tanks. An external bond–wire connection or bond–wire integral with a hose shall be provided for the transferring of flammable liquids through open connections into underground tanks.

7904.6.4 Smoking. Smoking by tank vehicle drivers, helpers or other personnel is prohibited while they are driving, making deliveries, filling or making repairs to tank vehicles.

7904.6.5 Parking.

7904.6.5.1 General. Parking of tank vehicles shall be in accordance with Section 7904.6.5.

EXCEPTION: In cases of accident, breakdown or other emergencies, tank vehicles are allowed to be parked and left unattended at any location while the operator is obtaining assistance.

7904.6.5.2 Unattended Parking.

7904.6.5.2.1 Parking Near Residential, Educational and Institutional Occupancies and Other High–Risk Areas. Tank vehicles shall not be left unattended at any time on residential streets, or within 500 feet (152.4 m) of a residential area, apartment or hotel complex, educational facility, hospital, or care facility. Tank vehicles shall not be left unattended at any other place that would, in the opinion of the chief, present an extreme life hazard.

7904.6.5.2.2 Parking on Thoroughfares. Tank vehicles shall not be left unattended on a street, highway, avenue or alley.

EXCEPTIONS: 1. The necessary absence in connection with loading or unloading the vehicle. During actual fuel transfer, Section 7904.6.3.2 shall apply. The vehicle location shall be in accordance with Section 7904.6.5.2.1.

2. Stops for meals during the day or night, if the street is well lighted at the point of parking. The vehicle location shall be in accordance with Section 7904.6.5.2.1.

7904.6.5.2.3 Parking of Tank Vehicles. Tank vehicles shall not be parked within 25 feet (7620 mm) of a protected aboveground tank.

EXCEPTION: When the tank is being filled from the tank vehicle.

7904.6.5.2.4 Durations Exceeding One Hour. Tank vehicles parked at any one point for longer than one hour shall be located off of streets, highways, avenues or alleys, and

1. Inside of a bulk plant and either 25 feet (7620 mm) or more from the nearest property line or within a building approved for such use, or

2. At other approved locations not less than 50 feet (15 240 mm) from buildings other than those approved for the storage or servicing of such vehicles.

7904.6.6 Garaging. Tank vehicles shall not be parked or garaged in buildings other than those specifically approved for such use by the chief.

7904.6.7 Fire Protection. Tank vehicles shall be equipped with a fire extinguisher having a minimum rating of 2–A, 20–B:C.

During unloading of the tank vehicle, the fire extinguisher shall be out of the carrying device on the vehicle and shall be 15 feet (4572 mm) or more from the unloading valves.

7904.7 Refineries.

7904.7.1 General. Plants and portions of plants in which flammable liquids are produced on a commercial scale from crude petroleum, natural gasoline or other hydrocarbon sources shall be in accordance with Section 7904.7.

7904.7.2 Corrosion Protection. Aboveground tanks and piping systems shall be protected against corrosion. See Article 90, Standard a.3.6.

7904.7.3 Cleaning of Tanks. The safe entry and cleaning of petroleum storage tanks shall be conducted in accordance with nationally recognized standards and practices. See Section 9003, Standard a.3.16.

7904.7.4 Storage of Heated Petroleum Products. When petroleum–derived asphalts and residue are stored in heated tanks at refineries and bulk storage facilities or in tank vehicles, such products shall also be in accordance with nationally recognized standards. See Section 9003, Standard a.3.17.

TABLE 7904.2–A—MINIMUM VENT SIZES FOR TANKS
(See Section 7904.2.5.3)

TANK CAPACITY (gallons) × 3.785 for L	MINIMUM VENT SIZE (Nominal Pipe Diameter, inches) × 25.4 for mm
Up to 275	1 1/2
276–660	2
661–900	2 1/2
901–1,100	3
1,101–10,000	See Sections 7902.1.13.7 and 7902.2.6.3

ARTICLE 80 — HAZARDOUS MATERIALS

References in Standards 80-1, 80-4, Appendices II-E, VI-A, and NFPA 704 1996 Edition, NFPA 50B 1999 Edition and NFPA 508 1999 Edition.

SECTION 8001 — GENERAL

8001.1 Scope.

8001.1.1 General. Prevention, control and mitigation of dangerous conditions related to storage, dispensing, use and handling of hazardous materials and information needed by emergency response personnel shall be in accordance with Article 80.

EXCEPTIONS: 1. The quantities of alcoholic beverages, medicines, foodstuffs and cosmetics, containing not more than 50 percent by volume of water–miscible liquids and with the remainder of the solutions not being flammable, in retail sales occupancies are unlimited when packaged in individual containers not exceeding 4 liters.

2. Application and release of pesticide products and materials intended for use in weed abatement, erosion control, soil amendment or similar applications when applied in accordance with the manufacturer's instructions and label directions.

3. Oregon Revised Statutes 466.605 through 466.680, 468B.300 through 468B.335 and 466.200 through 466.205 and administered under Oregon Administrative Rules.

The storage of hazardous materials and maximum quantity on–site is prohibited within the limits established by law as the limits of districts in which such storage is prohibited. (See model adopting ordinance, page ix)

ORS 466.605 through 466.680 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

ORS 466.605 through 466.680 define the regulations for Spill Response and Cleanup of Hazardous Materials.

ORS 468B.300 through 468B.335 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

ORS 468B.300 through 468B.335 define the regulations for Oil or Hazardous Material Spillage with regard to Water Quality.

ORS 466.200.through 466.205 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

ORS 466.200 through 466.205 define the regulations for Procedures for Emergencies and also Liability for Improper Disposal of waste with regard to the Storage, Treatment and Disposal of Hazardous Waste

OAR 340, Division 108 is not a part of this code but is reproduced or paraphrased here for the reader's convenience:

Oar 340, Division 108 defines the regulations for Spills and other incidents with regard to Hazardous Waste Management.

8001.1.2 Material Classification. Hazardous materials are those chemicals or substances defined as such in Article 2. See Appendix VI–A, page 1-335, for the classification of hazard categories and hazard evaluations.

The classification system referenced in Section 8002 shall apply to all hazardous materials, including those materials regulated elsewhere in this code.

Mixtures shall be classified in accordance with hazards of the mixture as a whole. Mixtures shall be classified by an approved qualified organization, individual or testing laboratory.

8001.1.3 Application. Article 80 shall apply to all hazardous materials, including those materials regulated elsewhere in this code, except that when specific requirements are provided in other articles, those specific requirements shall apply. See Section 101.6.

When a material has multiple hazards, all hazards shall be addressed.

The provisions of Article 80 related to health hazards as classified in Section 8002 are waived when the chief has determined that such enforcement is preempted by other codes, statutes or ordinances. The details of any action granting such a waiver shall be recorded and entered in the files of the code enforcement agency.

8001.1.4 Existing Buildings. For existing buildings, see Section 102.

8001.1.5 Retail and Wholesale Storage and Display. For retail and wholesale storage and display of nonflammable solid and nonflammable or noncombustible liquid hazardous materials in Group M retail sales occupancies, see Section 8001.14.

8001.2 Definitions.

8001.2.1 General. For definitions of BARRICADE; BULK OXYGEN SYSTEM; CARCINOGEN; CEILING LIMIT, CHEMICAL; C.F.R.; CHEMICAL NAME; COMMON RADIATION SOURCE MATERIAL; COMPRESSED GAS; COMPRESSED GAS CONTAINER; COMPRESSED GAS SYSTEM; CONTINUOUS GAS–DETECTION SYSTEM; CONTROL AREA; CORROSIVE; CYLINDER; DEFLAGRATION; DETACHED STORAGE; DETONATION; DOT; EXCESS FLOW CONTROL; EXCESS FLOW VALVE; EXPLOSION; EXPLOSIVE; FISSILE MATERIAL; FLAMMABLE GAS; FLAMMABLE LIQUEFIED GAS; FLAMMABLE SOLID; HANDLING; HAZARDOUS MATERIAL; HEALTH HAZARD; HIGHLY TOXIC MATERIAL; HIGHLY VOLATILE LIQUID; IDLH; INERT GAS; IRRITANT; MATERIAL SAFETY DATA SHEET; NESTING; NORMAL TEMPERATURE AND PRESSURE (NTP); ORGANIC PEROXIDE; OSHA; OXIDIZER; PERMISSIBLE EXPOSURE LIMIT (PEL); PEROXIDE–FORMING CHEMICAL; PHYSICAL HAZARD; PORTABLE TANKS; PRIMARY CONTAINMENT; PROPRIETARY INFORMATION; PYROPHORIC; REDUCED FLOW VALVE; RETAIL SALES OCCUPANCY; SCAVENGED GAS; SECONDARY CONTAINMENT; SEGREGATED; SENSITIZER; SEPARATE GAS STORAGE ROOM; SIMPLE ASPHYXIANT GAS; STATIONARY TANK; STORAGE FACILITY; TOXIC MATERIAL; UNAUTHORIZED DISCHARGE; UNSTABLE

MATERIAL; UNSTABLE (reactive) LIQUID; USE; USE, CLOSED SYSTEM; USE, OPEN SYSTEM; and WATER–REACTIVE MATERIAL, see Article 2.

8001.2.2 Limited Application. For the purpose of Article 80, certain terms are defined as follows:

CONTAINER is any vessel of 60 United States gallons (227.1 L) or less capacity used for transporting or storing hazardous materials.

OUTDOOR CONTROL AREA is an area which contains hazardous materials not exceeding the limits of Table 8001.15–C or 8001.15–D.

8001.3 Permits.

8001.3.1 General. Permits are required to store, dispense, use or handle hazardous material in excess of quantities specified in this Article. See Section 105.

8001.3.2 Hazardous Materials Management Plan. When required by the chief, each application for a permit shall include a hazardous materials management plan (HMMP). The location of the HMMP shall be posted adjacent to permits when an HMMP is provided. The HMMP shall include a facility site plan designating the following:

1. Storage and use areas,

2. Maximum amount of each material stored or used in each area,

3. Range of container sizes,

4. Locations of emergency isolation and mitigation valves and devices,

5. Product conveying piping containing liquids or gases, other than utility–owned fuel gas lines and low–pressure fuel gas lines,

6. On and off positions of valves for valves which are of the self–indicating type, and

7. Storage plan showing the intended storage arrangement, including the location and dimensions of aisles.

The plans shall be legible and approximately to scale. Separate distribution systems are allowed to be shown on separate pages.

See also Appendix II–E.

8001.3.3 Hazardous Materials Inventory Statement. When required by the chief, each application for a permit shall include a hazardous materials inventory statement (HMIS). See also Appendix II–E.

8001.4 Systems, Equipment and Processes.

8001.4.1 General. Systems, equipment and processes utilized for storage, dispensing, use or handling of hazardous materials shall be in accordance with Section 8001.4.

8001.4.2 Design and Construction of Containers, Cylinders and Tanks. Containers, cylinders and tanks shall be designed and constructed in accordance with nationally recognized standards. See Article 90 and Section 101.3. Containers, cylinders, tanks and other means used for containment of hazardous materials shall be of an approved type.

8001.4.3 Piping, Tubing, Valves and Fittings.

8001.4.3.1 General. Piping, tubing, valves and fittings conveying hazardous materials shall be installed in accordance with approved standards and shall be in accordance with Section 8001.4.3.

8001.4.3.2 Design and Construction. Piping, tubing, valves, fittings and related components used for hazardous materials shall be in accordance with the following:

1. Piping, tubing, valves, fittings and related components shall be designed and fabricated from materials compatible with the material to be contained and shall be of adequate strength and durability to withstand the pressure, structural and seismic stress, and exposure to which they are subject,

2. Piping and tubing shall be identified in accordance with nationally recognized standards (see Section 9003, Standard a.2.1) to indicate the material conveyed,

3. Emergency shutoff valves shall be identified and the location shall be clearly visible and indicated by means of a sign, and

4. Backflow–prevention or check valves shall be provided when the backflow of hazardous materials could create a hazardous condition or cause the unauthorized discharge of hazardous materials.

8001.4.3.3 Additional Regulations for Supply Piping for Hazard Materials. Supply piping and tubing for gases and liquids having a hazard ranking of 3 or 4 in accordance with Section 9002, Standard 79–3 shall also be in accordance with the following:

1. Piping and tubing utilized for the transmission of highly toxic or toxic material shall have welded or brazed connections throughout unless an exhausted enclosure is provided if the material is a gas, or the piping is provided with a receptor for containment if the material is a liquid.

> **EXCEPTIONS:** 1. Nonmetallic piping with approved connections.
>
> 2. Metallic piping with nonmetallic lining with approved connections.
>
> 3. Threaded pipe and connections in accordance with nationally recognized standards. See Section 9003, Standard a.2.5.

2. Piping and tubing shall not be located within corridors, within any portion of a means of egress required to be enclosed in fire–resistive construction or in above areas not classified as Group H Occupancies.

