

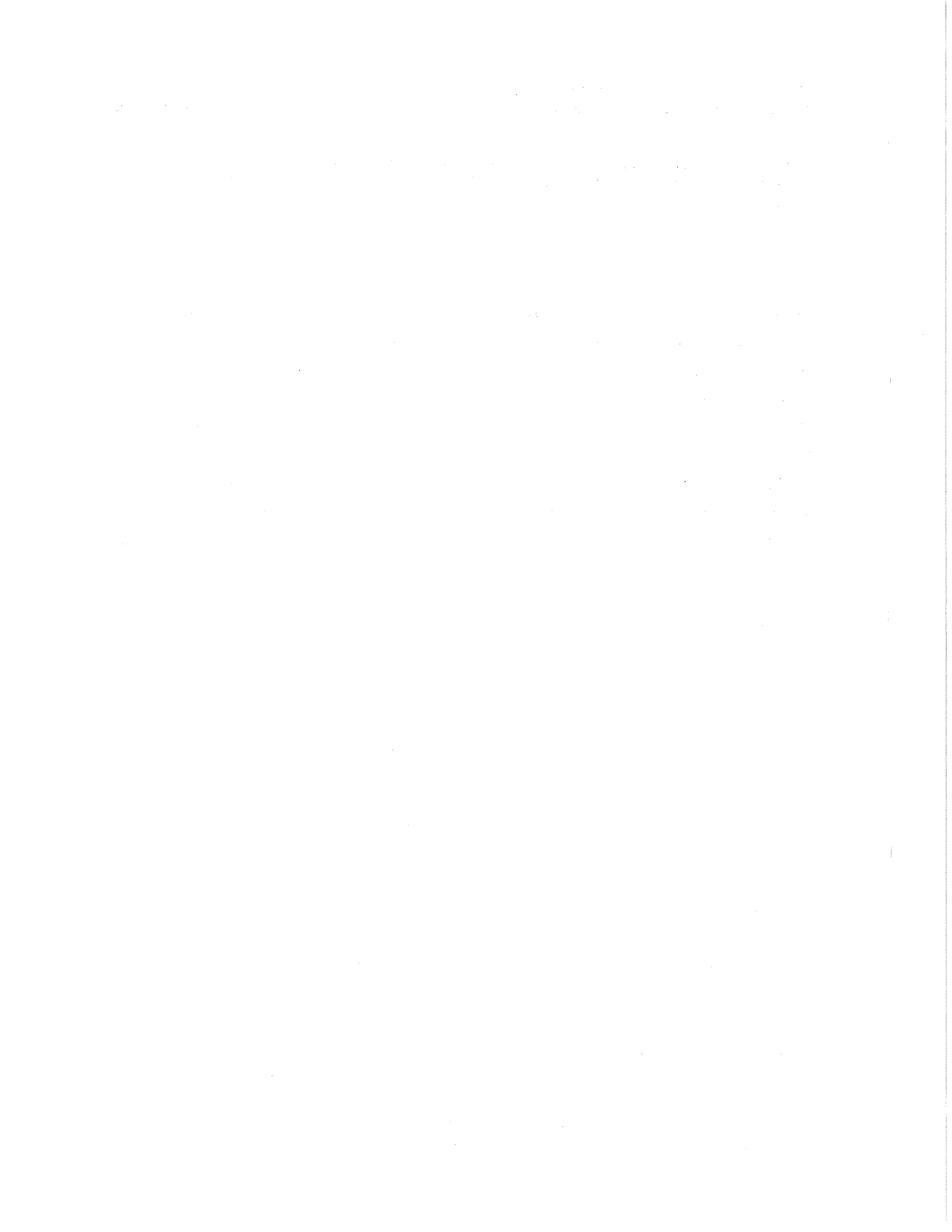
The contents of this handbook have been designed to assist the inspector with reference to code requirements that would be frequently used for inspection work.

The handbook also contains excerpts from the 1983 NFPA 58 with changes or amendments from the 1979 NFPA 58 indicated by a vertical line in the left margin.

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First Edition - January 1984, Prepared by Marv Olson, Fire Prevention Coordinator, Division of Safety & Buildings



ILHR 11.31 IDENTIFICATION OF VEHICLES POWERED BY LIQUEFIED PETROLEUM GASES.

(1) GENERAL. Each over the road general purpose vehicle powered by liquefied petroleum gas shall be identified with a diamond shaped decal.

(2) LOCATION OF DECAL. (a) The decal shall be located on the lower right rear of the vehicle inboard from any other markings.

(b) The decal shall be located on the trunk lid of a vehicle so equipped.

(c) The decal shall not be located on the bumper of any vehicle.

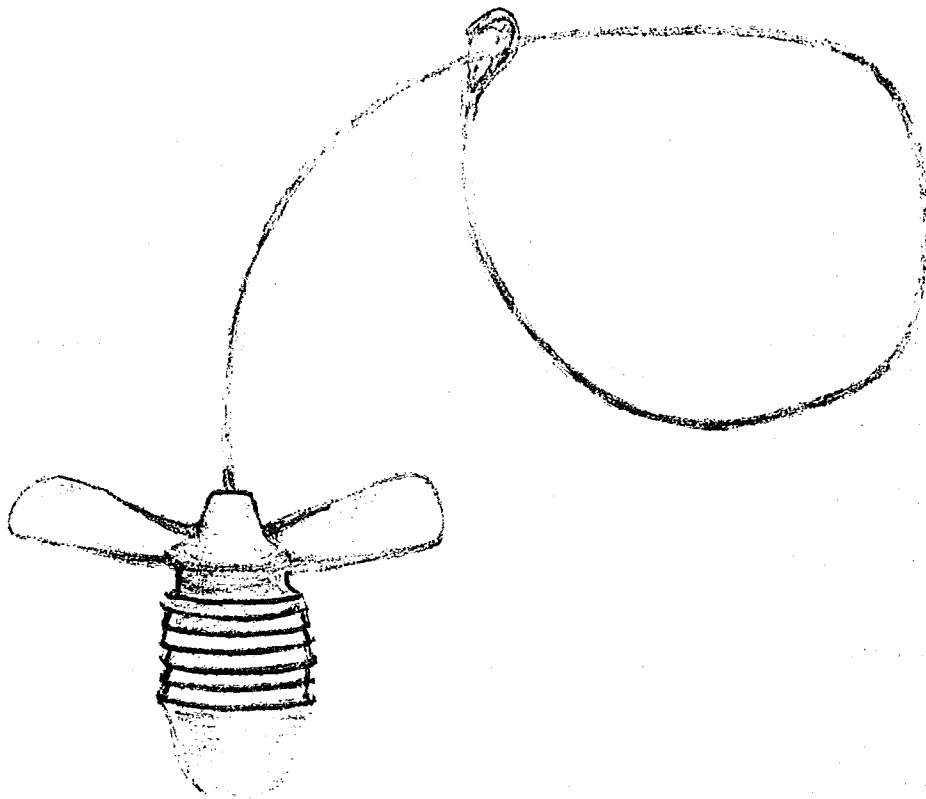
(3) SIZE OF DECAL. The decal shall be 4-3/4 inches long by 3-1/4 inches high.

(4) MARKING AND COLOR OF DECAL. (a) The marking of the decal shall consist of a border and a word "PROPANE".

(b) The border and the word "PROPANE" shall be of silver or white reflective luminous material on a black background.

(c) The word "PROPANE" shall consist of letters at least one inch in height centered in the diamond.





ILHR 11.37 Valve outlets on containers of 108 lbs water capacity (nominal 45 lbs propane capacity) or less shall be equipped with an effective seal such as a plug, cap or an approved quick closing coupling. This seal shall be in place whenever the container is not connected for use. Single trip nonrefillable, disposable and new unused containers are excluded from this requirement.

WARNING

TO PREVENT ACCIDENTAL GAS LEAKS

Outlet plug must be tightly in place with valve closed when transporting and storing this cylinder.

Tighten plug by turning Counter Clockwise. Make sure valve is tightly closed before removing plug slowly.

Do not transport cylinder in a very hot vehicle. Use and store cylinder outdoors. Always keep cylinder in upright position.

3-2.2 Location of Containers.

