CHAPTER 38
LIQUEFIED PETROLEUM GASES

SECTION 3801
GENERAL

3801.1 Scope. Storage, handling and on-site transportation of liquefied petroleum gas (LP-gas) and the installation of LP-gas equipment pertinent to systems for such uses shall comply with this chapter and NFPA 58. Properties of LP-gases shall be determined in accordance with Appendix B of NFPA 58.

3801.2 Permits and plans.

3801.2.1 Permits. Permits shall be required as set forth in Sections 105.6 and 105.7. A construction or operating permit is not required to install or maintain DOT cylinders or ASME containers less than 125 gallons (473 L) aggregate water capacity.

3801.2.2 Plans. Construction plans shall be submitted to the Fire Code Official for review and approval for installations where the aggregate water capacity of containers is 125 gallons (473 L) or greater, an ASME or DOT container is used for liquid service, an industrial or bulk plant is modified, or an LP-gas exchange program is installed or modified.

Distributors shall not fill an LP-gas container for which a construction permit is required until the installation has been inspected and approved by the Fire Code Official.

3801.2.3 Operational permit. An operational permit is required to operate a LP-gas installation with an aggregate water capacity of more than 2,000 gallons (7571 L) or to use an open flame (flare) to dispose of LP-gas from a container.

3801.3 Records. Installers shall maintain a record of installations for which a permit is not required by Section 105.6 and have such record available for inspection by the Fire Code Official.

Exception: Installation of gas-burning appliances and replacement of portable cylinders.

SECTION 3802
DEFINITIONS

3802.1 Definition. The following word and term shall, for the purposes of this chapter and as used elsewhere in this code, have the meaning shown herein.

LIQUEFIED PETROLEUM GAS (LP-gas). A material which is composed predominantly of the following hydrocarbons or mixtures of them: propane, propylene, butane (normal butane or isobutane) and butylenes.

SECTION 3803
INSTALLATION OF EQUIPMENT

3803.1 General. LP-gas equipment shall be installed in accordance with the *International Fuel Gas Code* and NFPA 58, except as otherwise provided in this chapter.

3803.2 Use of LP-gas containers in buildings. The use of LP-gas containers in buildings shall be in accordance with Sections 3803.2.1 and 3803.2.2.

3803.2.1 Portable containers. Portable LP-gas containers, as defined in NFPA 58, shall not be used in buildings except as specified in NFPA 58 and Sections 3803.2.1.1 through 3803.2.1.7.

3803.2.1.1 Use in basement, pit or similar location. LP-gas containers shall not be used in a basement, pit or similar location where heavier-than-air gas might collect. LP-gas containers shall not be used in an above-grade underfloor space or basement unless such location is provided with an approved means of ventilation.

Exception: Use with self-contained torch assemblies in accordance with Section 3803.2.1.6.

3803.2.1.2 Construction and temporary heating. Portable containers are allowed to be used in buildings or areas of buildings undergoing construction or for temporary heating as set forth in NFPA 58.

3803.2.1.3 Group F occupancies. In Group F occupancies, portable LP-gas containers are allowed to be used to supply quantities necessary for processing, research or experimentation. Where manifolded, the aggregate water capacity of such containers shall not exceed 735 pounds (334 kg) per manifold. Where multiple manifolds of such containers are present in the same room, each manifold shall be separated from other manifolds by a distance of not less than 20 feet (6096 mm).

3803.2.1.4 Group E and I occupancies. In Group E and I occupancies, portable LP-gas containers are allowed to be used for research and experimentation. Such containers shall not be used in classrooms. Such containers shall not exceed a 50-pound (23 kg) water capacity in occupancies used for educational purposes and shall not exceed a 12-pound (5 kg) water capacity in occupancies used for institutional purposes. Where more than one such container is present in the same room, each container shall be separated from other containers by a distance of not less than 20 feet (6096 mm).