> **EXCEPTION:** Piping and tubing within the space defined by the walls of corridors and floor or roof above or in concealed space above other occupancies when installed in accordance with the Building Code as required for Group H, Division 6 Occupancies. See UBC Section 307.11.6.2 except that occasional transverse crossings of the corridors by piping which is enclosed within ferrous pipe or tube for the width of the corridor need not comply with Items 1 through 5.

3. Where gases or liquids are carried in pressurized piping above 15 psig (103.4 kPa), excess flow control shall be provided. Where the piping originates from within a hazardous material storage room or area, the excess flow control shall be located within the storage room or area. Where the piping originates from a bulk source, the excess flow control shall be located as close to the bulk source as practical, and

4. Readily accessible manual or automatic remotely activated fail–safe emergency shutoff valves shall be installed on supply piping and tubing at the following locations:

4.1 The point of use, and

4.2 The tank, cylinder or bulk source.

8001.4.3.4 Flammable, Oxidizing and Pyrophoric Gases. When low melting point materials, such as aluminum, copper, some brass alloys or nonmetallic materials, are used for piping systems, conveying flammable, pyrophoric or oxidizing gases such piping systems shall be protected with one of the following:

1. Isolation from fire exposure by fire–resistive construction or other approved means;

2. Isolation from fire exposure by gas cabinets;

3. Protected from fire exposure by an automatic fire–extinguishing system;

4. Located so that any release resulting from failure of the piping systems will not unduly expose persons, buildings or structures; or

5. Provided with a readily accessible shutoff valve or valves which will shut off the source of gas to the piping system in the event of leakage.

8001.4.4 Equipment, Machinery and Alarms. Equipment, machinery and required detection and alarm systems associated with the use, storage or handling of hazardous materials shall be listed or approved.

8001.4.5 Installation of Tanks.

8001.4.5.1 Underground Tanks.

8001.4.5.1.1 General. Underground tanks used for the storage of liquid hazardous materials shall be located and protected in accordance with Section 7902.6.11.

8001.4.5.1.2 Secondary Containment. Secondary containment shall be provided for new installations of underground tanks.

8001.4.5.2 Aboveground Tanks. Aboveground stationary tanks used for the storage of hazardous materials shall be located and protected in accordance with the requirements for outdoor storage of the particular material involved and shall be marked as required by Section 8001.7.

8001.4.6 Empty Containers and Tanks. Empty containers and tanks previously used for the storage of hazardous materials shall be free from residual material and vapor as defined by DOT, the Resource Conservation and Recovery Act (RCRA) or other regulating authority or maintained as specified for the storage of the hazardous material.

8001.4.7 Maintenance.

8001.4.7.1 General. Equipment, machinery and required detection and alarm systems associated with hazardous materials shall be maintained in an operable condition. Defective containers, cylinders and tanks shall be removed from service, repaired or disposed of in an approved manner. Defective equipment or machinery shall be removed from service and repaired or replaced. Required detection and alarm systems shall be replaced or repaired where defective. See also Section 8001.4.4.

8001.4.7.2 Tanks Out-of-Service for 90 Days. Stationary tanks not used for a period of 90 days shall be properly safeguarded or removed in an approved manner. Such tanks shall have the fill line, gauge opening and pump connection secured against tampering. Vent lines shall be properly maintained.

Tanks which are to be placed back in service shall be tested in an approved manner.

8001.4.7.3 Defective Containers and Tanks. Defective containers and tanks shall be removed from service, repaired or disposed of in an approved manner.

8001.4.8 Liquid–level Limit Control. Atmospheric tanks which have a capacity greater than 500 gallons (1893 L) containing hazardous material liquids shall be equipped with a liquid–level limit control to prevent overfilling of the tank.

> **EXCEPTION:** Tanks monitored by a system which limits net contents by weight.

8001.4.9 Seismic Protection. Machinery and equipment utilizing hazardous materials shall be seismically anchored in accordance with the Building Code.

8001.5 Release of Hazardous Materials.

8001.5.1 General. Hazardous materials shall not be released into a sewer, storm drain, ditch, drainage canal, lake, river or tidal waterway, or upon the ground, sidewalk, street, highway or into the atmosphere.

> **EXCEPTION:** Materials released in accordance with federal, state or local governing regulations or permits of the jurisdictional Air Quality Management Board with a National Pollutant Discharge Elimination System Permit, with waste discharge requirements established by the jurisdictional Water Quality Control Board or with local sewer pretreatment requirements for publicly owned treatment works.

8001.5.2 Unauthorized Discharges.

8001.5.2.1 Records. Accurate records shall be kept of the unauthorized discharge of hazardous materials by the permittee.

8001.5.2.2 Notification. The chief shall be notified immediately or in accordance with approved emergency operating procedures when an unauthorized discharge becomes reportable under state, federal or local regulations.

8001.5.2.3 Preparation. Provisions shall be made for controlling and mitigating unauthorized discharges.

8001.5.2.4 Control. When an unauthorized discharge due to primary container failure is discovered, the involved primary container shall be repaired or removed from service.

8001.5.2.5 Responsibility for Cleanup. The person, firm or corporation responsible for an unauthorized discharge shall institute and complete all actions necessary to remedy the effects of such unauthorized discharge, whether sudden or gradual, at no cost to the jurisdiction. When deemed necessary by the chief, cleanup may be initiated by the fire department or by an authorized individual or firm. Costs associated with such cleanup shall be borne by the owner, operator or other person responsible for the unauthorized discharge.

8001.6 Material Safety Data Sheets. Material safety data sheets (MSDS) shall be readily available on the premises for hazardous materials regulated by Article 80. See also Section 8001.3.2.

8001.7 Identification Signs. Visible hazard identification signs as specified in Section 9002, UFC Standard 79–3 shall be placed on stationary aboveground tanks and at entrances to locations where hazardous materials are stored, dispensed, used or handled in quantities requiring a permit. Signs shall be provided at specific entrances and locations designated by the chief.

EXCEPTION: The chief may waive this requirement in special cases when consistent with safety if the owner or operator has submitted a hazardous materials management plan and hazardous materials inventory statement. See Appendix II–E and Sections 8001.3.2 and 8001.3.3.

Individual containers, cartons or packages shall be conspicuously marked or labeled in accordance with nationally recognized standards.

Rooms or cabinets containing compressed gases shall be conspicuously labeled COMPRESSED GAS.

Signs shall not be obscured or removed.

Signs shall be in English as a primary language or in symbols allowed by this code.

Signs shall be durable.

The size, color and lettering shall be in accordance with nationally recognized standards.

8001.8 Signs. In addition to the hazard identification signs required by Section 8001.7, additional hazard identification and warning signs shall be provided as follows:

1. Stationary containers and tanks shall be placarded with hazard identification signs as specified in Section 9002, UFC Standard 79–3 for the specific material contained.

2. Signs prohibiting smoking shall be provided in the following situations:

2.1 In rooms or areas where hazardous materials are stored or dispensed or used in open systems in amounts requiring a permit in accordance with Section 8001.3.1.

2.2 Within 25 feet (7620 mm) of outdoor storage, dispensing or open–use areas.

Signs shall not be obscured or removed. Signs shall be in English as a primary language or in symbols allowed by this code. Signs shall be durable. The size, color and lettering shall be in accordance with nationally recognized standards.

8001.9 Sources of Ignition. Smoking shall be prohibited in the following locations:

1. Within 25 feet (7620 mm) of outdoor storage or dispensing areas.

2. In rooms or areas where hazardous materials are stored or dispensed or used in open systems in amounts requiring a permit in accordance with Section 8001.3.1.

Open flames and high–temperature devices shall not be used in a manner which creates a hazardous condition.

EXCEPTION: Energy–consuming equipment listed for use with the hazardous materials stored or used.

8001.10 Construction Requirements.

8001.10.1 General. Buildings, or portions thereof, in which hazardous materials are stored, handled or used shall be constructed in accordance with the Building Code.

8001.10.2 Control Areas.

8001.10.2.1 Construction Requirements. Control areas shall be separated from each other by not less than a one–hour fire–resistive occupancy separation.

8001.10.2.2 Number. The number of control areas in buildings or portions of buildings having Group M Occupancies and buildings or portions having Group S Occupancies with storage conditions in accordance with Section 8001.14 shall not exceed two. The number of control areas in buildings with other uses or with other Group S Occupancy storage conditions shall not exceed four.

8001.10.3 Gas Rooms.

8001.10.3.1 General. When a gas room is used to increase compressed gas exempt amounts or when the location of compressed gases in a gas room is required or allowed by Section 8003 or 8004, the gas room shall be in accordance with Section 8001.10.3.

8001.10.3.2 Construction. Gas rooms shall be separated from the remainder of the building by not less than a one–hour fire–resistive occupancy separation. For highly toxic and toxic compressed gases used in conjunction with or serving a semiconductor fabrication facility classified as a Group H, Division 6 Occupancy, also see the Building Code.

8001.10.3.3 Ventilation System. The ventilation system for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding area. For toxic and highly toxic gases, the requirements set forth in Section 8003.3.1.3.4 shall also be met.

8001.10.4 Exhausted Enclosures.

8001.10.4.1 General. When an exhausted enclosure is used to increase exempt amounts or when the location of hazardous materials in exhausted enclosures is either required or allowed by Section 8003 or 8004, the exhausted enclosure shall be in accordance with Section 8001.10.4.

8001.10.4.2 Construction. Exhausted enclosures shall be noncombustible.

8001.10.4.3 Ventilation. The ventilation system for exhausted enclosures shall be designed to operate at a negative pressure in relation to the surrounding area. For toxic and highly toxic gases, the requirements set forth in Section 8003.3.1.3.3 shall also be met.

8001.10.5 Gas Cabinets.

8001.10.5.1 General. When a gas cabinet is used to increase exempt amounts or when the location of compressed gases in gas cabinets is either required or allowed by Section 8003 or 8004, the gas cabinet shall be in accordance with Section 8001.10.5.

8001.10.5.2 Construction. Gas cabinets shall be constructed in accordance with the following:

1. Constructed of not less than 0.097 inch (2.46 mm) (12 gauge) steel.

2. Be provided with self–closing limited access ports or noncombustible windows to give access to equipment controls.

3. Be provided with self–closing doors.

8001.10.5.3 Ventilation. The ventilation system for gas cabinets shall be designed to operate at a negative pressure in relation to the surrounding area. For toxic and highly toxic gases, the requirements set forth in Section 8003.3.1.3.2 shall also be met.

8001.10.6 Hazardous Materials Storage Cabinets.

8001.10.6.1 General. When storage cabinets are used to increase exempt amounts or to comply with Article 80, such cabinets shall be in accordance with Section 8001.10.6.

8001.10.6.2 Construction. Cabinets shall be constructed of metal. The interior of cabinets shall be treated, coated or constructed of materials that are nonreactive with the hazardous material stored. Such treatment, coating or construction shall include the entire interior of the cabinet. Cabinets shall either be listed as suitable for the intended storage (See Section 9003, Standard u.1.22) or constructed in accordance with the following:

1. Cabinets shall be of steel having a thickness of not less than 0.044 inch (1.12 mm) (18 gauge). The cabinet, including the door, shall be double walled with $1^1/_2$ inch (38.1 mm) airspace between the walls. Joints shall be riveted or welded and shall be tightfitting. Doors shall be well fitted, self-closing and equipped with a self-latching device, and

2. The bottoms of cabinets utilized for the storage of liquids shall be liquid tight to a minimum height of 2 inches (50.8 mm).

For requirements regarding electrical equipment and devices within cabinets used for the storage of hazardous gases or liquids, see the Electrical Code.

8001.11 General Safety Precautions.

8001.11.1 Personnel Training and Written Procedures.

8001.11.1.1 General. Persons responsible for the operation of areas in which hazardous materials are stored, dispensed, handled or used shall be familiar with the chemical nature of the materials and the appropriate mitigating actions necessary in the event of fire, leak or spill.

8001.11.1.2 Fire Department Liaison. Responsible persons shall be designated and trained to be liaison personnel for the fire department. These persons shall aid the fire department in preplanning emergency responses and identification of the locations where hazardous materials are located and shall have access to material safety data sheets and be knowledgeable in the site emergency response procedures.

8001.11.2 Security. The storage, dispensing, use and handling areas shall be secured against unauthorized entry and safeguarded with such protective facilities as public safety requires.

8001.11.3 Protection from Vehicles. Guard posts or other approved means shall be provided to protect storage tanks and connected piping, valves and fittings; dispensing areas; and use areas subject to vehicular damage. When guard posts are installed, the posts shall be:

1. Constructed of steel not less than 4 inches (101.6 mm) in diameter and concrete filled,

2. Spaced not more than 4 feet (1219 mm) between posts on center,

3. Set not less than 3 feet (914 mm) deep in a concrete footing of not less than a 15 inch (381 mm) diameter,

4. Set with the top of the posts not less than 3 feet (914 mm) above ground, and

5. Located not less than 5 feet (1524 mm) from the tank.

8001.11.4 Electrical Wiring and Equipment. Electrical wiring and equipment shall be installed in accordance with the Electrical Code.