3-2.2.1 LP-Gas containers shall be located outside of buildings, except as follows:

- (a) Portable containers as specifically provided for in Section 3-4.
- (b) Containers of less than 125 gal (0.5 m³) water capacity for the purposes of being filled in buildings or structures complying with Chapter 7.
- (c) Containers on LP-Gas vehicles complying with, and parked or garaged in accordance with, Chapter 6.
- (d) Containers used with LP-Gas stationary or portable engine fuel systems complying with Section 3-6.
- (e) Containers used with LP-Gas fueled industrial trucks complying with 3-6.3.6.
- (f) Containers on LP-Gas fueled vehicles garaged in accordance with 3-6.6.
- (g) Portable containers awaiting use or resale when stored in accordance with Chapter 5.

3-2.2.2 Containers installed outside of buildings, whether of the portable type replaced on a cylinder exchange basis, or permanently installed and refilled at the installation, shall be located with respect to the nearest container, important building, group of buildings, or line of adjoining property which may be built upon, in accordance with Table 3-2.2.2 or with 3-2.2.3.

3-2.2.2 Interpretation: An important building is a building used for habitation, a place of employment or a building frequented by the public.



Table 3-2.2.2

| Water Capacity Per Container Gallons (m ³) | Minimum Distances | | |
|--|---|-----------------------------|--|
| | Mounded or Underground Containers [Note (d)] | Aboveground Containers | Between Containers [Note (e)] |
| Less than 125 (0.5) [Note (a)] | 10 ft (3 m) | None [Note (b)] | None |
| 125 to 250 (0.5 to 1.0) | 10 ft (3 m) | 10 ft (3 m) | None |
| 251 to 500 (1.0 + to 1.9) | 10 ft (3 m) | 10 ft (3 m) | 3 ft (1 m) |
| 501 to 2,000 (1.9 + to 7.6) | 10 ft (3 m) | 25 ft (7.6 m) [Note (c)] | 3 ft (1 m) |
| 2,001 to 30,000 (7.6 + to 114) | 50 ft (15 m) | 50 ft (15 m) | 5 ft (1.5 m) |
| 30,001 to 70,000 (114 + to 265) | 50 ft (15 m) | 75 ft (23 m) | } (¼ of sum of diameters of adja- cent containers) |
| 70,001 to 90,000 (265 + to 341) | 50 ft (15 m) | 100 ft (30 m) | |
| 90,001 to 120,000 (341 + to 454) | 50 ft (15 m) | 125 ft (38 m) | |

Notes to Table 3-2.2.2

Note (a) At a consumer site, if the aggregate water capacity of a multi-container installation comprised of individual containers having a water capacity of less than 125 gal (0.5 m³) is 501 gal (1.9 + m³) or more, the minimum distance shall comply with the appropriate portion of this table, applying the aggregate capacity rather than the capacity per container. If more than one such installation is made, each installation shall be separated from any other installation by at least 25 ft (7.6 m). Do not apply the MINIMUM DISTANCES BETWEEN CONTAINERS to such installations.

Note (b) The following shall apply to aboveground containers installed alongside of buildings:

(1) DOT specification containers shall be located and installed so that the discharge from the container pressure relief device is at least 3 ft (1 m) horizontally away from any building opening below the level of such discharge, and shall not be beneath any building unless this space is well ventilated to the outside and is not enclosed for more than 50 percent of its perimeter. The discharge from container pressure relief devices shall be located not less than 5 ft (1.5 m) in any direction away from any exterior source of ignition, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes.

(2) ASME containers of less than 125 gal (0.5 m³) water capacity shall be located and installed so that the discharge from pressure relief devices shall not terminate in or beneath any building and shall be located at least 5 ft (1.5 m) horizontally away from any building opening below the level of such discharge, and not less than 5 ft (1.5 m) in any direction away from any exterior source of ignition, openings into direct vent (sealed combustion system) appliances, or mechanical ventilation air intakes.

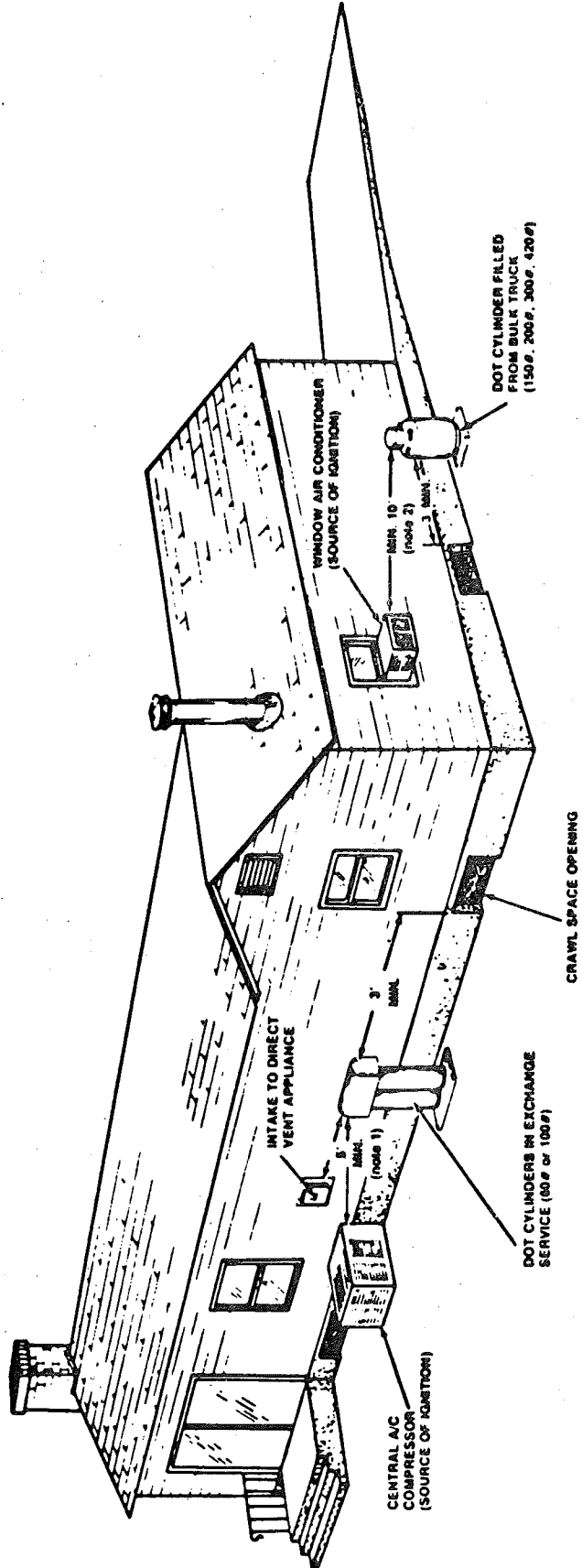
(3) The filling connection and the vent from liquid level gauges on either DOT or ASME containers filled at the point of installation shall be not less than 10 ft (3 m) in any direction away from any exterior source of ignition, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes.

Note (c) This distance may be reduced to not less than 10 ft (3 m) for a single container of 1,200 gal (4.5 m³) water capacity or less provided such container is at least 25 ft (7.6 m) from any other LP-Gas container of more than 125 gal (0.5 m³) water capacity.

Note (d) Minimum distances for underground containers shall be measured from the pressure relief device and filling or liquid level gauge vent connection at the container, except that no part of an underground container shall be less than 10 ft (3 m) from a building or line of adjoining property which may be built upon.