3803.2.1.5 Demonstration uses. Portable LP-gas containers are allowed to be used temporarily for demonstrations and public exhibitions. Such containers shall not exceed a water capacity of 12 pounds (5 kg). Where more than one such container is present in the same room, each container shall be separated from other containers by a distance of not less than 20 feet (6096 mm).

3803.2.1.6 Use with self-contained torch assemblies. Portable LP-gas containers are allowed to be used to supply approved self-contained torch assemblies or similar

appliances. Such containers shall not exceed a water capacity of 2.5 pounds (1 kg).

3803.2.1.7 Use for food preparation. Where approved, listed LP-gas commercial food service appliances are allowed to be used for food-preparation within restaurants and in attended commercial food-catering operations in accordance with the *International Fuel Gas Code,* the *International Mechanical Code* and NFPA 58.

3803.2.1.8 Industrial vehicles and floor maintenance machines. Containers on industrial vehicles and floor maintenance machines shall comply with NFPA 58.

3803.2.2 Flame effects before an audience. Where cylinders are used temporarily inside of buildings for flame effects before an audience shall be in accordance with NFPA 160 *Standard for Flame Effects Before an Audience* and the requirements of this section.

3803.2.2.1 Submittal. The plan for the use of flame effects shall be submitted in writing to the Fire Code Official. The plan shall include the following:

1. The name of the person, group, or organization responsible for the production.
2. The dates and times of the production.
3. The location of the production.
4. The design criteria in Appendix B of NFPA 160.
5. The flame effect classification.
6. A site plan showing the following:
   A) A narrative description of the flame effect.
   B) The location of flame effect devices to be fired and their controls and control sequence.
   C) The area affected by the flame effect device.
   D) The location of the audience.
   E) The fuels used and their estimated consumption.
   F) Air for combustion and ventilation for indoor effects.
   G) Flammable materials piping.
   H) Storage and holding areas and their capacities.
   I) Supplemental fire protection features.
   J) Emergency response procedures.
   K) Means of egress.
7. A current material safety data sheet (MSDS) for the materials (fuels) consumed in the flame effect.
8. Documentation that the combustible materials used for construction of the flame effects have been rendered flame retardant.
9. The name of the effect operator.

3803.2.2.2 Cylinder volume. Cylinders shall be limited to a maximum volume of 20 pounds (9 kg) of propane and shall only be used for vapor service.

3803.2.2.3 Cylinder limit. Not more than three cylinders shall be connected to any flame effect apparatus.

3803.2.2.4 Cylinder hoses. Hoses shall be designed for a working pressure of 350 psig (2413 kPa) with a safety factor of 5 to 1 and shall be continuously marked with LP-GAS, PROPANE, 350 PSI WORKING PRESSURE, and the manufacturer's name or trademark. Hose assemblies, after the application of couplings, shall have a design capability of 700 psig. Hose assemblies shall be leak tested at the time of installation at not less than operating pressure of the system in which they are installed.

3803.2.2.5 Manifolded cylinder connections. When a flame effect requires two or more cylinders, the cylinders shall be connected to the flame effect apparatus as follows:

1. A check valve shall be installed directly downstream of each cylinder valve;
2. The manifold shall be constructed of piping complying with NFPA 58; and
3. Hoses connecting the manifold to the apparatus shall meet Section 3803.2.2.4.

3803.2.2.6 Cylinders shall not be connected or disconnected during the flame effect or performance.

3803.2.2.7 Idle cylinders. Cylinders in storage awaiting use shall be stored outside of Group A occupancies.

3803.3 Cylinders filled on site. DOT cylinders in stationary service that are filled on site shall be requalified in accordance with NFPA 58.

3803.3.1 Any cylinder that fails one or more of the criteria in Section 3803.3.2 shall not be refilled or continued in service until the condition is corrected.

3803.3.2 Personnel shall be trained and qualified to perform inspections. Training shall be documented in accordance with Section 3806.1.