8001.11.5 Static Accumulation. When processes or conditions exist where a flammable mixture could be ignited by static electricity, means shall be provided to prevent the accumulation of a static charge.

8001.11.6 Protection from Light. Materials which are sensitive to light shall be stored in containers designed to protect them from such exposure.

8001.11.7 Shock Padding. Materials which are shock sensitive shall be padded, suspended or otherwise protected against accidental dislodgement and dislodgement during seismic activity. For seismic requirements and the seismic zone in which the material is located, see the Building Code.

8001.11.8 Separation of Incompatible Materials. Incompatible materials in storage and storage of materials incompatible with materials in use shall be separated when the stored materials are in containers having a capacity of more than 5 pounds (2.268 kg) or $^1/_2$ gallon (1.89 L). Separation shall be accomplished by:

1. Segregating incompatible materials storage by a distance of not less than 20 feet (6096 mm),

2. Isolating incompatible materials storage by a noncombustible partition extending not less than 18 inches (457.2 mm) above and to the sides of the stored material,

3. Storing liquid and solid materials in hazardous materials storage cabinets (see Section 8001.3.2), or

4. Storing compressed gases in gas cabinets or exhausted enclosures in accordance with Sections 8003.3.1.3.2 and 8003.3.1.3.3.

Materials which are incompatible shall not be stored within the same cabinet or exhausted enclosure.

8001.11.9 Shelf Storage. Shelving shall be of substantial construction, adequately braced and anchored. For seismic requirements and the seismic zone in which the material is located, see the Building Code.

Shelves shall be provided with a lip or guard when used for the storage of individual containers.

EXCEPTIONS: 1. Storage in hazardous materials storage cabinets or laboratory furniture specifically designed for such use.

2. Storage of hazardous materials in amounts not requiring a permit in accordance with Section 8001.3.

Shelf storage of hazardous materials shall be maintained in an orderly manner.

8001.12 Handling and Transportation.

8001.12.1 General. Handling and transportation of hazardous materials in corridors or exit enclosures shall be in accordance with Section 8001.12. See also Section 8001.4.

Hazardous materials gas containers, cylinders and tanks in transit shall have their protective caps in place. Containers, cylinders and tanks of highly toxic or toxic compressed gases shall have their valve outlets capped or plugged with an approved closure device. See also Sections 7401.7 and 7403.3.

8001.12.2 Required Use of Carts and Trucks. Liquids in containers exceeding 5 gallons (18.9 L) in a corridor or exit enclosure shall be transported on a cart or truck. Containers of hazardous materials having a hazard ranking of 3 or 4 in accordance with Section 9002, UFC Standard 79–3 transported within corridors or exit enclosures shall be on a cart or truck. When carts and trucks are required for transporting hazardous materials, they shall be in accordance with Section 8001.12.3.

EXCEPTIONS: 1. Two hazardous materials liquid containers, which are hand carried in acceptable safety carriers.

2. Single drums not exceeding 55 gallons (208.2 L), which are transported by suitable drum trucks.

3. Containers and cylinders of compressed gases, which are transported by approved hand trucks, and containers and cylinders not exceeding 25 pounds (11.3 kg), which are hand carried.

4. Solid hazardous materials not exceeding 100 pounds (45.4 kg), which are transported by approved hand trucks, and a single container not exceeding 50 pounds (22.7 kg), which is hand carried.

8001.12.3 Carts and Trucks.

8001.12.3.1 General. Carts and trucks required by Section 8001.12.2 to be used to transport hazardous materials shall be in accordance with Section 8001.12.3.

8001.12.3.2 Design. Carts and trucks used to transport hazardous materials shall be designed to provide a stable base for the commodities to be transported and shall have a means of restraining containers to prevent accidental dislodgement. Compressed gas cylinders placed on carts and trucks shall be individually restrained.

8001.12.3.3 Speed–control Devices. Carts and trucks shall be provided with a device which will enable the operator to safely control movement by providing stops or speed–reduction devices.

8001.12.3.4 Construction. Construction materials for hazardous materials carts or trucks shall be compatible with the material transported. The cart or truck shall be of substantial construction.

8001.12.3.5 Spill Control. Carts and trucks transporting liquids shall be capable of containing a spill from the largest single container transported.

8001.12.3.6 Attendance. Carts and trucks used to transport materials shall not obstruct or be left unattended within any part of a means of egress.

8001.12.3.7 Incompatible Materials. Incompatible materials shall not be transported on the same cart or truck.

8001.13 Facility Closure.

8001.13.1 Temporarily Out-of-Service Facilities. Facilities which are temporarily out of service shall continue to maintain a permit and be monitored and inspected.

8001.13.2 Permanently Out-of-Service Facilities. Facilities for which a permit is not kept current or is not monitored and inspected on a regular basis shall be deemed to be permanently out of service and shall be closed in accordance with Section 8001.13.3.

8001.13.3 Plan. The permit holder or applicant shall submit a plan to the fire department to terminate storage, dispensing, handling or use of hazardous materials at least 30 days prior to facility closure. The plan shall demonstrate that hazardous materials which were stored, dispensed, handled or used in the facility have been transported, disposed of or reused in a manner that eliminates the need for further maintenance and any threat to public health and safety. Such plan shall be submitted in accordance with Section 8001.3.1.

8001.14 Group M Occupancy Storage and Display and Group S Occupancy Storage.

8001.14.1 General. The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored and displayed within a single control area of a Group M Occupancy or stored in a single control area of a Group S Occupancy is allowed to exceed the exempt amounts specified in Section 8001.15 when in accordance with Section 8001.14.

8001.14.2 Exempt Amounts per Group M or Group S Occupancy Control Area. The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored and displayed within a single control area of a Group M Occupancy or stored in a single control area of a Group S Occupancy shall not exceed the exempt amounts set forth in Table 8001.14–A.

8001.14.3 Storage and Display.

8001.14.3.1 General. Storage and display shall be in accordance with Section 8001.14.3.

8001.14.3.2 Density. Storage and display of solids shall not exceed 200 pounds per square foot (976.4 kg/m^2) of floor area actually occupied by solid merchandise. Storage and display of liquids shall not exceed 20 gallons per square foot (76 L/m^2) of floor area actually occupied by liquid merchandise.

8001.14.3.3 Height. Storage and display height shall not exceed 6 feet (1829 mm) above the finished floor.

8001.14.3.4 Container Location. Individual containers less than 5 gallons (19 L) or less than 25 pounds (11 kg) shall be stored or displayed on pallets, racks or shelves.

8001.14.3.5 Racks and Shelves. Racks and shelves used for storage or display shall be in accordance with Section 8001.11.9.

8001.14.3.6 Container Type. Containers shall be approved for the intended use.

8001.14.3.7 Container Size. Individual containers shall not exceed 100 pounds (45.4 kg) or a 5 gallon (19 L) capacity.

8001.14.3.8 Incompatible Materials. Incompatible materials shall be separated in accordance with Section 8001.11.8.

8001.14.3.9 Floors. Floors shall be in accordance with Section 8003.1.13.

8001.14.3.10 Aisles. Aisles 4 feet (1219 mm) in width shall be maintained on three sides of the storage or display area.

8001.14.3.11 Signs. Hazard identification signs shall be provided in accordance with Section 8001.7.

TABLE 8001.14-A RETAIL AND WHOLESALE DISPLAY AND STORAGE EXEMPT AMOUNT PER CONTROL AREA

CONDITION		RETAIL AND WHOLESALE DISPLAY AND STORAGE EXEMPT AMOUNT PER CONTROL AREA		
MATERIAL	CLASS	Solids (pounds) x0.4536 for kg	Liquids Gallons (pounds) x 3.785 for L x 0.4536 for kg	
1. Health Hazard Materials - Nonflammable and Noncombustible Solids, Liquids, and Gases				
Carcinogens		N.L.		N.L.
Corrosives [2,3]		10,000		1,000
Highly Toxics		2 [2,3]		20 [2,3]
Irritants		N.L.		N.L.
Other Health Hazards		N.L.		N.L.
Sensitizers		N.L.		N.L.
Toxics [2,3]		1,000		100
2. Physical Hazard Materials - Nonflammable and Noncombustible Solids and Liquids				
Oxidizers [2,3]	4	N.A.		N.A.
	3	1,150		115
	2	2,250		225
	1	18,000		1,800
Unstable (Reactives) [2,3]	4	N.A.		N.A.
	3	550		55
	2	1,150		115
	1	N.L.		N.L.
Water (Reactives)	3 [2,3]	550		55
	2 [2,3]	1,150		115
	1	N.L.		N.L.

NA = Not Allowed

NL = Not Limited

[1] Hazard categories are as specified in Section 8002.

[2] Exempt amounts may be increased 100 percent in sprinklered buildings. When Footnote 3 also applies, the increase for both footnotes can be applied.

[3] Exempt amount may be increased 100 percent in approved storage cabinets. See Section 8001.10.6 for approved cabinets. When Footnote 2 also applies, the increase for both footnotes can be applied.

8001.15 Exempt Amounts.

8001.15.1 General. Exempt amounts shall be as specified in Section 8001.15.2 and Tables 8001.15–A through 8001.15–D. Storage, dispensing, use and handling of hazardous materials in quantities exceeding exempt amounts shall be in accordance with Sections 8001, 8003 and 8004.

Storage, dispensing, use and handling of hazardous materials in quantities not exceeding exempt amounts shall be in accordance with Section 8001.

Where exempt amounts are indicated in pounds (kilograms) and when the density of the material is not provided to the chief, a conversion of 10 pounds per gallon (1.2 kg/L) shall be used.

For retail and wholesale display, see Section 8001.14.

8001.15.2 Special Limitations for Indoor Storage and Use by Occupancy.

8001.15.2.1 General. Quantities of hazardous materials shall be limited within occupancies in accordance with Sections 8001.15.2 and 8001.15.3.

8001.15.2.2 Group A Occupancies.

8001.15.2.2.1 Toxic and Highly Toxic Compressed Gases. Toxic and highly toxic compressed gases shall not be stored or used within Group A Occupancies.

EXCEPTION: Cylinders not exceeding 20 cubic feet (0.57 m^3) at NTP are allowed within gas cabinets or fume hoods.

8001.15.2.2.2 Liquid and Solid Oxidizers.

8001.15.2.2.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used in Group A Occupancies.

EXCEPTION: Class 4 liquid and solid oxidizers are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets must comply with Section 8001.3.2 and shall not contain other storages.

8001.15.2.2.3 Organic Peroxides. Detonatable and Class I organic peroxides shall not be stored or used in Group A Occupancies.

EXCEPTION: Detonatable and Class 1 organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.10.6 and shall not contain other storage.

8001.15.2.2.4 Unstable (Reactive) Materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used in Group A Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.10.6 and shall not contain other storage.

8001.15.2.2.5 Flammable and Oxidizing Gases. Except for cylinders not exceeding 250 cubic feet (7.1 m^3) at NTP used for maintenance purposes, patient care or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group A Occupancies.

EXCEPTION: Food service operations in conformance with Section 8203.2.1.8.

The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the exempt amounts listed in Table 8001.15–A.

8001.15.2.3 Groups B, F, M and S Occupancies.

8001.15.2.3.1 Toxic and Highly Toxic Compressed Gases. Toxic and highly toxic compressed gases shall not be stored or used in offices, retail sales or classroom portions of Group B, F, M or S Occupancies.

EXCEPTION: When within classrooms of Group B Occupancies, cylinders not exceeding 20 cubic feet (0.57 m^3) at NTP are allowed in gas cabinets or fume hoods.

8001.15.2.3.2 Liquid and Solid Oxidizers.

8001.15.2.3.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used in offices, retail sales or classroom portions of Group B, F, M or S Occupancies.

EXCEPTION: When within classrooms of Groups B, F and M Occupancies, Class 4 liquid and solid oxidizers are allowed when stored in hazardous materials storage cabinets. Hazardous materials storage cabinets must comply with Section 8001.3.2 and shall not contain other storages.

8001.15.2.3.3 Organic Peroxides. Unclassified detonatable and Class I organic peroxides shall not be stored or used in offices, classrooms and retail sales portions of Group B, F, M or S Occupancies.

EXCEPTION: When within classrooms of Groups B, F and M Occupancies, undetonatable and Class 1 organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.3.2 and shall not contain other storage.

8001.15.2.3.4 Unstable (Reactive) Materials.

8001.15.2.3.4.1 Offices. Class 3 and 4 unstable (reactive) materials shall not be stored or used in offices of Group B, F, M or S Occupancies.