Appendix G Container Spacing

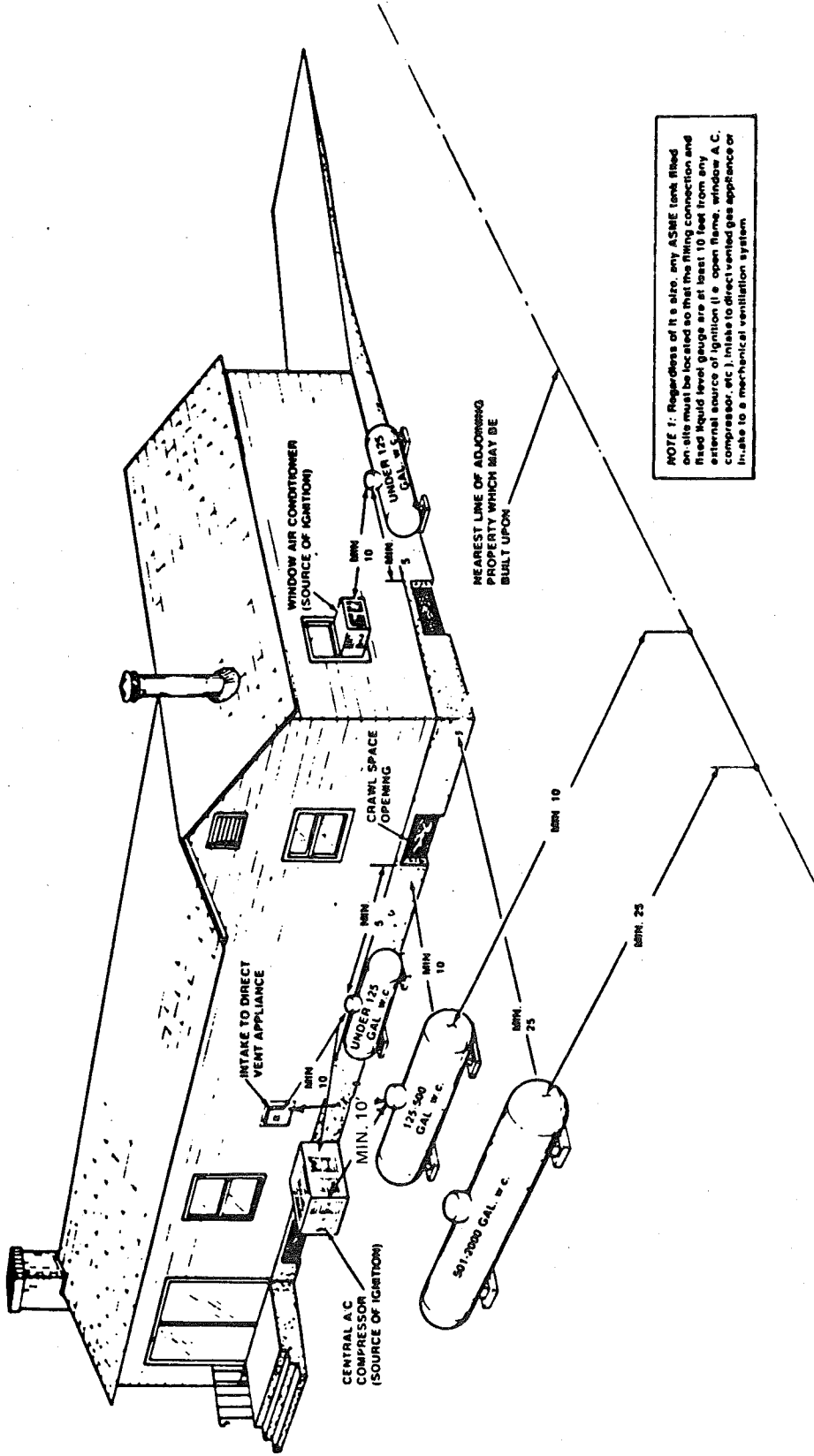
This Appendix is not a part of the requirements of this NFPA document. . . but is included for information purposes only.



NOTE 1: 8 foot minimum between relief valve discharge and external source of ignition (air conditioner), direct vent, or mechanical ventilation system (attic fan)
 NOTE 2: If the DOT cylinder is filled on-site from a bulk truck, the filling connection and vent valve must be at least 10 feet from any external source of ignition, direct vent, or mechanical ventilation system.

(For SI Units: 1 ft = 0.3048 m)

Figure G-1 DOT Cylinders
 (This figure for illustrative purposes only; text shall govern.)

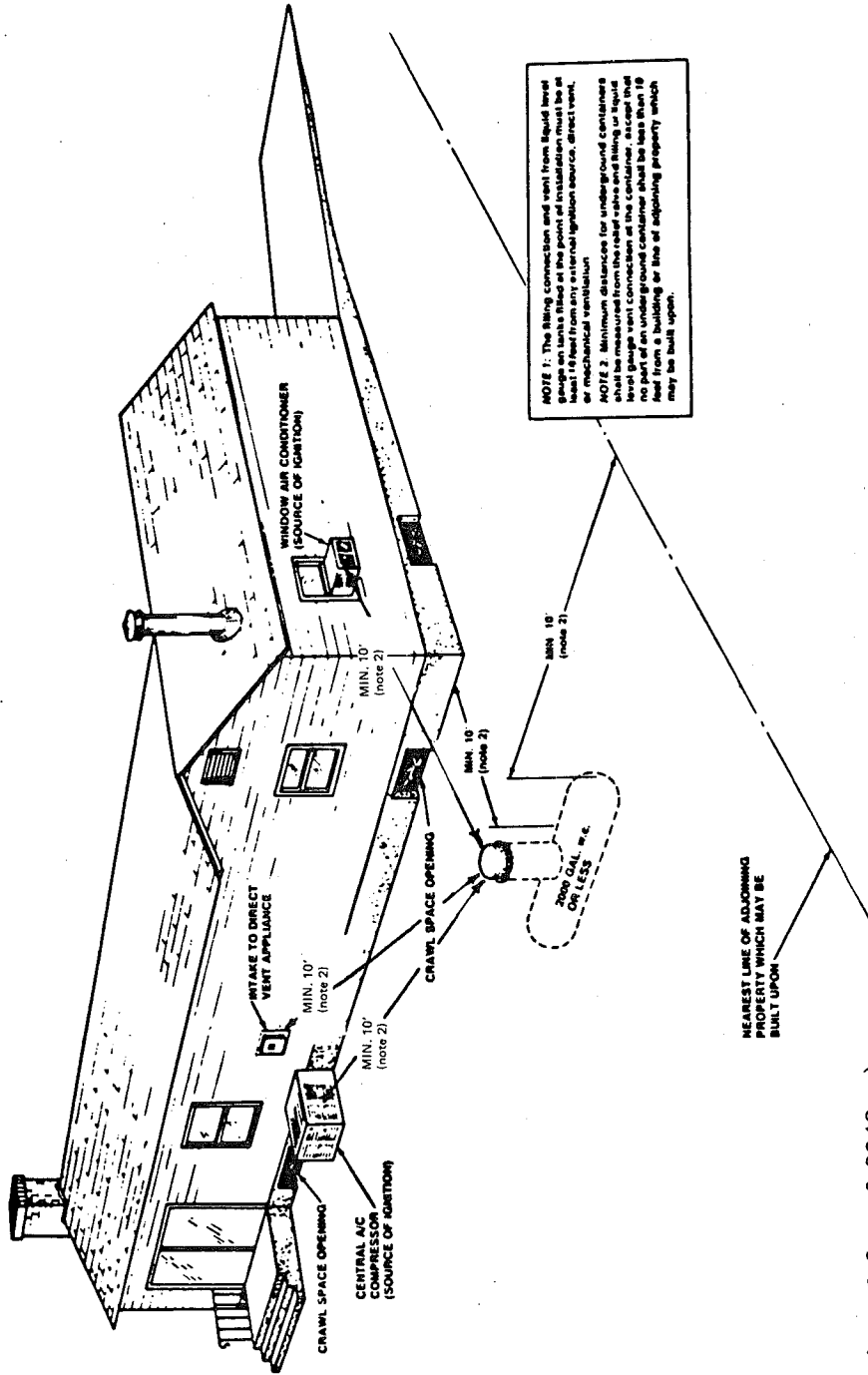


NOTE 1: Regardless of its size, any ASME tank filled on-site must be located so that the filling connection and fitted liquid level gauge are at least 10 feet from any external source of ignition (i.e. open flame, window A.C. compressor, etc.). Intake to direct vented gas appliance or intake to a mechanical ventilation system.

(For SI Units: 1 ft = 0.3048 m)

Figure G-2 Aboveground ASME Tanks
(This figure for illustrative purposes only; text shall govern.)