3803.3.3 Visual inspection shall be performed in accordance with the following:

1. The cylinder is inspected for exposure to fire, dents, cuts, gouges and corrosion according to CGA C-6, *Standard for Visual Inspection of Steel Compressed Gas Cylinders*, except that paragraph 4.2.1.1(1) of that standard (which requires tare weight verification), shall not be part of the required inspection criteria.
2. The cylinder protective collar (where utilized) and the foot ring are intact and firmly attached.
3. The cylinder is painted or coated to retard corrosion.
4. The cylinder pressure relief valve has no visible damage, corrosion of operating components, or obstructions.
5. There is no leakage from the cylinder or its appurtenances that is detectable without the use of instruments.
6. The cylinder is installed on a firm foundation and is not in contact with the soil.

3803.3.4 Cylinder marking. A cylinder that passes the visual examination shall be marked in accordance with DOT requirements.

3803.3.5 Documentation. The results of the visual inspection shall be documented and a record of the inspection shall be maintained for a 5-year period.

SECTION 3804
LOCATION OF CONTAINERS

3804.1 General. The storage and handling of LP-gas and the installation and maintenance of related equipment shall comply with NFPA 58 and be subject to the approval of the Fire Code Official.

3804.2 Maximum capacity within established limits. ASME containers shall only be permitted on property when allowed by the City of Phoenix Zoning Ordinance.

3804.3 Container location. Containers shall be located with respect to buildings, public ways, and lot lines of adjoining property that can be built upon, in accordance with NFPA 58 Sections 6.3 and 6.4, Tables 6.3.1 and 6.3.9, and Annex I.

3804.3.1 Special hazards. Containers shall also be located with respect to special hazards such as above-ground flammable or combustible liquid tanks, oxygen or gaseous hydrogen containers, flooding or electric power lines as specified in NFPA 58, Section 6.4.5.8 and Table 6.4.5.8.

3804.4 Multiple container installation. Multiple container installations with a total water storage capacity of more than 180,000 gallons (681 300 L) [150,000-gallon (567 750 L) LP-gas capacity] shall be subdivided into groups containing not more than 180,000 gallons (681 300 L) in each group. Such groups shall be separated by a distance of not less than 50 feet (15 240 mm), unless the containers are protected in accordance with one of the following:

1. Mounded in an approved manner.
2. Protected with approved insulation on areas that are subject to impingement of ignited gas from pipelines or other leakage.
3. Protected by firewalls of approved construction.
4. Protected by an approved system for application of water as specified in NFPA 58, Table 6.23.6.
5. Protected by other approved means.

Where one of these forms of protection is provided, the separation shall not be less than 25 feet (7620 mm) between container groups.

3804.5 Screen walls. Screen walls constructed around LP-gas cylinders or containers shall be in accordance with this section. Screen walls shall not be constructed around containers with a water capacity greater than 2,000 gallons (7570 L).

3804.5.1 Construction. The walls shall be of noncombustible construction.

3804.5.2 Number. Not more than two walls shall be erected to screen LP-gas containers.

3804.5.3 Height. The walls shall not exceed 4 feet (1219 mm) in height.

3804.6 Installations on building roofs. The permanent installation of an ASME containers or DOT cylinders with a capacity of 20 pounds (9 kg) propane or greater on the roofs of buildings or the top floor of parking garages is prohibited. A temporary installation of ASME containers on the roofs of buildings or on the top floor of a parking garage is prohibited. Temporary use of DOT cylinders shall be in accordance with Section 3803.2.1.2.

SECTION 3805
PROHIBITED USE OF LP-GAS

3805.1 Nonapproved equipment. LP-gas shall not be used for the purpose of operating devices or equipment unless such device or equipment is approved for use with LP-gas.

3805.2 Release to the atmosphere. LP-gas shall not be released to the atmosphere, except through an approved liquid-level gauge or other approved device.