8001.15.2.3.4.2 Classrooms. Class 3 and 4 unstable (reactive) materials shall not be stored or used in classrooms of Group B, F or M Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous material storage cabinets shall comply with Section 8001.3.2 and shall not contain other storage.

8001.15.2.3.4.3 Retail Sales. Class 4 unstable (reactive) materials shall not be stored or used in retail sales portions of Group M Occupancies.

8001.15.2.3.5 Flammable and Oxidizing Gases. Except for cylinders not exceeding 250 cubic feet (7.08 m^3) at NTP used for maintenance purposes, patient care or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group B, F, M or S Occupancies.

The aggregate quantities of gases used for maintenance purposes, patient care and operation of equipment shall not exceed the exempt amounts listed in Table 8001.15–A. Medical gas system supply cylinders shall be located in medical gas storage rooms or gas cabinets as set forth in Section 7404.2.

8001.15.2.4 Group E Occupancies.

8001.15.2.4.1 Toxic and Highly Toxic Compressed Gases. Toxic and highly toxic compressed gases shall not be stored or used in Group E Occupancies.

EXCEPTION: Cylinders not exceeding 20 cubic feet (0.57 m^3) at NTP are allowed within gas cabinets or fume hoods.

8001.15.2.4.2 Liquid and Solid Oxidizers.

8001.15.2.4.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used in Group E Occupancies.

EXCEPTION: Class 4 liquid and solid oxidizers are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets must comply with Section 8001.3.2 and shall not contain other storage.

8001.15.2.4.3 Organic Peroxides. Detonatable and Class I organic peroxides shall not be stored or used in Group E Occupancies.

EXCEPTION: Detonatable and Class I organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.3.2 and shall not contain other storage.

8001.15.2.4.4 Unstable (Reactive) Materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used in Group E Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.3.2 and shall not contain other storage.

8001.15.2.4.5 Flammable and Oxidizing Gases. Except for cylinders not exceeding 250 cubic feet (7.08 m^3) at NTP used for maintenance purposes or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group E Occupancies.

The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the exempt amounts listed in Table 8001.15–A.

8001.15.2.5 Group I Occupancies.

8001.15.2.5.1 Toxic and Highly Toxic Compressed Gases. Toxic and highly toxic compressed gases shall not be stored or used within Group I Occupancies.

EXCEPTION: Cylinders not exceeding 20 cubic feet (0.57 m^3) at NTP are allowed within gas cabinets or fume hoods in quantities up to the exempt amount.

8001.15.2.5.2 Liquid and Solid Oxidizers.

8001.15.2.5.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used in Group I Occupancies.

EXCEPTION: Class 4 liquid and solid oxidizers are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets must comply with Section 8001.3.2 and shall not contain other storage.

8001.15.2.5.2.2 Class 3. A maximum of 200 pounds (90.7 kg) of solid or 2 gallons (7.57 L) of liquid Class 3 oxidizer is allowed in Group I Occupancies when such materials are necessary for maintenance purposes or operation of equipment. The oxidizers shall be stored in approved containers and in an approved manner.

8001.15.2.5.3 Organic Peroxides. Detonatable and Class I organic peroxides shall not be stored or used in Group I Occupancies.

EXCEPTION: Detonatable and Class I organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.3.2 and shall not contain other storage.

8001.15.2.5.4 Unstable (Reactive) Materials. Class 3 and 4 unstable (Reactive) materials shall not be stored or used in Group I Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.3.2 and shall not contain other storage.

8001.15.2.5.5 Flammable and Oxidizing Gases. Except for cylinders not exceeding 250 cubic feet (7.08 m^3) at NTP used for maintenance purposes, patient care or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group I Occupancies.

The aggregate quantities of gases used for maintenance purposes, patient care and operation of equipment shall not exceed the exempt amounts listed in Table 8001.15–A. Medical gas system supply cylinders shall be located in medical gas storage rooms or gas cabinets as set forth in Section 7404.2.

8001.15.2.6 Group R Occupancies.

8001.15.2.6.1 Toxic and Highly Toxic Compressed Gases. Toxic and highly toxic compressed gases shall not be stored or used in Group R Occupancies.

8001.15.2.6.2 Liquid and Solid Oxidizers.

8001.15.2.6.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used within Group R Occupancies.

8001.15.2.6.3 Organic Peroxides. Detonatable and Class I organic peroxides shall not be stored or used within Group R Occupancies.

8001.15.2.6.4 Unstable (Reactive) Materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used within Group R Occupancies.

8001.15.2.6.5 Flammable and Oxidizing Gases. Except for cylinders not exceeding 250 cubic feet (7.08 m^3) at NTP used for maintenance purposes or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group R Occupancies.

The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the exempt amounts listed in Table 8001.15–A.

8001.15.2.7 Group U Occupancies.

8001.15.2.7.1 Toxic and Highly Toxic Compressed Gases. Toxic and highly toxic compressed gases shall not be stored or used within Group U Occupancies.

EXCEPTION: Cylinders not exceeding 20 cubic feet (0.57 m^3) at NTP are allowed within gas cabinets or fume hoods.

8001.15.2.7.2 Liquid and Solid Oxidizers.

8001.15.2.7.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used in Group U Occupancies.

EXCEPTION: Class 4 liquid and solid oxidizers are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.10.6 and shall not contain other storage.

8001.15.2.7.3 Organic Peroxides. Detonatable and Class I organic peroxides shall not be stored or used in Group U Occupancies.

EXCEPTION: Detonatable and Class I organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.10.6 and shall not contain other storage.

8001.15.2.7.4 Unstable (Reactive) Materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used in Group U Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8001.10.6 and shall not contain other storage.

8001.15.3 Special Requirements For Toxic Liquids. The exempt amount for toxic liquids with vapor pressures in excess of 1 psia (6.89 kPa) at 77°F (25°C) shall be the exempt amount listed for highly toxic liquids.

8001.15.4 Outdoor Storage.

8001.15.4.1 Quantities Exceeding Exempt Amounts. Outdoor storage of hazardous materials where the aggregate quantity exceeds the exempt amounts specified in Tables 8001.15–C and 8001.15–D shall be in accordance with the outdoor storage provisions of Section 8003.

8001.15.4.2 Quantities Not Exceeding The Exempt Amounts. Outdoor control areas are not required to be in accordance with Section 8003 except as follows:

1. Outdoor control area shall be kept free of weeds, debris and common combustible materials not necessary to the storage. The area surrounding an outdoor control area shall be kept clear of such materials for a minimum of 15 feet (4572 mm).

2. Outdoor control areas shall be located not closer than 20 feet (6096 mm) of a property line that can be built upon, street, alley or public way. A two–hour fire–resistive wall without openings extending not less than 30 inches (762 mm) above and to the sides of the storage area is allowed in lieu of such distance.

3. Where a property exceeds 10,000 square feet (929 m^2), a group of two outdoor control areas is allowed when approved and when each control area is separated by a minimum distance of 50 feet (15 240 mm).

4. Where a property exceeds 35,000 square feet (3252 m^2), additional groups of outdoor control areas are allowed when approved and when each group is separated by a minimum distance of 300 feet (91 440 mm).

8001.16 Regulations for Specific Hazardous Materials in Quantities not Exceeding Exempt Amounts.

8001.16.1 General. Hazardous materials stored, dispensed, used or handled in quantities not exceeding exempt amounts set forth in Section 8001.15 shall be in accordance with Section 8001.16.

8001.16.2 Flammable Gases.

8001.16.2.1 Emergency Shutoff. Compressed gas systems conveying flammable gases shall be provided with emergency shutoff capability in accordance with Section 8004.1.12.

8001.16.2.2 Ignition Source Control. Ignition sources in areas containing flammable gases shall be controlled in accordance with Section 8001.9.

NO SMOKING signs shall be posted in areas containing flammable gases in accordance with Section 8003.1.2.

8001.16.2.3 Liquefied Flammable Gases and Flammable Gases In Solution. Containers of liquefied flammable gases

and flammable gases in solution shall be positioned in accordance with Section 8004.1.13.

8001.16.3 Oxidizing Gases.

8001.16.3.1 Emergency Shutoff. Compressed gas systems conveying oxidizing gases shall be provided with emergency shutoff capability in accordance with Section 8004.1.12.

8001.16.3.2 Ignition Source Control. Ignition sources in areas containing oxidizing gases shall be controlled in accordance with Section 8001.9.

8001.16.4 Pyrophoric Gases.

8001.16.4.1 Emergency Shutoff. Compressed gas systems conveying pyrophoric gases shall be provided with emergency shutoff capability in accordance with Section 8004.1.12.

SECTION 8002 — CLASSIFICATION BY HAZARD

8002.1 General. Hazardous materials shall be classified according to hazard categories. The categories include materials regulated by Article 80 and materials regulated elsewhere in this code.

8002.2 Hazard Categories.

8002.2.1 Physical Hazards. The materials categories listed in this section are classified as physical hazards. A material with a primary classification as a physical hazard can also present a health hazard.

1. Explosives and blasting agents, regulated elsewhere in this code.
2. Compressed gases, regulated in Article 80 and elsewhere in this code, as follows:
   - 2.1 Air,
   - 2.2 Flammable,
   - 2.3 Inert,
   - 2.4 Oxidizing,
   - 2.5 Pyrophoric,
   - 2.6 Simple asphyxiant,
   - 2.7 Unstable (reactive), and
   - 2.8 Health hazards identified in Section 8002.2.2.
3. Flammable and combustible liquids regulated elsewhere in this code.
4. Flammable solids.
5. Organic peroxides.
6. Oxidizer solids and liquids.
7. Pyrophoric solids and liquids.
8. Unstable (reactive) solids and liquids.
9. Water–reactive solids and liquids.
10. Cryogenic fluids, regulated elsewhere in this code.

8002.2.2 Health Hazards. The materials categories listed in this section are classified as health hazards. A material with a primary classification as a health hazard can also present a physical hazard.

1. Highly toxic and toxic materials, including highly toxic and toxic compressed gases.
2. Radioactive materials.
3. Corrosives.
4. Carcinogens, irritants, sensitizers and other health hazards.

8002.3 Descriptions and Examples. For descriptions and examples of materials included in hazard categories, see Appendix VI–A, page 1-335 except that refrigerants regulated under Article 63 shall be classified in accordance with Appendix VI-J, Table A–VI–J–1 if the refrigerant used is included in Table A–VI–J–1.

TABLE 8001.15–A—EXEMPT AMOUNTS OF HAZARDOUS MATERIALS PRESENTING A PHYSICAL HAZARD MAXIMUM QUANTITIES PER CONTROL AREA[1]
When two units are given, values within parentheses are in cubic feet (cu. ft.) or pounds (lbs.)
(Apply table as specified in Section 8001.15.)

CONDITION		STORAGE[2]			USE[2]—CLOSED SYSTEMS			USE[2]—OPEN SYSTEMS	
Material	Class	Solid Lbs.[3] (cubic feet)	Liquid Gallons[3] (pounds)	Gas Cubic Feet	Solid Lbs. (cubic feet)	Liquid Gallons (pounds)	Gas Cubic Feet	Solid Lbs. (cubic feet)	Liquid Gallons (pounds)
		0.4536 for kg 0.0283 for m^3	3.785 for L 0.4536 for kg	0.0283 for m^3	0.4536 for kg 0.0283 for m^3	3.785 for L 0.4536 for kg	0.0283 for m^3	0.4536 for kg 0.0283 for m^3	3.785 for L 0.4536 for kg
1.1 Combustible liquid[4,5,6,7,8,9]	—	—	—	—	—	—	—	—	—
1.2 Combustible fiber[17] (loose)	—	(100)	N.A.	N.A.	(100)	N.A.	N.A.	(20)	N.A.
(baled)		(1,000)	N.A.	N.A.	(1,000)	N.A.	N.A.	(200)	N.A.
1.3 Cryogenic, flammable or oxidizing[17]	—	N.A.	45	N.A.	N.A.	45	N.A.	N.A.	10
2.1 Explosives[12,17]	—	1[10,13]	(1)[10,13]	N.A.	1/4	(1/4)	N.A.	1/4	(1/4)
3.1 Flammable solid[17]	—	125[6,10]	N.A.	N.A.	[14]	N.A.	N.A.	[14]	N.A.
3.2 Flammable gas[17] (gaseous)	—	N.A.	N.A.	750[6,10]	N.A.	N.A.	750[6,10]	N.A.	N.A.
(liquefied)		N.A.	15[6,10]	N.A.	N.A.	15[6,10]	N.A.	N.A.	N.A.
3.3 Flammable liquid[4,5,6,7,8,9] Combination I–A, I–B, I–C[4,5,6,7,8,9,15]	—	—	—	—	—	—	—	—	—
4.1 Organic peroxide, detonatable	—	1[10,12]	(1)[10,12]	N.A.	1/4[12]	(1/4)[12]	N.A.	1/4[12]	(1/4)[12]
4.2 Organic peroxide	I	5[6,10]	(5)[6,10]	N.A.	1[6]	(1)[6]	N.A.	1[6]	(1)[6]
	II	50[6,10]	(50)[6,10]	N.A.	50[6]	(50)[6]	N.A.	10[6]	(10)[6]
	III	125[6,10]	(125)[6,10]	N.A.	125[6]	(125)[6]	N.A.	25[6]	(25)[6]
	IV	500[6,10]	(500)[6,10]	N.A.	500[6]	(500)[6]	N.A.	100[6]	(100)[6]
	V	N.L.	N.L.	N.A.	N.L.	N.L.	N.A.	N.L.	N.L.