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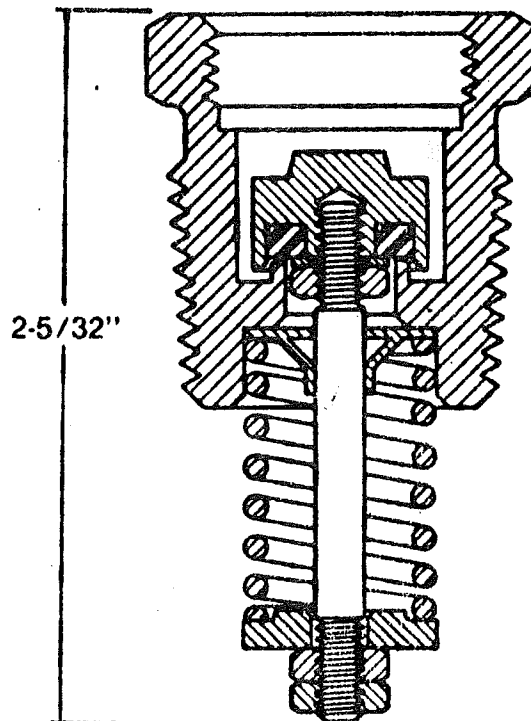
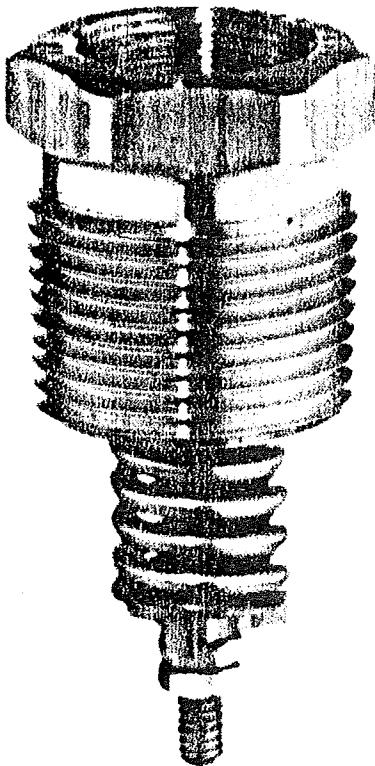
(For SI Units: 1 ft = 0.3048 m)

Figure G-3 Underground ASME Tanks
(This figure for illustrative purposes only; text shall govern.)

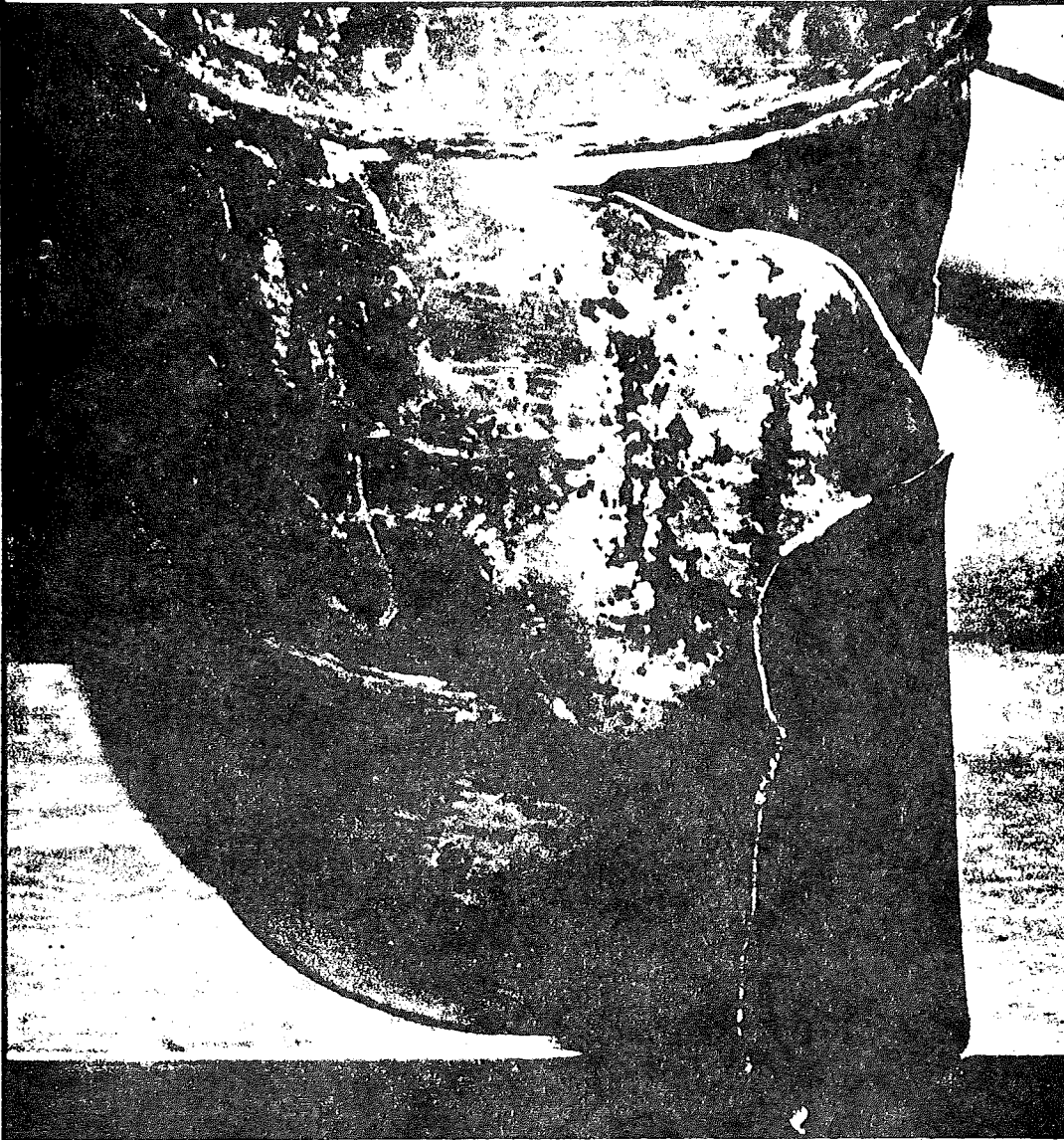
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2-3.2.5 All containers used in industrial truck (including fork lift truck cylinders) service shall have the container pressure relief valve replaced by a new or unused valve within 12 years of the date of manufacture of the container and each 10 years thereafter.

Safety Relief Valve for DOT Fork Lift Cylinders



Only luck kept this lift truck cylinder from exploding when excess gas pressure caused it to rupture. One of many on a dealer's loading dock, this cylinder's relief valve was made inoperative by particles of metal paint.



There are several reasons why gas in a cylinder will develop extreme pressure. Overfilling—often the result of a misguided attempt to give a customer “more for his money”—and exposure to high heat are the two most common causes. Regardless of the cause, however, the relief valve provided in all cylinders will release gas. But if that valve is plugged or clogged, the cylinder becomes a hazard. Fortunately, this one ruptured without igniting.

Note that the steel cylinder wall is peeled back but that the welds are still intact, without breaks or loosening.

3-2.2.5 The following provisions shall also apply:

- (a) Containers shall not be stacked one above the other.
- (b) Loose or piled combustible material and weeds and long dry grass shall not be permitted within 10 ft (3 m) of any container.
- (c) Suitable means shall be used to prevent the accumulation or flow of liquids having flash points below 200°F (93.4°C) under adjacent LP-Gas containers such as by dikes, diversion curbs or grading. Determination of flash points shall be in accordance with NFPA 321, *Standard on Basic Classification of Flammable and Combustible Liquids*.
- (d) When tanks containing flammable or combustible liquids (see NFPA 321 for definitions of these liquids) are within a diked area, LP-Gas containers shall be outside the diked area and at least 10 ft (3 m) away from the centerline of the wall of the diked area.
- (e) The minimum horizontal separation between aboveground LP-Gas containers and aboveground tanks containing liquids having flash points below 200°F (93.4°C) shall be 20 ft (6 m). This provision shall not apply when LP-Gas containers of 125 gal (0.5 m³) or less water capacity are installed adjacent to fuel oil supply tanks of 660 gal (2.5 m³) or less capacity. No horizontal separation is required between aboveground LP-Gas containers and underground tanks containing flammable or combustible liquids installed in accordance with NFPA 30, *Flammable and Combustible Liquids Code*. See 3-2.2.5(c) for flash point determinations.
- (f) The minimum separation between LP-Gas containers and oxygen or gaseous hydrogen containers shall be in accordance with Table 3-2.2.5(f) except that lesser distances are permitted where protective structures having a minimum fire resistance rating of two hours interrupt the line of sight between uninsulated portions of the oxygen or hydrogen containers and the LP-Gas containers. The location and arrangement of such structures shall minimize the problems cited in the Note to 3-2.2.7. Also, see NFPA 50 and 51 for oxygen systems and NFPA 50A on gaseous hydrogen systems. The minimum separation between LP-Gas containers and liquefied hydrogen containers shall be in accordance with NFPA 50B.