SECTION 3806
LIQUID TRANSFER AND OVERFILLING

3806.1 Personnel qualifications. Persons who transfer liquid LP-gas shall be trained in proper handling procedures, including the applicable requirements of NFPA 58. Refresher training shall be provided at least every 3 years. The training shall be documented. Dispensing of LP-gas as a motor vehicle fuel shall be in accordance with Chapter 22.

3806.2 Overfilling. LP-gas containers shall not be filled or maintained with LP-gas in excess of either the volume determined using the fixed liquid-level gauge installed by the manufacturer or the weight determined by the required percentage of the water capacity marked on the container. Portable containers shall not be refilled unless equipped with an overfilling prevention device (OPD) when required by Section 5.7.6 of NFPA 58.

3806.3 Dispensing locations. The point of transfer of LP-gas from one container to another shall be separated from exposures as specified in NFPA 58.

SECTION 3807
SAFETY PRECAUTIONS AND DEVICES

3807.1 Safety devices. Safety devices on LP-gas containers, equipment and systems shall not be tampered with or made ineffective.

3807.2 Smoking and other sources of ignition. "No Smoking" signs complying with Section 310 shall be posted when required by the Fire Code Official. Smoking within 25 feet (7620 mm) of a point of transfer, while filling operations are in progress at containers or vehicles, shall be prohibited. Control of other sources of ignition shall comply with Chapter 3 and NFPA 58, Section 6.20.

3807.3 Clearance to combustibles. Weeds, grass, brush, trash and other combustible materials shall be kept a minimum of 10 feet (3048 mm) from LP-gas tanks or containers.

3807.4 Protecting containers from vehicles. Where exposed to vehicular damage due to proximity to alleys, driveways or

parking areas, LP-gas containers, regulators and piping shall be protected in accordance with Section 312.

SECTION 3808
FIRE PROTECTION

3808.1 General. Fire protection shall be provided for installations having storage containers with a an aggregate water capacity of more than 4,000 gallons (15 140 L), as required by Section 6.23 of NFPA 58.

3808.2 Portable fire extinguishers. Portable fire extinguishers complying with Section 906 shall be provided as specified in NFPA 58.

3808.3 Fire safety analysis. A written fire safety analysis shall be provided for all new and existing installations with an aggregate water capacity of 4,000 gallons (15 140 L) or greater. The fire safety analysis shall be prepared in accordance with NFPA 58, Section 6.23. The fire safety analysis shall be provided to the Fire Code Official for review and approval.

SECTION 3809
STORAGE OF PORTABLE LP-GAS CONTAINERS AWAITING USE OR RESALE

3809.1 General. Storage of portable containers of 1,000 pounds (454 kg) or less, whether filled, partially filled or empty, at consumer sites or distributing points, and for resale by dealers or resellers shall comply with Sections 3809.2 through 3809.15.

Exceptions:

1. Containers that have not previously been in LP-gas service.
2. Containers at distributing plants.
3. Containers at consumer sites or distributing points, which are connected for use.

3809.2 Exposure hazards. Containers in storage shall be located in a manner which minimizes exposure to excessive temperature rise, physical damage or tampering.

3809.3 Position. Containers in storage having individual water capacity greater than 2.5 pounds (1 kg) [nominal 1-pound (0.454 kg) LP-gas capacity] shall be positioned with the pressure relief valve in direct communication with the vapor space of the container.

3809.4 Separation from means of egress. Containers stored in buildings in accordance with Sections 3809.9 and 3809.11 shall not be located within 10 feet (3048 mm) of an exit access doors, exits, or stairways used as a means of egress.

3809.5 Quantity. Empty containers that have been in LP-gas service shall be considered as full containers for the purpose of determining the maximum quantities of LP-gas allowed in Sections 3809.9 and 3809.11.

3809.6 Storage on roofs. Containers which are not connected for use shall not be stored on roofs.

3809.7 Storage in basement, pit or similar location. LP-gas containers shall not be stored in a basement, pit or similar location where heavier-than-air gas might collect. LP-gas containers shall not be stored in above-grade underfloor spaces or basements unless such location is provided with an approved means of ventilation.