(Continued)

4.3 Oxidizer	4	1[10,12]	(1)[10,12]	N.A.	1/4[12]	(1/4)[12]	N.A.	1/4[12]	(1/4)[12]
	3[16]	10[6,10]	(10)[6,10]	N.A.	2[6]	(2)[6]	N.A.	2[6]	(2)[6]
	2	250[6,10]	(250)[6,10]	N.A.	250[6]	(250)[6]	N.A.	50[6]	(50)[6]
	1	4,000[6,10]	(4,000)[6,10]	N.A.	4,000[6]	(4,000)[6]	N.A.	1,000[6]	(1,000)[6]
4.4 Oxidizer—gas (gaseous)[6,10,17] (liquefied)[6,10,17]	—	N.A. N.A.	N.A. 15	1,500 N.A.	N.A. N.A.	N.A. 15	1,500 N.A.	N.A. N.A.	N.A. N.A.
5.1 Pyrophoric[17]	—	4[10,12]	(4)[10,12]	50[10,12]	1[12]	(1)[12]	10[10,12]	0	0
6.1 Unstable (reactive)[17]	4	1[10,12]	(1)[10,12]	10[10,12]	1/4[12]	(1/4)[12]	2[10,12]	1/4[12]	(1/4)[12]
	3	5[6,10]	(5)[6,10]	50[6,10]	1[6]	(1)[6]	10[6,10]	1[6]	(1)[6]
	2	50[6,10]	(50)[6,10]	750[6,10]	50[6]	(50)[6]	750[6,10]	10[6]	(10)[6]
	1	N.L.	N.L.	N.L.[6,10]	N.L.	N.L.	N.L.	N.L.	N.L.
7.1 Water reactive	3	5[6,10]	(5)[6,10]	N.A.	5[6]	(5)[6]	N.A.	1[6]	(1)[6]
	2	50[6,10]	(50)[6,10]	N.A.	50[6]	(50)[6]	N.A.	10[6]	(10)[6]
	1	N.L.	N.L.	N.A.	N.L.	N.L.	N.A.	N.L.	N.L.

NA = Not Applicable. NL = Not Limited.

[1]Control areas shall be separated from each other by not less than a one-hour fire-resistive occupancy separation. The number of control areas within a building having Group M Occupancies and buildings or portions of buildings having Group S Occupancies with storage conditions in accordance with Section 8001.14 shall not exceed two. The number of control areas in buildings with other uses or with other Group S Occupancy storage conditions shall not exceed four. See Sections 204 and 8001.10.2.

[2]The aggregate quantity in use and storage shall not exceed the quantity listed for storage. Quantities shall not exceed limits set forth in Section 8001.15.2.

[3]The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials within a single control area of Group M Occupancies used for retail sales may exceed the exempt amounts when such areas are in compliance with Section 8001.14.

[4]For flammable and combustible liquids, see Article 79. See also Section 8001.1.1, Exception 2.

[5]For aerosols, see Article 88.

[6]Quantities may be increased 100 percent in sprinklered buildings. When Footnote 10 also applies, the increase for both footnotes may be applied.

[7]For storage and use of flammable and combustible liquids in Groups A, B, E, F, H, I, M, R, S and U Occupancies, see also the Building Code.

[8]For wholesale and retail sales use, see Section 7902.5.10.2.

[9]Spray application of any quantity of flammable or combustible liquids shall be conducted as set forth in Article 45.

[10]Quantities may be increased 100 percent when stored in approved storage cabinets, gas cabinets or exhausted enclosures as specified in Sections 8001.3.2, 8003.3.1.3.2 and 8003.3.1.3.3. When Footnote 6 also applies, the increase for both footnotes may be applied.

[11]The quantities permitted in a sprinklered building are not limited.

[12]Permitted in sprinklered buildings only. None is allowed in unsprinklered buildings.

[13]One pound (.454 kg) of black sporting powder and 20 pounds (9 kg) of smokeless powder are permitted in sprinklered or unsprinklered buildings.

[14]See definitions of Group H, Divisions 2 and 3 Occupancies in Section 216.

[15]See Article 79.

[16]A maximum quantity of 200 pounds (90.7 kg) of solid or 20 gallons (75.7 L) of liquid Class 3 oxidizers is allowed when such materials are necessary for maintenance purposes, operation or sanitation of equipment. Storage containers and the manner of storage shall be approved.

[17]For any amount, see Articles 28, 30, 45, 46, 48, 50, 74, 75, 76, 77 and 78 as applicable for the hazard category.

[18]Unless the actual weight of the pyrotechnic composition of the fireworks, 1.4G is known, 25 percent of the gross weight of the fireworks, including packaging, may be used to determine the weight of the fireworks for the purpose of this table.

TABLE 8001.15-B—EXEMPT AMOUNTS OF HAZARDOUS MATERIALS PRESENTING A HEALTH HAZARD MAXIMUM QUANTITIES PER CONTROL AREA[1,2]

When two units are given, values within parentheses are in pounds (lbs.)
(Apply table as specified in Section 8001.15.)

MATERIAL	STORAGE[3]			USE[3]—CLOSED SYSTEMS			USE[3]—OPEN SYSTEMS	
	Solid Pounds[4,5,6]	Liquid Gallons[4,5,6] (pounds)	Gas Cubic Feet[6]	Solid Pounds[8]	Liquid Gallons[8] (pounds)	Gas Cubic Feet[6]	Solid Pounds	Liquid Gallons (pounds)
	0.4536 for kg	3.785 for L 0.4536 for kg	0.028 for m^3	0.4536 for kg	3.785 for L 0.4536 for kg	0.028 for m^3	0.4536 for kg	3.785 for L 0.4536 for kg
1. Corrosives	5,000	500	810[6]	5,000	500	810[6]	1,000[5]	100[5]
2. Highly toxics[11]	10	(10)	20[12]	10	(10)	20[12]	3[5]	(3)[5]
3. Irritants[7]	N.L.	N.L.	810[6,9]	N.L.	N.L.	810[9]	5,000[9]	500[9]
4. Sensitizers[7]	N.L.	N.L.	810[6,9]	N.L.	N.L.	810[6,9]	5,000[9]	500[9]
5. Other health hazards[7]	N.L.	N.L.	810[6,9]	N.L.	N.L.	810[6,9]	5,000[9]	500[9]
6. Toxics[11]	500	(500)	810[6]	500	(500)	810[12]	125[5]	(125)[5]

NL = Not Limited.

[1]Control areas shall be separated from each other by not less than a one-hour fire-resistive occupancy separation. The number of control areas within a building having Group M Occupancies and buildings or portions of buildings having Group S Occupancies with storage conditions in accordance with Section 8001.14 shall not exceed two. The number of control areas in buildings with other uses or with other Group S Occupancy storage conditions shall not exceed four. See Sections 204 and 8001.10.2.

[2]See Section 8001.1.1, Exception 2.

[3]The aggregate quantity in use and storage shall not exceed the quantity listed for storage. Quantities shall not exceed limits set forth in Sections 8001.15.2and 8001.15.3.

[4]The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid health hazard materials within a single control area of Group M and Group S Occupancies may exceed the exempt amounts when such areas are in compliance with Section 8001.14.

[5]Quantities may be increased 100 percent in sprinklered buildings. When Footnote 6 also applies, the increase for both footnotes may be applied.

[6]Quantities may be increased 100 percent when stored in approved storage cabinets, gas cabinets or exhausted enclosures as specified in Sections 8001.3.2, 8003.3.1.3.2 and 8003.3.1.3.3. When Footnote 5 also applies, the increase for both footnotes may be applied.

[7]Irritants, sensitizers and other health hazards do not include commonly used building materials and consumer products that are not otherwise regulated by this code.

[8]See also applicable federal and state OSHA guidelines.

[9]The quantities allowed in a sprinklered building are not limited when exhaust ventilation in accordance with Sections 8003.1.4, 8004.1.11, 8004.2.2.2 and 8004.2.3.3, as applicable to the material condition, is provided.

[10]The quantities allowed in a sprinklered building are not limited when exhaust ventilation in accordance with Sections 8003.1.4, 8004.1.11, 8004.2.2.2 and 8004.2.3.3 and spill control and secondary containment in accordance with Sections 8003.1.3, 8004.1.4, 8004.2.2.5 and 8004.2.3.6, as applicable to the material condition, is provided.

[11]For special provisions, see Sections 8003.3, 8003.12, 8004.2.3.7 and 8004.3.5.

[12]Permitted only when located in approved gas cabinets, exhausted enclosures or gas rooms. See Sections 8003.3.1.3.2, 8003.3.1.3.3 and 8003.3.1.3.4.

[13]Licensed, sealed sources for instruments, calibration devices and equipment are exempt. Licensing requirements and determination of whether a source is sealed or nonsealed shall be as set forth in Nuclear Regulatory Commission regulations.

Individual containers shall not exceed a quantity of 2 mCi (7.4 10^7 becquerels) for alpha emitters, 200 Ci (7.4 10^{12} becquerels) for beta emitters and 0.1 Ci (3.7 10^9 becquerels) for gamma emitters.

Ci = curies, mCi = millicuries

TABLE 8001.15-C—EXEMPT AMOUNTS OF HAZARDOUS MATERIALS PRESENTING A PHYSICAL HAZARD—MAXIMUM QUANTITIES ALLOWED IN AN OUTDOOR CONTROL AREA[1, 2, 3]

CONDITION		STORAGE			USE—CLOSED SYSTEM			USE—OPEN SYSTEM	
Material	Class	Solid Pounds	Liquid Gallons (pounds)	Gas Cu. Ft. at NTP	Solid Pounds	Liquid Gallons (pounds)	Gas Cu. Ft. at NTP	Solid Pounds	Liquid Gallons (pounds)
		? 0.4536 for kg	? 3.785 for L ? 0.4536 for kg	? 0.0283 for m^3	? 0.4536 for kg	? 3.785 for L ? 0.4536 for kg	? 0.0283 for m^3	? 0.4536 for kg	? 3.785 for L ? 0.4536 for kg
Flammable gas									
Gaseous		N.A.	N.A.	750	N.A.	N.A.	750	N.A.	N.A.
Liquefied		N.A.	15	N.A.	N.A.	15	N.A.	N.A.	N.A.
Flammable solid		125	N.A.	N.A.	25	N.A.	N.A.	25	N.A.
Organic peroxide	Unclassified Detonable	1	(1)	N.A.	1/4	(1/4)	N.A.	1/4	(1/4)
Organic peroxide	I	5	(5)	N.A.	1	(1)	N.A.	1	(1)
	II	50	(50)	N.A.	50	(50)	N.A.	10	(10)
	III	125	(125)	N.A.	125	(125)	N.A.	25	(25)
	IV	500	(500)	N.A.	500	(500)	N.A.	100	(100)
	V	N.L.	N.L.	N.A.	N.L.	N.L.	N.A.	N.L.	N.L.
Oxidizer	4	1	(1)	N.A.	1/4	(1/4)	N.A.	1/4	(1/4)
	3	10	(10)	N.A.	2	(2)	N.A.	2	(2)
	2	250	(250)	N.A.	250	(250)	N.A.	50	(50)
	1	4,000	(4,000)	N.A.	4,000	(4,000)	N.A.	1,000	(1,000)
Oxidizer gas									
Gaseous		N.A.	N.A.	1,500	N.A.	N.A.	1,500	N.A.	N.A.
Liquefied		N.A.	15	N.A.	N.A.	15	N.A.	N.A.	N.A.
Pyrophoric		4	4	50	1	(1)	10	0	0
Unstable	4	1	(1)	10	1/4	(1/4)	2	1/4	(1/4)
(reactive)	3	5	(5)	50	1	(1)	10	1	1
	2	50	(50)	250	50	(50)	250	10	10
	1	N.L.	N.L.	750	N.L.	N.L.	N.L.	N.L.	N.L.
Water reactive	3	5	(5)	N.A.	5	(5)	N.A.	1	(1)
	2	50	(50)	N.A.	50	(50)	N.A.	10	(10)
	1	N.L.	N.L.	N.A.	N.L.	N.L.	N.A.	N.L.	N.L.