Table 3-2.2.5(f)

| LP-Gas Containers Having An | Separation From Oxygen Containers Having An | | Separation From Gaseous Hydrogen Containers Having An | |
|--|--|---|--|---|
| Aggregate Water Capacity of | Aggregate capacity of 400 CF (11 m ³)* or less | Aggregate capacity of more than 400 CF (11 m ³)* to 20,000 CF (566 m ³)*, including unconnected reserves. | Aggregate capacity of less than 400 CF (11 m ³)* | Aggregate capacity of more than 400 CF (11 m ³)* to 3000 CF (85 m ³)* |
| 1200 Gal (4.5 m ³) or less | None | 20 ft (6 m) | 25 ft (7.6 m) | 25 ft (7.6 m) |
| Over 1200 Gal (4.5 m ³) | None | 20 ft (6 m) | 50 ft (15 m) | 25 ft (7.6 m) |
| 500 Gal (1.9 m ³) or less | | | None | 10 ft (3 m) |
| Over 500 Gal (1.9 m ³) | | | None | 25 ft (7.6 m) |
| | | | None | 50 ft (15 m) |

*Cubic feet measured at 70°F and atmospheric pressure.

(g) Where necessary to prevent flotation due to possible high flood waters around aboveground containers, or high water table for those underground, containers shall be securely anchored.

(h) When LP-Gas containers are to be stored or used in the same area with other compressed gases, the containers shall be marked to identify their content in accordance with ANSI Standard Z48.1, *Method of Marking Portable Compressed Gas Containers to Identify the Material Contained*.

3-2.2.6 Because of the pronounced volatility of LP-Gas in installations covered by this standard, dikes normally serve no useful purpose. [See 3-2.2.5(c).]

3-2.2.7 Except as permitted by 3-2.2.2, 3-2.2.5(c), 3-2.2.5(f) and 3-3.6.1, structures such as fire walls, fences, earth or concrete barriers and other similar structures shall be avoided around or over installed containers.

Exception: Such structures partially enclosing containers are permissible if designed in accordance with a sound fire protection analysis.

NOTE: The presence of such structures can create significant hazards, e.g., pocketing of escaping gas, interference with application of cooling water by fire departments, redirection of flames against containers and impeding egress of personnel in an emergency.

3-2.3 Installation of Containers.

3-2.3.1 Containers shall be installed in accordance with 3-2.3.1(a) through (f):

(a) DOT cylinder specification containers shall be installed only aboveground, and shall be set upon a firm foundation, or otherwise firmly secured. Flexibility shall be provided in the connecting piping. (See 3-2.7.5 and 3-2.7.8.)

(b) All containers shall be positioned so that the pressure relief valve is in direct communication with the vapor space of the container.

* (c) Where physical damage to LP-Gas containers, or systems of which they are a part, from vehicles is a possibility, precautions against such damage shall be taken.

(d) The installation position of ASME containers shall make all container appurtenances accessible for their normally intended use.

(e) Field welding on containers shall be limited to attachments to nonpressure parts, such as saddle plates, wear plates or brackets applied by the container manufacturer. Welding to container proper shall comply with 2-2.1.6.

(f) Aboveground containers shall be kept properly painted.

*Note - see other side of this page for interpretation.

*Interpretation: Protection from vehicle damage shall consist of 6" diameter steel posts anchored in concrete and filled with concrete and to a minimum height of 4 ft above grade and so spaced that container or system can not be damaged. Equivalent protection as approved by the department or authorized deputy will be accepted.

3-2.3.2 Horizontal ASME containers designed for permanent installation in stationary service aboveground, except as provided in 3-2.3.2(a)(2)b and 3-2.3.2(b), shall be placed on substantial masonry or noncombustible structural supports on concrete or firm masonry foundations, and supported as follows:

(a) Horizontal containers shall be mounted on saddles in such a manner as to permit expansion and contraction, and not to cause an excessive concentration of stresses. Structural steel supports may be used as follows, or if in compliance with 3-2.3.2(b).

(1) Containers of more than 2,000 gal (7.6 m³) water capacity shall be provided with concrete or masonry foundations formed to fit the container contour, or if furnished with saddles in compliance with 2-2.5.1, may be placed on flat-topped foundations.

(2) Containers of 2,000 gal (7.6 m³) water capacity or less may be installed on concrete or masonry foundations formed to fit the container contour, or if equipped with attached supports complying with 2-2.5.2(a), may be installed as follows:

a. If the bottoms of the horizontal members of the container saddles, runners or skids are to be more than 12 in. (305 mm) above grade, fire-resistive foundations shall be provided. A container shall not be mounted with the outside bottom of the container shell more than 5 ft (1.5 m) above the surface of the ground.

b. For temporary use at a given location, not to exceed 6 months, fire-resistive foundations or saddles are not required provided the outside bottom of the container shell is not more than 5 ft (1.5 m) above the ground and that flexibility in the connecting piping is provided. (See 2-4.6.3.)

(3) Containers or container-pump assemblies mounted on a common base complying with 2-2.5.2(b) may be placed on paved surfaces or on concrete pads at ground level within 4 in. (102 mm) of ground level.

(b) With the approval of the authority having jurisdiction, single containers complying with 2-2.5.1 or 2-2.5.2 may be installed in isolated locations, with nonfireproofed steel supports resting on concrete pads or footings, provided the outside bottom of the container shell is not more than 5 ft (1.5 m) above the ground level.

(c) Suitable means of preventing corrosion shall be provided on that part of the container in contact with the saddles or foundations or on that part of the container in contact with masonry.

3-2.5 Regulator Installation.

3-2.5.1 Regulators used to control distribution or utilization pressure shall be as close to the container or vaporizer outlets as is practicable. First stage regulating equipment shall be outside of buildings except as used with containers and liquid piping systems covered by 3-2.2.1(a), (b), (d), (e) and (f), and 3-2.6.1(d).

3-2.5.2 Regulators shall be securely attached to container valves, containers, supporting standards or building walls.

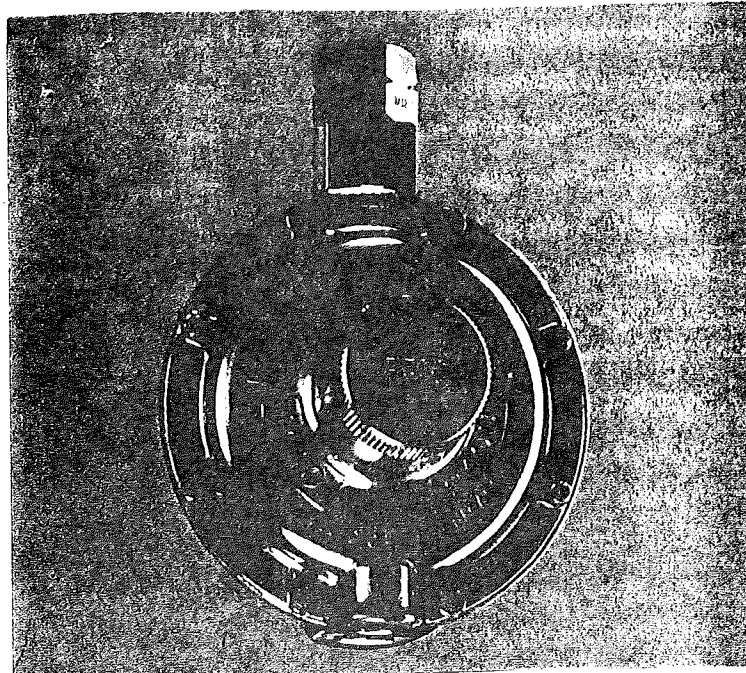
(a) First stage regulators shall be either directly connected to the container shutoff valve or outlet of vaporizer where used, unless attached thereto with flexibility provided in the connecting piping or the interconnecting piping of manifolded containers or vaporizers.

(b) All regulators for outdoor installations, except regulators used for portable industrial applications, shall be designed, installed, or protected so their operation will not be affected by the elements (freezing rain, sleet, snow, ice, mud, or debris). This protection may be integral with the regulator.