Exception: Department of Transportation (DOTn) specification cylinders with a maximum water capacity of 2.5 pounds (1 kg) for use in completely self-contained hand torches and similar applications. The quantity of LP-gas shall not exceed 20 pounds (9 kg).

3809.8 Protection of valves on containers in storage. Container valves shall be protected by screw-on-type caps or collars which shall be securely in place on all containers stored regardless of whether they are full, partially full or empty. Container outlet valves shall be closed or plugged.

3809.9 Storage within buildings accessible to the public. Department of Transportation (DOTn) specification cylinders with maximum water capacity of 2.5 pounds (1 kg) used in completely self-contained hand torches and similar applications are allowed to be stored or displayed in a building accessible to the public. The quantity of LP-gas shall not exceed 200 pounds (91 kg) except as provided in Section 3809.11.

Exception: Up to 400 pounds (182 kg) of LP-gas in containers meeting the requirements of this section may be stored in buildings protected by an automatic sprinkler system designed to deliver a minimum Ordinary Hazard Group II discharge density. Storage and displays shall be located at least 20 feet (6096 mm) from Class I, II and III-A liquids or solid or liquid oxidizers.

3809.10 Storage within buildings not accessible to the public. The maximum quantity allowed in one storage location in buildings not accessible to the public, such as industrial buildings, shall not exceed a water capacity of 735 pounds (334 kg) [nominal 300 pounds (136 kg) of LP-gas]. Where additional storage locations are required on the same floor within the same building, they shall be separated by a minimum of 300 feet (91 440 mm). Storage beyond these limitations shall comply with Section 3809.11.

3809.10.1 Quantities on equipment and vehicles. Containers carried as part of service equipment on highway mobile vehicles need not be considered in the total storage capacity in Section 3809.10, provided such vehicles are stored in private garages and do not carry more than three LP-gas containers with a total aggregate LP-gas capacity not exceeding 100 pounds (45.4 kg) per vehicle. Container valves shall be closed.

3809.11 Storage within rooms used for gas manufacturing. Storage within buildings or rooms used for gas manufacturing, gas storage, gas-air mixing and vaporization, and compressors not associated with liquid transfer shall comply with Sections 3809.11.1 and 3809.11.2.

3809.11.1 Quantity limits. The maximum quantity of LP-gas shall be 10,000 pounds (4540 kg).

3809.11.2 Construction. The construction of such buildings and rooms shall comply with requirements for Group H occupancies in the *International Building Code,* Chapter 10, and NFPA 58, Section 8.3.4 and both of the following:

1. Adequate vents shall be provided to the outside at both top and bottom, located at least 5 feet (1524 mm) from building openings.
2. The entire area shall be classified for the purposes of ignition source control in accordance with NFPA 58 Section 8.3.4.2 (2).

3809.12 Location of storage outside of buildings. Storage outside of buildings of containers awaiting use, resale shall be located in accordance with Table 3809.12.

3809.13 Protection of containers. Containers shall be stored within a suitable enclosure or otherwise protected against tampering. Vehicular protection shall be provided as required by the Fire Code Official.

3809.14 Separation from means of egress for containers located outside of buildings. Containers located outside of buildings shall not be located within 20 feet (6096 mm) of any exit access doors, exits, stairways or a means of egress.

3809.15 Alternative location and protection of storage. Where the provisions of Sections 3809.12 and 3809.13 are impractical at construction sites, or at buildings or structures undergoing major renovation or repairs, the storage of containers shall be as approved by the Fire Code Official.

SECTION 3810
CONTAINERS NOT IN SERVICE

3810.1 Temporarily out of service. Containers whose use has been temporarily discontinued shall comply with all of the following:

1. Be disconnected from appliance piping.
2. Have container outlets, except relief valves, closed or plugged.
3. Be positioned with the relief valve in direct communication with container vapor space.