NA = Not Applicable. NL = Not Limited.

[1]For gallons of liquids, divide the amount in pounds by 10.

[2]The aggregate quantities in storage and use shall not exceed the quantity listed for storage.

[3]The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials allowed in outdoor storage per single property under the same ownership or control used for retail or wholesale sales is allowed to exceed the exempt amounts when such storage is in accordance with Section 8001.14.

TABLE 8001.15–D—EXEMPT AMOUNTS OF HAZARDOUS MATERIALS PRESENTING A HEALTH HAZARD—MAXIMUM QUANTITIES ALLOWED IN AN OUTDOOR CONTROL AREA[1,2,3]

MATERIAL	STORAGE			USE—CLOSED SYSTEM			USE—OPEN SYSTEM	
	Solid Pounds	Liquid Gallons (pounds)	Gas Cu. Ft. at NTP	Solid Pounds	Liquid Gallons (pounds)	Gas Cu. Ft. at NTP	Solid Pounds	Liquid Gallons (pounds)
	? 0.4536 for kg	? 3.785 for L ? 0.4536 for kg	? 0.0283 for m^3	? 0.4536 for kg	? 3.785 for L ? 0.4536 for kg	? 0.0283 for m^3	? 0.4536 for kg	? 3.785 for L ? 0.4536 for kg
Corrosives	5,000	500	810	5,000	500	810	1,000	100
Highly toxics	10	(10)	20[4]	10	(10)	20[4]	3	(3)
Irritants	10,000	1,000	810	10,000	1,000	810	5,000	500
Other health hazards	10,000	1,000	810	10,000	1,000	810	5,000	500
Radioactive[5,6]:								
Alpha emitters	2 mCi (74 MBa)	2 mCi (74 MBa)	2 mCi (74 MBa)	0	0	0	0	0
Beta emitters	200 mCi (7.4 x 10^6 MBa)	200 mCi (7.4 x 10^6 MBa)	200 mCi (7.4 x 10^6 MBa)	0	0	0	0	0
Gamma emitters	14 Ci (5.2 x 10^5 MBa)	14 Ci (5.2 x 10^5 MBa)	14 Ci (5.2 x 10^5 MBa)	0	0	0	0	0
Sensitizers	10,000	1,000	810	10,000	1,000	810	5,000	500
Toxics	500	(500)	810	500	50	810	25	(25)

[1]For gallons of liquids, divide the amount in pounds by 10.

[2]The aggregate quantities in storage and use shall not exceed the quantity listed for storage.

[3]The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials allowed in outdoor storage per single property under the same ownership or control used for retail or wholesale sales is allowed to exceed the exempt amounts when such storage is in accordance with Section 8001.14.

[4]Permitted only when used in approved exhausted gas cabinets, exhausted enclosures or fume hoods.

[5]For licensed nonsealed sources, the maximum quantity allowed and the maximum quantity per container in outdoor storage per single property under the same ownership or control are as follows; alpha emitters, 2 millicuries (mCi) (7.4 x 10^5 MBa) and the maximum quantity allowed per container is 0.1 curie(Ci) (3.7 x 10^9 becquerels).

[6]Licensed, sealed sources in instruments, calibration devices and equipment are exempted.

SECTION 8003 — STORAGE

8003.1 General.

8003.1.1 Applicability. Storage of hazardous materials where the aggregate quantity is in excess of the exempt amounts set forth in Section 8001.15 shall be in accordance with Sections 8001 and 8003.

Storage of hazardous materials where the aggregate quantity does not exceed the exempt amounts set forth in Section 8001.15 shall be in accordance with Section 8001.

For display and storage in retail and wholesale sales occupancies, see Section 8001.14.

8003.1.2 Signs. Signs prohibiting smoking shall be provided in storage areas and within 25 feet (7620 mm) of outdoor storage areas.

8003.1.3 Spill Control and Secondary Containment for Hazardous Materials Liquids and Solids.

8003.1.3.1 Applicability. Rooms, buildings or areas used for the storage of liquid or solid hazardous materials shall be provided with spill control and secondary containment in accordance with Section 8003.1.3.

EXCEPTION: Outdoor storage of containers on approved containment pallets in accordance with Section 8003.1.3.4.

8003.1.3.2 Spill Control for Hazardous Materials Liquids. Rooms, buildings or areas used for the storage of hazardous materials liquids in individual vessels having a capacity of more than 55 gallons (208.2 L) or when the aggregate capacity of multiple vessels exceeds 1,000 gallons (3785 L) shall be provided with spill control to prevent the flow of liquids to adjoining areas. Floors in indoor locations and similar surfaces in outdoor locations shall be constructed to contain a spill from the largest single vessel by one of the following methods:

1. Liquid–tight sloped or recessed floors in indoor locations or similar areas in outdoor locations,

2. Liquid–tight floors in indoor locations or similar areas in outdoor locations provided with liquid–tight raised or recessed sills or dikes, or

3. Sumps and collection systems.

Except for surfacing, the floors, sills, dikes, sumps and collection systems shall be constructed of noncombustible material, and the liquid–tight seal shall be compatible with the material stored. When liquid–tight sills or dikes are provided, they are not required at perimeter openings which are provided with an open–grate trench across the opening that connects to an approved collection system.

8003.1.3.3 Secondary Containment for Hazardous Materials Liquids and Solids. When required by Table 8003.1–A, buildings, rooms or areas used for the storage of hazardous materials liquids or solids shall be provided with secondary containment in accordance with this section when the capacity of an individual vessel or the aggregate capacity of multiple vessels exceeds the following:

Liquids: Capacity of an individual vessel exceeds 55 gallons (208.2 L) or the aggregate capacity of multiple vessels exceeds 1,000 gallons (3785 L).

Solids: Capacity of an individual vessel exceeds 550 pounds (248.8 kg) or the aggregate capacity of

multiple vessels exceeds 10,000 pounds (4524.8 kg).

The building, room or area shall contain or drain the hazardous materials and fire–protection water through the use of one of the following methods:

1. Liquid–tight sloped or recessed floors in indoor locations or similar areas in outdoor locations,

2. Liquid–tight floors in indoor locations or similar areas in outdoor locations provided with liquid–tight raised or recessed sills or dikes,

3. Sumps and collection systems, or

4. Drainage systems leading to an approved location.

Incompatible materials shall be separated from each other in the secondary containment system.

Secondary containment for indoor storage areas shall be designed to contain a spill from the largest vessel plus the design flow volume of fire–protection water calculated to discharge from the fire–extinguishing system over the minimum required system design area or area of the room or area in which the storage is located, whichever is smaller, for a period of 20 minutes.

Secondary containment for outdoor storage areas shall be designed to contain a spill from the largest individual vessel. If the area is open to rainfall, secondary containment shall be designed to include the volume of a 24–hour rainfall as determined by a 25–year storm and provisions shall be made to drain accumulations of groundwater and rainwater.

A monitoring method shall be provided to detect hazardous materials in the secondary containment system. The monitoring method is allowed to be visual inspection of the primary or secondary containment, or other approved means. Where secondary containment is subject to the intrusion of water, a monitoring method for detecting water shall be provided. When monitoring devices are provided, they shall be connected to distinct visual or audible alarms.

Drainage systems shall be in accordance with the Plumbing Code and the following:

1. The slope of floors in indoor locations or similar areas in outdoor locations to drains shall not be less than 1 percent,

2. Drains from indoor storage areas shall be sized to carry the volume of the fire–protection water as determined by the design density discharged from the automatic fire–extinguishing system over the minimum required system design area or area of the room or area in which the storage is located, whichever is smaller,

3. Drains from outdoor storage areas shall be sized to carry the volume of the fire flow and the volume of a 24–hour rainfall as determined by a 25–year storm,

4. Materials of construction for drainage systems shall be compatible with the materials stored,

5. Incompatible materials shall be separated from each other in the drainage system, and

6. Drains shall terminate in an approved location away from buildings, valves, means of egress, fire access roadways, adjoining property and storm drains.

8003.1.3.4 Containment Pallets. When used as a substitute for spill control and secondary containment for outdoor storage in accordance with the exception in Section 8003.1.3.1, containment pallets shall comply with the following:

1. A liquid–tight sump accessible for visual inspection shall be provided,

2. The sump shall be designed to contain not less than 66 gallons (249.8 L),

3. Exposed surfaces shall be compatible with material stored, and

4. Containment pallets shall be protected to prevent collection of rainwater within the sump.

8003.1.4 Ventilation.

8003.1.4.1 General. Indoor storage areas and storage buildings shall be provided with mechanical exhaust ventilation or natural ventilation where natural ventilation can be shown to be acceptable for the materials as stored.

EXCEPTION: Storage areas for flammable solids. See also Article 76.

8003.1.4.2 System Requirements. Exhaust ventilation systems shall comply with all of the following:

1. Installation shall be in accordance with the Mechanical Code,

2. Mechanical ventilation shall be at a rate of not less than 1 cubic foot per minute per square foot (5.1 l/s per m^2) of floor area over the storage area,

3. Systems shall operate continuously unless alternate designs are approved,

4. A manual shutoff control shall be provided outside of the room in a position adjacent to the access door to the room or in an approved location. The switch shall be of the break–glass type and shall be labeled VENTILATION SYSTEM EMERGENCY SHUTOFF,

5. Exhaust ventilation shall be arranged to consider the density of the potential fumes or vapors released. For fumes or vapors that are heavier than air, exhaust shall be taken from a point within 12 inches (304.8 mm) of the floor,

6. The location of both the exhaust and inlet air openings shall be arranged to provide air movement across all portions of the floor or room to prevent the accumulation of vapors, and

7. Exhaust ventilation shall not be recirculated within the room or building if the materials stored are capable of emitting hazardous vapors.

8003.1.5 Separation of Incompatible Hazardous Materials. See Section 8001.11.8.

8003.1.6 Fire–extinguishing Systems. Indoor storage areas and storage buildings shall be protected by an automatic sprinkler system. The design of the sprinkler system shall not be less than that required by the Building Code for Ordinary Hazard Group 2 with a minimum design area of 3,000 square feet (278.7 m^2). See Section 9002, Standard 10-3. Where the materials or storage arrangement requires a higher level of sprinkler system protection in accordance with nationally recognized standards, the higher level of sprinkler system protection shall be provided.

EXCEPTION: Approved alternate automatic fire–extinguishing systems are allowed.

8003.1.7 Explosion Control. Indoor storage rooms, areas and buildings containing the following materials shall be provided with explosion control in accordance with the Building Code:

1. Highly toxic flammable or toxic flammable gases when not stored in gas cabinets, exhausted enclosures or gas rooms (see Section 8001.9).
2. Combustible dusts. See Article 76.
3. Class 4 oxidizers.
4. Detonatable and Class I organic peroxides.
5. Pyrophoric gases.
6. Class 3 and 4 unstable (reactive) materials.
7. Class 2 and 3 water–reactive solids and liquids.

8003.1.8 Standby Power. When mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be connected to a secondary source of power to automatically supply electrical power in the event of loss of power from the primary source. These systems shall be installed, maintained and tested in accordance with Section 1113.

EXCEPTION: Storage areas for:

1. Class 1 and 2 oxidizers.
2. Class III, IV and V organic peroxides.

8003.1.9 Limit Controls.

8003.1.9.1 General. Limit controls shall be provided in accordance with Section 8003.1.9.

8003.1.9.2 Temperature Control. Materials which must be stored at temperatures other than normal ambient temperatures to prevent a hazardous reaction shall be stored in an area provided with a means to maintain the temperature within a safe range. Redundant temperature control equipment which will operate upon failure of the primary temperature control system shall be provided. Alternate means which prevent a hazardous reaction are allowed.

8003.1.9.3 Pressure Control. Stationary tanks used for the storage of hazardous materials liquids which can generate pressures exceeding the tank design limits due to exposure fires or internal reaction shall have some form of construction or device that will relieve excessive internal pressure. Such relief devices shall vent to an approved location or to an exhaust scrubber or treatment system when specified in Sections 8003.2 through 8003.15.

8003.1.10 Emergency Alarm. An approved emergency alarm system shall be provided in buildings, rooms or areas used for storage of hazardous materials. Emergency alarm–initiating devices shall be installed outside of each interior exit or exit–access door of storage buildings, rooms or areas. Activation of an emergency alarm–initiating device shall sound a local alarm to alert occupants of an emergency situation involving hazardous materials.

8003.1.11 Supervision. Emergency alarm, detection and automatic fire–extinguishing systems required by Section 8003 shall be supervised by an approved central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on–site location.

8003.1.12 Clearance from Combustibles. The area surrounding an outdoor storage area or tank shall be kept clear of combustible materials and vegetation for a minimum distance of 30 feet (9144 mm).