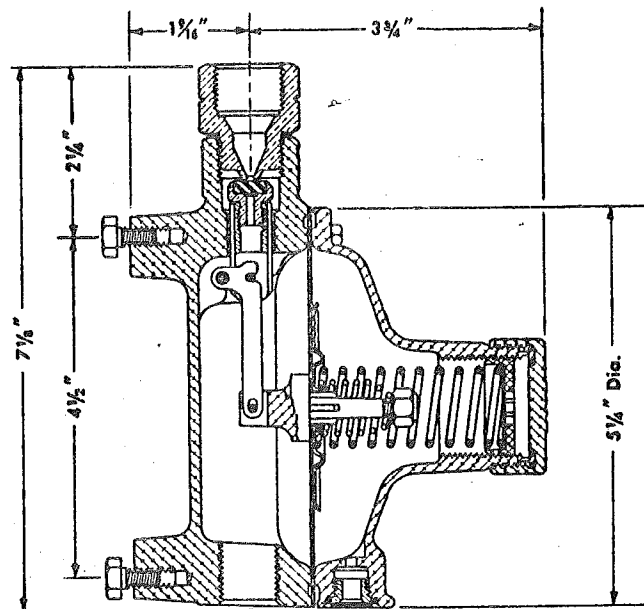
3-2.5.3 On regulating equipment installed outside of buildings, the discharge from a pressure relief device shall be located not less than 3 ft (1 m) horizontally away from any building opening below the level

3-2.5.4 On regulators installed inside buildings, the discharge from the pressure relief device and from above the regulator and relief device diaphragms shall be vented to the outside air with the discharge outlet located not less than 3 ft (1 m) horizontally away from any building opening below the level of such discharge. This provision shall not apply to appliance regulators otherwise protected (*see NFPA 54*), or to regulators used in connection with containers in buildings as provided for in 3-2.2.1(a), (b), (d), (e) and (f).

The outlet on a regulator vent should be installed down or provisions made to protect outlet from the elements (freezing rain, sleet, snow mud, or debris).



↖ ↗ Outlet Vent



3-2.7.6 Metallic piping outside buildings may be underground or aboveground or both. Aboveground piping shall be well supported and protected against physical damage. Where underground piping is beneath driveways, roads or streets, possible damage by vehicles shall be taken into account. Nonmetallic piping, including the nonmetallic portions of transition fittings, shall be installed outside, a minimum of 12 in. (305 mm) underground and in accordance with the piping manufacturers' instructions.

3-2.7.7 Underground metallic piping shall be protected against corrosion as warranted by soil conditions. Corrosion protection shall comply with the following:

(a) Underground piping shall be protected as needed with a suitable coating to retard the effects of the corrosion conditions existing in the local soil. Coated pipe shall extend at least 6 in. (152 mm) aboveground on all risers.

(b) When dissimilar metals are joined underground, an insulating fitting shall be installed to electrically isolate them from each other.

(c) If cathodic protection is used, insulating fittings shall be installed to electrically isolate the cathodically protected underground system from all aboveground piping and systems.

(d) LP-Gas piping shall not be used as a grounding electrode.

3-2.7.8 Flexible components used in piping systems shall comply with 2-4.6 for the service in which they are to be used, shall be installed in accordance with the manufacturer's instructions, and shall also comply with the following:

(a) Flexible connectors in lengths up to 36 in. (1 m) (*see 2-4.6.3 and 2-4.6.4*) may be used for liquid or vapor piping, on portable or stationary tanks, to compensate for expansion, contraction, jarring, vibration and settling. This is not to be construed to mean that flexible connectors shall be used if provisions were incorporated in the design to compensate for these effects.

(b) Hoses may be installed if flexibility is required for liquid or vapor transfer. The use of wet hose (*see 4-2.3.4 for explanation of term "wet hose"*) is recommended for liquid.

3-2.7.9 On new installations, and by December 31, 1980 on existing installations, (1) stationary single container systems of over 4,000 gal (15.1 m³) water capacity, or (2) stationary multiple container systems with an aggregate water capacity of more than 4,000 gal (15.1 m³) utilizing a common or manifolded liquid transfer line, shall comply with 3-2.7.9(a) and (b).

(a) When a hose or swivel type piping 1½ in. or larger is used for liquid transfer or a 1¼ in. or larger vapor hose or swivel type piping is used in this service (excluding flexible connectors in such liquid and vapor piping), an emergency shutoff valve complying with 2-4.5.4 shall be installed in the fixed piping of the transfer system within 20 ft (6 m) of lineal pipe from the nearest end of the hose or swivel type piping to which the hose or swivel type piping is connected. The preceding sizes are nominal. Where the flow is only in one direction, a backflow check valve may be used in lieu of an emergency shutoff valve if installed in the fixed piping downstream of the hose or swivel type piping, provided the backflow check valve has a metal-to-metal seat or a primary resilient seat with a secondary metal seat not hinged with combustible material. When either a liquid or vapor line has two or more hoses or swivel type piping of the sizes designated, either an emergency shutoff valve or a backflow check valve shall be installed in each leg of the piping.

(1) Emergency shutoff valves shall be installed so that the temperature sensitive element in the valve, or a supplemental temperature sensitive element [250°F (121°C) maximum] connected to actuate the valve, is not more than 5 ft (1.5 m) from the nearest end of the hose or swivel type piping connected to the line in which the valve is installed.

(b) The emergency shutoff valve(s) or backflow check valve(s) specified in 3-2.7.9(a) shall be installed in the plant piping so that any break resulting from a pull will occur on the hose or swivel type piping side of the connection while retaining intact the valves and piping on the plant side of the connection. This may be accomplished by use of concrete bulkheads or equivalent anchorage or by the use of a weakness or shear fitting. Such anchorage is not required for tank car unloading.

3-2.7.10 Hose may be used on the low pressure side of regulators to connect to other than domestic and commercial appliances as follows:

- (a) The appliance connected shall be of a portable type.
- (b) For use inside buildings, the hose shall be of a minimum length, not exceeding 6 ft (1.8 m) [except as provided for in 3-4.2.3(b)], and shall not extend from one room to another, nor pass through any partitions, walls, ceilings or floors (except as provided for in 3-4.3.7). It shall not be concealed from view or used in concealed locations. For use outside buildings, hose length may exceed 6 ft (1.8 m), but shall be kept as short as practicable.
- (c) Hose shall be securely connected to the appliance. The use of rubber slip ends is not permissible.
- (d) A shutoff valve shall be provided in the piping immediately upstream of the inlet connection of the hose. When more than one such appliance shutoff is located near another, precautions shall be taken to prevent operation of the wrong valve.
- (e) Hose used for connecting appliances to wall or other outlets shall be protected against physical damage.

3-2.8 Hydrostatic Relief Valve Installation.

3-2.8.1 A hydrostatic relief valve complying with 2-4.7.1 or a device providing pressure relieving protection shall be installed in each section of piping (including hose) in which liquid LP-Gas can be isolated between shutoff valves so as to relieve the pressure which could develop from the trapped liquid to a safe atmosphere or product-retaining section.

3-2.9 Testing Piping Systems.

3-2.9.1 After assembly, piping systems (including hose) shall be tested and proven free of leaks at not less than the normal operating pressure. Piping within the scope of NFPA 54, *National Fuel Gas Code*, [see 1-2.3.1(f)], shall be pressure tested in accordance with that Code. Tests shall not be made with a flame.

3-2.10.6 LP-Gas engine fuel dispensing devices installed in service stations shall be installed as recommended by the manufacturer and in accordance with 3-2.10.6(a) through (h).

(a) Installation shall not be within a building, but may be under weather shelter or canopy, provided this area is adequately ventilated and is not enclosed for more than 50 percent of its perimeter.

(b) Dispensing devices shall be located as follows:

(1) Not less than 10 ft (3 m) from aboveground storage containers of more than 2,000 gal (7.6 m³) water capacity.

(2) Not less than 20 ft (6 m) from any building [not including canopies covered in 3-2.10.6(a)], basement, cellar, pit or line of adjoining property which may be built upon.

(3) Not less than 10 ft (3 m) from sidewalks, streets or thoroughfares.

(c) Dispensing devices shall either be installed on a concrete foundation or be part of a complete storage and dispensing unit mounted on a common base [to be mounted as provided in 3-2.3.1(b) and (d)]. In either case, they shall be adequately protected against physical damage.

(d) Control for the pump used to transfer LP-Gas through the dispensing device into motor vehicle tanks shall be provided at the device in order to minimize the possibility of leakage or accidental discharge. The following also shall apply:

(1) Means shall be provided at some point outside the dispensing device, such as a remote switch [see 3-2.10.1(c)], to shut off the power in the event of fire or accident.

(2) A manual shutoff valve and an excess-flow check valve of suitable capacity shall be located in the liquid line between the pump and dispenser inlet only when the dispensing device is installed at a remote location and not part of a complete storage and dispensing unit mounted on a common base.

(e) Provision shall be made for venting the LP-Gas contained in the dispenser to a safe location.

(f) The dispensing hose shall comply with 2-4.6. An excess-flow check valve, or an automatic shutoff valve [see 2-3.3.3(d) and 2-4.5.4] shall be installed at the terminus of the liquid piping at the point of attachment of the dispensing hose. A differential back pressure valve shall be considered as meeting this provision.