3810.2 Permanently out of service. Containers to be placed permanently out of service shall be removed from the site.

SECTION 3811
PARKING AND GARAGING

3811.1 General. Parking of LP-gas tank vehicles shall comply with Sections 3811.2 and 3811.3.

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.

3811.2 Unattended parking. The unattended parking of LP-gas tank vehicle shall be in accordance with Sections 3811.2.1 and 3811.2.2.

3811.2.1 Near residential, educational and institutional occupancies and other high-risk areas. LP-gas tank vehicles shall not be left unattended at any time on residential streets or within 500 feet (152 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 Fire Code Official, pose an extreme life hazard.

3811.2.2 Durations exceeding 1 hour. LP-gas tank vehicles parked at any one point for longer than1 hour shall be located as follows:

1. Off public streets, highways, public avenues or public alleys.
2. Inside of a bulk plant.
3. 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.

TABLE 3809.12
SEPARATION FROM EXPOSURES OF CONTAINERS AWAITING USE, RESALE OR EXCHANGE STORED OUTSIDE OF BUILDINGS FROM EXPOSURES

QUANTITY OF LP-GAS STORED (pounds)	MINIMUM SEPARATION DISTANCE FROM STORED CYLINDERS TO (feet):						
	Nearest important building or group of buildings or line of adjoining property that may be built upon	Line of adjoining property occupied by schools, places of religious worship, hospitals, athletic fields or other points of public gathering; busy thoroughfares; or sidewalks	LP-gas dispensing station	Doorway or opening to a building with two or more means of egress	Doorway or opening to a building with one means of egress	Combustible materials	Motor vehicle fuel dispenser
720 or less	0	0	5	5	10	10	20
721 - 2,500	0	10	10	5	10	10	20
2,501 - 6,000	10	10	10	10	10	10	20
6,001 - 10,000	20	20	20	20	20	10	20
Over 10,000	25	25	25	25	25	10	20

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg.

3811.3 Garaging. Garaging of LP-gas tank vehicles shall be as specified in NFPA 58. Vehicles with LP-gas fuel systems are allowed to be stored or serviced in garages as specified in NFPA 58, Sections 6.21.9 and 8.3.3.4, and the *Phoenix Building Code*.

SECTION 3812
LIQUEFIED PETROLEUM GAS EXCHANGE PROGRAM

3812.1 General. Section 3812 applies to LP-gas exchange programs that meet the following:

1. Storage is outdoors.
2. Individual LP-gas cylinders are limited to 20-pound (9 kg) propane capacity.
3. Cylinders are displayed for sale.

3812.2 Zoning districts. LP-gas exchange programs shall only be permitted at locations approved by the planning department.

3812.3 Storage racks.

3812.3.1 Construction. Storage racks shall be constructed of noncombustible materials and be designed so that the cylinder pressure relief device is in direct communication with the cylinder vapor space.

The rack construction shall provide natural ventilation and be arranged so cooling water can be applied in the event of a leak or fire.

The rack shall be equipped with a lock or equivalent means to prevent tampering with the valves and theft of the cylinders.

3812.3.2 Installation. Each rack shall be secured to prevent the rack from falling over or dislodgement.

3812.3.3 Protection from vehicles. Storage racks shall be protected against vehicle impact in accordance with the following:

1. Section 312, or
2. A 6-foot (1829 mm) long parking block, shall be allowed in parking spaces located horizontal to the rack when:
   2.1. A 6-inch (152 mm) high sidewalk curb (measured vertical from grade level) is not available; and
   2.2. The front of the rack is a minimum of 4 feet (1219 mm) from the curb edge.

3812.3.4 No smoking. "No Smoking" signs shall be posted on or near the racks.

SECTION 3813
DISTANCE BETWEEN POINT OF TRANSFER AND EXPOSURES

3813.1 Distance between point of transfer and exposures. The distance shall be in accordance with NFPA Table 6.5.3.