8003.1.13 Noncombustible Floor. Except for surfacing, floors of storage areas shall be of noncombustible construction.

8003.1.14 Weather Protection. When overhead noncombustible construction is provided for sheltering outdoor hazardous material storage areas, such storage shall not be considered indoor storage when all of the following conditions are met:

EXCEPTION: Storage of explosive, detonatable or pyrophoric materials shall be considered as indoor storage.

1. Supports shall be of noncombustible construction,
2. Supports and walls shall not obstruct more than 25 percent of the perimeter of the storage area, and
3. The distance to buildings, property lines, streets, alleys, public ways or means of egress to a public way shall not be less than the distance required for an outdoor hazardous material storage area without weather protection.

8003.1.15 Required Detached Storage. Group H Occupancies containing quantities of hazardous materials in excess of those set forth in Table 8003.1–B shall be in buildings used for no other purpose, shall not exceed one story in height and shall be without basements, crawl spaces or other under–floor spaces.

TABLE 8003.1–A—REQUIRED SECONDARY CONTAINMENT—HAZARDOUS MATERIALS SOLIDS AND LIQUIDS STORAGE

MATERIAL		INDOOR STORAGE		OUTDOOR STORAGE	
		Solids	Liquids	Solids	Liquids
1. Physical Hazard Materials					
Combustible dusts		NR	NA	NR	NA
Combustible liquids	Class II	NA	See Article 79	NA	See Article 79
	Class III–A	NA	See Article 79	NA	See Article 79
	Class III–B	NA	See Article 79	NA	See Article 79
Cryogenic liquids		NA	See Article 75	NA	See Article 75
Explosives		See Article 77		See Article 77	
Flammable liquids	Class I–A	NA	See Article 79	NA	See Article 79
	Class I–B	NA	See Article 79	NA	See Article 79
	Class I–C	NA	See Article 79	NA	See Article 79
Flammable solids		NR	NA	NR	NA
Organic peroxides	Class D	R	R	NR	NR
	Class I	R	R	NR	NR
	Class II	R	R	NR	NR

(Continued)

	Class III	R	R	NR	NR
	Class IV	R	R	NR	NR
	Class V	NR	NR	NR	NR
Oxidizers	Class 4	R	R	NR	NR
	Class 3	R	R	NR	NR
	Class 2	R	R	NR	NR
	Class 1	R	R	NR	NR
Pyrophorics		NR	R	NR	R
Unstable (reactives)	Class 4	R	R	R	R
	Class 3	R	R	R	R
	Class 2	R	R	R	R
	Class 1	NR	NR	R	R
Water reactives	Class 3	R	R	R	R
	Class 2	R	R	R	R
	Class 1	NR	NR	R	R
2. Health Hazard Materials					
Carcinogens		NR	NR	NR	R
Corrosives		NR	R	NR	R
Highly toxics		R	R	R	R
Irritants		NR	NR	NR	R
Other health hazards		NR	NR	NR	R
Radioactives		R	R	R	R
Sensitizers		NR	NR	NR	R
Toxics		R	R	R	R

NA = Not Applicable NR = Not Required R = Required D = Detonatable

TABLE 8003.1–B—REQUIRED DETACHED STORAGE (See Section 8003.1.15)

DETACHED STORAGE IS REQUIRED WHEN THE QUANTITY OF MATERIAL EXCEEDS THAT LISTED			
Material		Solids and Liquids (tons)[1,2] 907.2 for kg	Gases (cubic feet)[1,2] 0.0283 for m^3
1. Explosives, blasting agents, black powder, fireworks (1.4G), detonatable organic peroxides 2. Class 4 oxidizers 3. Class 3 or 4 detonatable unstable (reactives)		Over exempt amounts	Over exempt amounts
4. Oxidizers, liquids and solids	Class 3 Class 2	1,200 2,000	N.A. N.A.
5. Organic peroxides	Class I Class II Class III	Over exempt amounts 25 50	N.A. N.A. N.A.
6. Unstable (reactives)	Class 4 Class 3 Class 2	1/1,000 1 25	20 2,000 10,000
7. Water reactives	Class 3 Class 2	1 25	N.A. N.A.
8. Pyrophoric gases		N.A.	2,000

N.A = Not Applicable.

[1]For materials which are detonatable, the distance to other buildings or property lines shall be as specified in the nationally recognized standard.

[2]"Over exempt amounts" means over the quantities set forth in Table 8001.15–A.

8003.2 Explosives and Blasting Agents. Storage of explosives and blasting agents shall be in accordance with Article 77. Storage of fireworks shall be in accordance with Article 78.

Storage of explosives, blasting agents, black powder and fireworks shall be in detached buildings in accordance with Section 8003.1.15 when required by Section 8003.1.15.

8003.3 Toxic and Highly Toxic Compressed Gases.

8003.3.1 Indoor Storage.

8003.3.1.1 General. Indoor storage of toxic and highly toxic compressed gases in amounts exceeding the exempt amounts set forth in Section 8001.15 shall be in accordance with Sections 8003.1, 8003.3.1 and 8003.3.3.

8003.3.1.2 Fire–extinguishing System. In addition to Section 8003.1.6, the following requirements shall apply:

1. Gas cabinets, exhausted enclosures and gas rooms for the storage of cylinders shall be internally sprinklered, and

2. Alternate fire–extinguishing systems shall not be used for storage areas, gas cabinets, exhausted enclosures or gas rooms.

8003.3.1.3 Ventilation and Storage Arrangement.

8003.3.1.3.1 Ventilated Area. Cylinders shall be stored within gas cabinets, exhausted enclosures or gas rooms.

EXCEPTION: Toxic gas cylinders having an aggregate capacity not exceeding the exempt amounts set forth in Table 8001.15–B when Footnote 6 is not applied.

Portable and stationary tanks shall be stored within gas rooms or exhausted enclosures. The room or area in which gas cabinets or exhausted enclosures are located shall be provided with exhaust ventilation. Gas cabinets or exhausted enclosures shall not be used as the sole means of exhaust for any room or area.

8003.3.1.3.2 Gas Cabinets. Gas cabinets shall comply with all of the following:

1. Operate at negative pressure in relation to the surrounding area,

2. Be provided with self–closing limited access ports or noncombustible windows to give access to equipment controls. The average velocity at the face of access ports or windows shall not be less than 200 feet per minute (1.02 m/s) with a minimum of 150 feet per minute (0.76 m/s) at any point of the access port or window,

3. Be connected to an exhaust system,

4. Be provided with self–closing doors, and

5. Be constructed of not less than 0.097–inch (2.46 mm) (12 gauge) steel.

8003.3.1.3.3 Exhausted Enclosures. Exhausted enclosures shall be designed to:

1. Operate at a negative pressure in relation to the surrounding area, and

2. Provide an average velocity at the face of the enclosure of not less than 200 feet per minute (1.02 m/s) with a minimum of 150 feet per minute (0.76 m/s) at any point.

8003.3.1.3.4 Gas Rooms. Gas rooms shall be designed to:

1. Operate at a negative pressure in relation to the surrounding area, and

2. Direct the exhaust ventilation to an exhaust system.

8003.3.1.3.5 Treatment Systems.

8003.3.1.3.5.1 General. Treatment systems shall be utilized to handle the accidental release of gas. Treatment systems shall be utilized to process all exhaust ventilation to be discharged from gas cabinets, exhausted enclosures and gas rooms.

1. Highly toxic and toxic gases—Storage. A treatment system is not required for cylinders, containers and tanks of highly toxic or toxic gases in storage when all of the following controls are provided:

   1.1. Valve outlets are equipped with gastight outlet plugs or caps.

   1.2. Handwheel-operated valves have handles secured to prevent movement.

   1.3. Approved containment vessels or containment systems are provided in accordance with Section 8003.3.3.3, Exception 2.

2. Toxic gases—Use. Treatment systems are not required for toxic gases supplied by cylinders when the following are provided:

   2.1. A gas detection system with a sensing interval not exceeding 5 minutes is provided.

   2.2. An approved automatic-closing fail-safe valve, located immediately adjacent to cylinder valves, is provided. The fail-safe valve shall close when gas is detected at the permissible exposure limit (PEL) by a gas detection system monitoring the exhaust system at the point of discharge from the gas cabinet, exhausted enclosure, ventilated enclosure or gas room. The gas detection shall comply with Section 8003.3.1.6.

8003.3.1.3.5.2 Design. Treatment systems shall be capable of diluting, adsorbing, absorbing, containing, neutralizing, burning or otherwise processing the entire contents of the largest single tank or cylinder of gas stored or used. When a total containment system is utilized, the system shall be designed to handle the maximum anticipated pressure of release to the system when it reaches equilibrium.

8003.3.1.3.5.3 Performance. Treatment systems shall be designed to reduce the maximum allowable discharge concentration of the gas to one–half IDLH at the point of discharge to the atmosphere. When more than one gas is emitted to the treatment system, the treatment system shall be designed to handle the worst–case release based on the release rate, the quantity and the IDLH for all the gases stored or used.

8003.3.1.3.5.4 Sizing. Treatment systems shall be sized to process the maximum worst–case release of gas based on the maximum flow rate of release from the largest cylinder or tank utilized. The entire contents of tanks and cylinders shall be considered.

8003.3.1.3.5.5 Stationary Tanks. Stationary tanks shall be labeled with the maximum rate of release for the gas contained based on valves or fittings that are inserted directly into the tank. If multiple valves or fittings are provided, the maximum flow rate of release for the valve or fitting with the highest flow rate shall be indicated. If liquefied gases are in contact with valves or fittings, the liquid flow rate shall be utilized for purposes of computation. Flow rates indicated on the label shall be converted to cubic feet per minute (L/s) of gas at normal temperature and pressure.

8003.3.1.3.5.6 Portable Tanks and Cylinders. For portable tanks and cylinders, the maximum flow rate of release shall be calculated based on assuming the total release from the cylinder or tank within the time specified in Table 8003.3–A. When portable tanks or cylinders are equipped with approved excess flow or reduced flow valves, the worst–case release shall be determined by the maximum achievable flow from the valve as determined by the valve manufacturer or the gas supplier. Reduced flow and excess flow valves shall be permanently marked by the manufacturer to indicate the maximum design flow rate. Such markings shall indicate the flow rate for air under standard conditions.

TABLE 8003.3–A—RATE OF RELEASE FOR CYLINDERS AND PORTABLE TANKS

CONTAINER	NONLIQUEFIED (minutes)	LIQUEFIED (minutes)
Cylinders	5	30
Portable tanks	40	240

8003.3.1.4 Emergency Power. Emergency power shall be provided in lieu of standby power for:

1. Exhaust ventilation, including the power supply for treatment systems,

2. Gas–detection systems,

3. Emergency alarm systems, and

4. Temperature–control systems.

8003.3.1.5 Limit Controls. In addition to the limit controls required by Section 8003.1.9, excess flow control shall be provided for stationary tanks which are piped for filling or dispensing.

8003.3.1.6 Gas Detection. A continuous gas–detection system shall be provided to detect the presence of gas at or below the permissible exposure limit or ceiling limit. The detection system shall initiate a local alarm and transmit a signal to a constantly attended control station. The alarm shall be both visual and audible and shall be designed to provide warning both inside and outside of the storage area. The audible alarm shall be distinct from all other alarms.

EXCEPTIONS: 1. Signal transmission to a constantly attended control station need not be provided when not more than one cylinder is stored.

2. A continuous gas–detection system need not be provided for toxic gases when the physiological warning properties for the gas are at a level below the accepted permissible exposure limit for the gas.

The gas–detection system shall be capable of monitoring the room or area in which the gas is stored at or below the permissible exposure limit or ceiling limit and the discharge from the treatment system at or below one–half the IDLH limit.

8003.3.1.7 Smoke Detection. An approved supervised smoke–detection system shall be provided in rooms or areas where highly toxic compressed gases are stored indoors. Activation of the detection systems shall sound a local alarm.

8003.3.1.8 Maximum Number of Cylinders per Gas Cabinet. The number of cylinders contained in a single gas cabinet shall not exceed three.

EXCEPTION: Cabinets containing cylinders not exceeding1 pound (0.4536 kg) net contents each shall be limited to a maximum of 100 cylinders.

8003.3.2 Outdoor Storage.

8003.3.2.1 General. Outdoor storage of highly toxic or toxic compressed gases in amounts exceeding the exempt amounts set forth in Section 8001.15 shall be in accordance with Sections 8003.1, 8003.3.2 and 8003.3.3.

8003.3.2.2 Distance from Storage to Exposures.

8003.3.2.2.1 General. Outdoor storage of highly toxic or toxic compressed gases shall comply with the Building Code and Section 8003.3.2.2.