(g) Piping leading to, and within the dispenser, and the dispensing hose shall be provided with hydrostatic relief valves as specified in 3-2.8.1 (see also 2-4.7.1).

(h) No drains or blowoffs from the dispensing device shall be directed toward, or be in close proximity to sewer systems.

3-3.6 Protection Against Tampering for Section 3-3 Systems.

3-3.6.1 To minimize the possibilities for trespassing and tampering, the area which includes container appurtenances, pumping equipment, loading and unloading facilities and container filling facilities shall be protected by one of the following methods:

(a) Enclosure with at least a 6-ft (1.8-m) high industrial-type fence, unless otherwise adequately protected. There shall be at least two means of emergency access from the fenced or other enclosure. Clearance shall be provided to permit maintenance to be performed and a clearance of at least 3 ft (1 m) shall be provided to allow emergency access to the required means of egress. If guard service is provided, it shall be extended to the LP-Gas installation. Guard personnel shall be properly trained. (See 1-6.1.1.)

Exception: If a fenced or otherwise enclosed area is not over 100 sq ft (9 m²) in area, the point of transfer is within 3 ft (1 m) of a gate and containers being filled are not located within the enclosure, a second gate need not be provided.

(b) As an alternate to fencing the operating area, suitable devices which can be locked in place shall be provided. Such devices, when in place, shall effectively prevent unauthorized operation of any of the container appurtenances, system valves or equipment.

3-3.7 Lighting.

3-3.7.1 If operations are normally conducted during other than daylight hours, adequate lighting shall be provided to illuminate storage containers, containers being loaded, control valves and other equipment.

3-4.8 Use in Buildings for Demonstrations or Training, or in Small Containers.

3-4.8.1 Containers having a maximum water capacity of 12 lb (5.4 kg) [nominal 5 lb (2 kg) LP-Gas capacity] may be used temporarily inside buildings for public exhibitions or demonstrations, including use in classroom demonstrations. If more than one such container is located in the same room, the containers shall be separated by at least 20 ft (6 m).

3-4.8.2 Containers may be used temporarily in buildings for training purposes related to the installation and use of LP-Gas systems, provided:

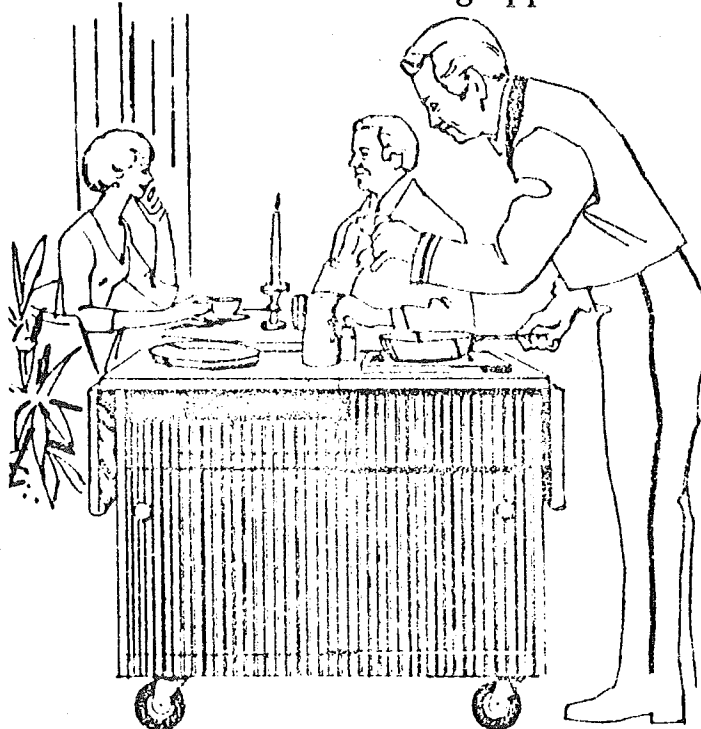
(a) The maximum water capacity of individual containers shall be 245 lb (111 kg) [nominal 100 lb (45 kg) LP-Gas capacity], but not more than 20 lb (9 kg) of LP-Gas may be placed in a single container.

(b) If more than one such container is located in the same room, the containers shall be separated by at least 20 ft (6 m).

(c) The training location shall be acceptable to the authority having jurisdiction.

(d) Containers shall be promptly removed from the building when the training class has terminated.

3-4.8.3 Containers having a maximum water capacity of 2½ lb (1 kg) [nominal 1 lb (0.45 kg) LP-Gas capacity] may be used in buildings as part of approved self-contained torch assemblies or similar appliances other than mobile cooking appliances.



*Note: The use of LP gas fueled mobile cooking appliances within buildings is prohibited under 3-4.8.3.

3-6.1.4 In the interest of safety, each person engaged in installing, repairing, filling or otherwise servicing an LP-Gas engine fuel system shall be properly trained in the necessary procedures.

3-6.2.3 Container Appurtenances.

(8) Containers fabricated after June 30, 1983 for use as engine fuel containers on vehicles shall be equipped or fitted with an automatic means to prevent filling in excess of the maximum permitted filling density.

a. An over-filling prevention device may be installed on the container or exterior of the compartment when remote filling is used, provided that a double back check valve is installed in the container fill valve opening.

3-7.3 Installation of Direct Gas-Fired Vaporizers.

3-7.3.1 Direct gas-fired vaporizers shall comply with 2-5.4.3, and shall be installed as provided in 3-7.3.2 through 3-7.3.6.

3-7.3.2 Direct gas-fired vaporizers may be installed out-of-doors or in separate structures constructed in accordance with Section 7-2. Any such buildings shall be well ventilated near the floor line and roof.

3-7.3.3 Direct gas-fired vaporizers may also be installed in structures attached to, or in rooms within, a gas manufacturing or distributing structure (but not buildings used for other purposes), provided:

(a) The housing provided shall comply with Section 7-3, and shall be well ventilated near the floor line and roof.

(b) The wall separating it from all other compartments or rooms containing LP-Gas vaporizers, pumps and central gas mixing devices shall have no openings.

3-7.3.4 The housing for the vaporizer covered in 3-7.3.2 and 3-7.3.3 shall not have unprotected drains or sump pits. Pressure relief valves on vaporizers within buildings in industrial or gas manufacturing plants shall be piped to a point outside the building and shall discharge vertically upward.

3-7.3.5 Direct gas-fired vaporizers may be connected to the liquid space or to both the liquid and the vapor space of the container, but in any case there shall be a manually operated shutoff valve in each connection at the container, to permit completely shutting off all flow of vapor or liquid.

3-7.3.6 Direct gas-fired vaporizers of any capacity shall be located in accordance with Table 3-7.3.6.

Table 3-7.3.6

| Exposure | Mimimum Distance Required |
|---|---------------------------|
| Container | 10 ft (3 m) |
| Container shutoff valves | 15 ft (5 m) |
| Point of transfer | 15 ft (5 m) |
| Nearest important building or group of buildings or line of adjoining property which may be built upon (except buildings in which vaporizer is installed. See 3-7.3.2 and 3-7.3.3). | 25 ft (7.6 m) |
| Gas-air mixing (<i>see</i> 3-7.7) | |

3-7.7 Installation of Gas-Air Mixers.

3-7.7.1 Gas-air mixing equipment shall be located at least 25 ft (7.6 m) from a direct-fired vaporizer when the mixer is installed outdoors. If the mixer is installed in a building, the building shall comply with the provisions of Chapter 7 and no direct-fired vaporizer is to be located within the same building enclosure. Such a structure shall be located at least 25 ft (7.6 m) from a direct-fired vaporizer.

3-7.7.2 Listed vaporizer-mixers in a common cabinet having a direct-fired type vaporizer shall be installed outdoors in accordance with the distance provisions in 3-7.3. Listed vaporizer-mixers not in a common cabinet having an indirect-fired type vaporizer may be installed in a building or structure complying with Chapter 7 provided there is no source of ignition in such building or structure.

3-10.2.6 Suitable roadways or other means of access for emergency equipment, such as fire department apparatus, shall be provided.

3-10.2.7 Each industrial plant, distributing plant and distributing point shall be provided with at least one approved portable fire extinguisher having a minimum capacity of 20 lb of dry chemical with a B:C rating.

3-10.2.8 LP-Gas fires shall not normally be extinguished until the source of the burning gas has been shut off or can be shut off.