8003.3.2.2.2 Distance Limitation to Exposures. Outdoor storage of highly toxic or toxic compressed gases shall not be within 75 feet (22 860 mm) of a property line, street, alley, public way or means of egress to a public way or building not used exclusively for storage, distribution, or manufacturing of gases unless the storage is shielded by a structure having a minimum fire–resistive rating of two hours and which interrupts the line of sight between the storage and the exposure. The protective structure shall be at least 5 feet (1524 mm) from exposures. The protective structure shall not have more than two sides at approximately 90–degree directions, or three sides with connecting angles of approximately 135 degrees.

EXCEPTION: Gases in gas cabinets complying with Section 8003.3.1.3.2 and located 5 feet (1524 mm) or more from buildings and 25 feet (7620 mm) from means of egress. Section 8003.3.2.2.3 shall not apply.

8003.3.2.2.3 Openings in Exposed Buildings. When the storage area is located closer than 75 feet (22 860 mm) to a building, openings into a building other than piping shall not be above the height of the top of the shielding structure or within 50 feet (15 240 mm) horizontally from the storage area whether or not shielded by a protective structure.

EXCEPTION: Buildings associated with the manufacture or distribution of highly toxic or toxic gases.

8003.3.2.2.4 Air Intakes. The storage area shall not be within75 feet (22 860 mm) of air intakes.

8003.3.2.3 Canopies. Portable tanks and cylinders stored outside of buildings shall be stored under a canopy of noncombustible construction. Such storage shall not be considered indoor storage. See also Section 8003.1.14.

An automatic fire–sprinkler system shall be provided for canopies used for storage of highly toxic or toxic compressed gases.

EXCEPTION: An automatic sprinkler system is not required when:

1. All materials under the canopy, including hazardous materials and the containers in which they are stored, are noncombustible, and

2. The canopy is located not less than 30 feet from combustible materials or structures or is separated from such materials or structures using a fire barrier complying with Section 8003.3.2.2.2.

8003.3.2.4 Piping and Controls. In addition to the requirements of Section 8001.4.3, piping and controls on stationary tanks shall be in accordance with all of the following:

1.Pressure–relief devices shall be vented to a treatment system designed in accordance with Section 8003.3.1.3.5,

EXCEPTION: When approved by the Chief, sealed emergency relief devices provided exclusively for relieving pressure due to fire exposure need not be vented to a treatment system provided that: 1) the material in the tank is not flammable, 2) the tank is not located in a diked area with other tanks containing combustible materials, and 3) the tank is located not less than 75-feet from combustible materials or structures or is shielded by a fire barrier complying with Section 8003.3.2.2.2.

2. Where filling or dispensing connections are provided, they shall have a means of local exhaust. Such exhaust shall be designed to capture fumes and vapors. The exhaust shall be directed to a treatment system designed in accordance with Section 8003.3.1.3.5, and

3. Stationary tanks shall be provided with a means of excess flow control on tank inlet and outlet connections.

EXCEPTIONS: 1. Inlet connections that are designed to preclude backflow.

2. Pressure–relief devices.

3. When approved, sealed emergency relief devices, on a tank, provided exclusively for relieving pressure due to fire exposure need not be vented to a treatment system provided that: 1) the material in the tank is not flammable, 2) the tank is not located in a diked area with other tanks containing combustible materials, and 3) the tank is located not less than 75 feet from combustible materials or structures or is shielded by a fire barrier complying with Section 8003.3.2.2.2.

8003.3.3 Special Provisions.

8003.3.3.1 Seismic Protection. Stationary tanks and associated piping systems shall be seismically braced in accordance with the Building Code.

8003.3.3.2 Security. See Section 8001.11.2.

8003.3.3.3 Leaking Cylinders. One or more gas cabinets or exhausted enclosures shall be provided to handle leaking cylinders.

EXCEPTION: A cabinet or exhausted enclosure need not be provided for leaking cylinders if:

1. All cylinders are stored within gas cabinets or exhausted enclosures, or
2. Approved containment vessels or containment systems are provided in accordance with all of the following:
   - 2.1 Containment vessels or containment systems shall be capable of fully containing or terminating a release,
   - 2.2 Trained personnel shall be available at an approved location, and
   - 2.3 Containment vessels or containment systems shall be capable of being transported to the leaking cylinder.

Gas cabinets or exhausted enclosures shall be located as follows:

1. Within or adjacent to outdoor storage areas, or
2. Within gas rooms.

Gas cabinets or exhausted enclosures shall be connected to an exhaust system. See Section 8003.3.1.3.5.

8003.3.3.4 Local Exhaust for Leaking Portable Tanks. A means of local exhaust shall be provided to capture leaks from portable tanks. Portable ducts or collection systems designed to be applied to the site of a leak in a valve or fitting on the tank are acceptable. The local exhaust system shall be connected to a treatment system as specified in Section 8003.3.1.3.5. The local exhaust system shall be provided:

1. Within or immediately adjacent to outdoor storage areas, or
2. Within gas rooms used for portable or stationary tanks.

8003.4 Flammable and Combustible Liquids. Storage of flammable and combustible liquids shall be in accordance with Article 79.

8003.5 Flammable Solids and Flammable Gases.

8003.5.1 Indoor Storage.

8003.5.1.1 General. Indoor storage of flammable solids and flammable gases in amounts exceeding the exempt amounts set forth in Section 8001.15 shall be in accordance with Sections 8003.1 and 8003.5.1. Storage of combustible fibers shall be in accordance with Article 28. See also Section 8001.16.2 for storage of flammable gases in quantities not exceeding exempt amounts.

8003.5.1.2 Pile Size Limits and Location for Solids. Flammable solids stored in quantities greater than 1,000 cubic feet (28.3 m3) shall be separated into piles each not larger than 1,000 cubic feet (28.3 m^3). Aisle widths between piles shall not be less than the height of the piles or 4 feet (1219 mm), whichever is greater.

Flammable solids shall not be stored in basements.

8003.5.1.3 Static–producing Equipment. Static–producing equipment located in flammable gas storage areas shall be grounded.

8003.5.2 Outdoor Storage.

8003.5.2.1 General. Outdoor storage of flammable solids and flammable gases in amounts exceeding exempt amounts set forth in Section 8001.15 shall be in accordance with Sections 8003.1 and 8003.5.2. Storage of combustible fibers shall be in accordance with Article 28.

8003.5.2.2 Distance from Storage to Exposures. Outdoor storage of flammable solids shall not be located within 20 feet (6096 mm) of any building, property line, street, alley, public way, or means of egress to a public way. An unpierced two–hour fire–resistive wall extending not less than 30 inches (762 mm) above and to the sides of the storage area is allowed in lieu of such distance.

Outdoor storage of flammable gases shall be in accordance with Table 8003.5–A.

8003.5.2.3 Pile Size Limits for Solids. Outdoor storage of flammable solids shall be separated into piles not larger than 5,000 cubic feet (141 m^3) each. Aisle widths between piles shall not be less than one–half the height of the piles or 10 feet (3048 mm), whichever is greater.

8003.5.2.4 Static–producing Equipment. Static–producing equipment in flammable gas storage areas shall be grounded.

TABLE 8003.5–A—FLAMMABLE COMPRESSED GASES—DISTANCE FROM STORAGE TO EXPOSURES[1]

MAXIMUM AMOUNT PER STORAGE AREA (cubic feet)	MINIMUM DISTANCE TO BUILDINGS, STREETS, ALLEYS, PUBLIC WAYS OR PROPERTY LINES THAT CAN BE BUILT ON (feet)	MINIMUM DISTANCE BETWEEN STORAGE AREAS (feet)
× 0.0283 for m^3	× 304.8 for mm	
0–4,225	5	5
4,226–21,125	10	10
21,126–50,700	15	10
50,701–84,500	20	10
84,501 or greater	25	20

[1]The distances can be reduced to 5 feet (1524 mm) when protective structures having a minimum fire resistance of two hours interrupt the line of sight between the container and the exposure. The protective structure shall be at least 5 feet (1524 mm) from the exposure. The configuration of the protective structure shall allow natural ventilation to prevent the accumulation of hazardous gas concentrations.

8003.6 Oxidizers.

8003.6.1 Indoor Storage.

8003.6.1.1 Indoor storage of oxidizers in amounts exceeding the exempt amounts set forth in Sections 8001.15 shall be in accordance with Sections 8003.1 and 8003.6.1. Storage and display of Class 1, 2 and 3 oxidizers in Group M Occupancies shall be in accordance with Section 8001.14. Storage of Class 1, 2 and 3 oxidizers in Group S Occupancies is allowed to be in accordance with Section 8001.14.

See also Section 8001.16.3 for storage of oxidizing gases in quantities not exceeding exempt amounts.

8003.6.1.2 Detached Storage. Storage of liquid and solid oxidizers shall be in detached buildings in accordance with Section 8003.1.15 when required by Section 8003.1.15.

8003.6.1.3 Distance from Detached Storage Buildings to Exposures. In addition to the requirements of the Building Code, detached storage buildings shall be located in accordance with Tables 8003.6–A and 8003.6–B.

8003.6.1.4 Liquid–tight Floor. In addition to Section 8003.1.13, floors of storage areas for liquid and solid oxidizers shall be of liquid–tight construction.

8003.6.1.5 Smoke and Heat Venting. Smoke and heat venting shall be provided. The design criteria shall be as set forth in the Building Code.

8003.6.1.6 Smoke Detection. An approved supervised smoke–detection system shall be installed in liquid and solid oxidizer storage areas. Activation of the detection systems shall sound a local alarm.

> **EXCEPTION:** A smoke–detection system need not be provided in detached storage buildings protected by an automatic fire–extinguishing system.

8003.6.1.7 Storage Conditions. The maximum quantities per building in detached storage buildings shall not exceed those set forth in Tables 8003.6–C through 8003.6–F.

The storage arrangement for liquid and solid oxidizers shall be as set forth in Tables 8003.6–C through 8003.6–F.

Class 2 oxidizers shall not be stored in basements except when such storage is in stationary tanks. Class 3 and 4 oxidizers in excess of the exempt amounts set forth in Section 8001.15 shall be stored on the ground floor only.

8003.6.1.8 Separation of Class 4 Oxidizers from Other Materials. In addition to Section 8001.11.8, Class 4 oxidizer liquids and solids shall be separated from other hazardous materials by not less than one–hour fire–resistive construction or stored in hazardous materials storage cabinets. See Section 8001.10.6.

Detached storage buildings for Class 4 oxidizer liquids and solids shall be located a minimum of 50 feet (15 240 mm) from other hazardous materials storage.

8003.6.1.9 Contamination. Liquid and solid oxidizers shall not be stored on or against combustible surfaces. During storage, care shall be taken to prevent contamination.

8003.6.1.10 Static–producing Equipment. Static–producing equipment in oxidizer gas storage areas shall be grounded.

8003.6.2 Outdoor Storage.

8003.6.2.1 General. Outdoor storage of oxidizers in amounts exceeding the exempt amounts set forth in Section 8001.15 shall be in accordance with Sections 8003.1 and 8003.6.2.

8003.6.2.2 Distance from Storage to Exposures.

8003.6.2.2.1 Solids and Liquids. Storage areas for liquid and solid oxidizers shall be located in accordance with Tables 8003.6–A and 8003.6–B.

8003.6.2.2.2 Gases. Storage areas for oxidizer gases shall be in accordance with Table 8003.6–G.

8003.6.2.3 Storage Conditions.

8003.6.2.3.1 Solids and Liquids. Storage arrangement for liquid and solid oxidizers shall be in accordance with Tables 8003.6–C through 8003.6–F.

8003.6.2.3.2 Gases. Storage arrangement for oxidizer gases shall be in accordance with Table 8003.6-G.

TABLE 8003.6–A—CLASS 1, 2 AND 3 OXIDIZER LIQUIDS AND SOLIDS—SEPARATION OF DETACHED AND OUTDOOR STORAGE FROM OTHER BUILDINGS, PROPERTY LINES, STREETS, ALLEYS, PUBLIC WAYS OR MEANS OF EGRESSTO A PUBLIC WAY

OXIDIZER CLASS	MINIMUM DISTANCE (feet) × 304.8 for mm
1	NR
2	35
3	50

NR = Not Required.

TABLE 8003.6–B—CLASS 4 OXIDIZER LIQUIDS AND SOLIDS—SEPARATION OF DETACHED AND OUTDOOR STORAGE FROM OTHER BUILDINGS, PROPERTY LINES, STREETS, ALLEYS, PUBLIC WAYS OR MEANS OF EGRESS TO A PUBLIC WAY

WEIGHT (pounds) × 0.4536 for kg	MINIMUM DISTANCE (feet) × 304.8 for mm
Over 10 to 100	75
101 to 500	100
501 to 1,000	125
1,001 to 3,000	200
3,001 to 5,000	300
5,001 to 10,000	400
Over 10,000	As determined by the chief

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