3-10.2.9 Emergency controls shall be conspicuously marked and the controls shall be located so as to be readily accessible in emergencies.

Table 4-3.3.2¹

Distance Between Point of Transfer and Exposures

| Part | Exposure | Min. Horizontal Distance, Feet (Meters) |
|------|--|---|
| 1. | Buildings ² with fire resistive walls ³ | 10 (3) |
| 2. | Buildings ² with other than fire resistive walls | 25 (7.6) |
| 3. | Building wall openings or pits at or below the level of the point of transfer | 25 (7.6) |
| 4. | Line of adjoining property which can be built upon | 25 (7.6) |
| 5. | Outdoor places of public assembly, including school yards, athletic fields and playgrounds | 50 (15) |
| 6. | Public ways, including public streets, highways, thoroughfares and sidewalks | |
| | (a) From points of transfer in Distributing Points | 10 (3) |
| | (b) From points of transfer in all other locations | 25 (7.6) |
| 7. | Driveways | 5 (1.5) |
| 8. | Mainline railroad track centerlines | 25 (7.6) |
| 9. | Containers ⁴ other than those being filled | 10 (3) |

¹Table 4-3.3.2 is not applicable to the transfer operations covered in 4-3.2.1.

²"Buildings," for the purpose of this Table, include structures such as mobile homes, recreational vehicles, modular homes, tents and box trailers at construction sites.

³Walls constructed of noncombustible materials having, as erected, a fire resistance of at least one hour as determined by NFPA 251, *Standard Methods of Fire Tests of Building Construction and Materials*.

⁴Not applicable to filling connections at the storage container or to dispensing units of 2000 gal (7.6 m³) water capacity or less when used for filling containers not mounted upon vehicles.

4-3.4 Cargo Vehicles.

4-3.4.1 Cargo vehicles (*see Section 6-3*) unloading into storage containers shall be at least 10 ft (3 m) from the container and so positioned that the shutoff valves on both the truck and the container are readily accessible. In the case of distributing points, such as LP-Gas service stations, the truck or transport shall not be parked on a public way.

Chapter 5 Storage of Portable Containers Awaiting Use or Resale

5-1 Scope.

5-1.1 Application.

5-1.1.1 The provisions of this chapter are applicable to the storage of portable containers of 1,000 lb (454 kg) water capacity, or less, whether filled, partially filled or empty (if they have been in LP-Gas service) as follows:

- (a) At consumer sites or distributing points, but not connected for use.
- (b) In storage for resale by dealer or reseller.

5-1.1.2 The provisions of this chapter do not apply to:

- (a) Containers stored at distributing plants.

5-2 General Provisions.

5-2.1 General Location of Containers.

5-2.1.1 Containers in storage shall be so located as to minimize exposure to excessive temperature rise, physical damage or tampering.

5-2.1.2 Containers in storage having individual water capacity greater than 2½ lb (1 kg) [nominal one pound (0.45kg) LP-Gas capacity] shall be positioned such that the pressure relief valve is in direct communication with the vapor space of the container.

5-2.1.3 Containers stored in buildings in accordance with Section 5-3 shall not be located near exits, stairways, or in areas normally used, or intended to be used, for the safe egress of people.

5-2.1.4 Empty containers which have been in LP-Gas service shall preferably be stored in the open. If stored inside, they shall be considered as full containers for the purposes of determining the maximum quantities of LP-Gas permitted in 5-3.1.1, 5-3.2.1, and 5-3.3.1.

5-2.1.5 Containers not connected for use shall not be stored on roofs.

5-2.2 Protection of Valves on Containers in Storage.

5-2.2.1 Container valves shall be protected as required by 2-2.4.1. Screw-on type caps or collars shall be securely in place on all containers stored regardless of whether they are full, partially full or empty, and container outlet valves shall be closed or plugged.

5-3 Storage Within Buildings.**5-3.1 Storage within Buildings Frequented by the Public.**

5-3.1.1 DOT specification cylinders with a maximum water capacity of 2½ lb (1 kg), used with completely self-contained hand torches and similar applications, may be stored or displayed in a building frequented by the public. The quantity of LP-Gas shall not exceed 200 lb (91 kg) except as provided in 5-3.3.

5-3.2 Storage within Buildings Not Frequented by the Public (such as industrial buildings).

5-3.2.1 The maximum quantity allowed in one storage location shall not exceed 735 lb (334 kg) water capacity [nominal 300 lb (136 kg) LP-Gas]. If additional storage locations are required on the same floor within the same building, they shall be separated by a minimum of 300 ft (91 m). Storage beyond these limitations shall comply with 5-3.3

5-3.2.2 Containers carried as a part of the service equipment on highway mobile vehicles are not to be considered in the total storage capacity in 5-3.2.1 provided such vehicles are stored in private garages and carry only one LP-Gas container with an LP-Gas capacity of 100 lb (45 kg) or less per vehicle. Container valves shall be closed.

5-3.3 Storage within Special Buildings or Rooms.

5-3.3.1 The maximum quantity of LP-Gas which may be stored in special buildings or rooms shall be 10,000 lb (4540 kg).

5-3.3.2 Special buildings or rooms for storing LP-Gas containers shall not be located adjoining the line of property occupied by schools, churches, hospitals, athletic fields or other points of public gathering.

5-3.3.3 The construction of all such special buildings, and rooms within, or attached to, other buildings, shall comply with Chapter 7 and the following:

(a) Adequate vents, to the outside only, shall be provided at both top and bottom, located at least 5 ft (1.5 m) away from any building opening.

(b) The entire area shall be classified for purposes of ignition source control in accordance with Section 3-8.

5-4 Storage Outside of Buildings.**5-4.1 Location of Storage Outside of Buildings.**

5-4.1.1 Storage outside of buildings, for containers awaiting use or resale, shall be located in accordance with Table 5-4.1.1 with respect to:

- (a) Nearest important building or group of buildings.
- (b) Line of adjoining property which may be built upon.
- (c) Busy thoroughfares or sidewalks.
- (d) Line of adjoining property occupied by schools, churches, hospitals, athletic fields or other points of public gathering.

Table 5-4.1.1

| Quantity of LP-Gas Stored | Distance to: | |
|--|---------------|---------------|
| | (a) and (b) | (c) and (d) |
| 500 lb (227 kg) or less | 0 | 0 |
| 501 (227 + kg) to 2,500 lb (1134 kg) | 0 | 10 ft (3 m) |
| 2,501 (1134 + kg) to 6,000 lb (2721 kg) | 10 ft (3 m) | 10 ft (3 m) |
| 6,001 (1721 + kg) to 10,000 lb (4540 kg) | 20 ft (6 m) | 20 ft (6 m) |
| Over 10,000 lb (4540 kg) | 25 ft (7.6 m) | 25 ft (7.6 m) |

5-4.2 Protection of Containers.

5-4.2.1 Containers shall be stored within a suitable enclosure or otherwise protected against tampering.

5-4.3 Alternate Location and Protection of Storage.

5-4.3.1 When the provisions of 5-4.1.1 and 5-4.2.1 are impractical at construction sites, or at buildings or structures undergoing major renovation or repairs, the storage of containers shall be acceptable to the authority having jurisdiction.

5-5 Fire Protection.**5-5.1 Fire Extinguisher Requirements.**

5-5.1.1 Storage locations, other than supply depots at separate locations apart from those of the dealer, reseller or user's establishments, shall be provided with at least one approved portable fire extinguisher having a minimum capacity of 20 lb dry chemical with a B:C rating. (Also see NFPA 10.)

Chapter 6 Vehicular Transportation of LP-Gas

6-1 Scope.

6-1.1 Application.

6-1.1.1 This chapter includes provisions applying to containers, container appurtenances, piping, valves, equipment and vehicles used in the transportation of LP-Gas, as follows:

(a) Transportation of portable containers.

Exception: The provisions of this chapter are not applicable to LP-Gas containers and related equipment incident to their use on vehicles as covered in Sections 3-6 and 3-9.

(b) Transportation in cargo vehicles, whether fabricated by mounting cargo tanks on conventional truck or trailer chassis, or constructed as integral cargo units in which the container constitutes in whole, or in part, the stress member of the vehicle frame. Transfer equipment and piping, and the protection of such equipment and the container appurtenances against overturn, collision or other vehicular accidents are also included.

(c) Most truck transportation of LP-Gas is subject to regulation by the US Department of Transportation. Many of the provisions of this chapter are identical or similar to DOT Regulations and are intended to extend these provisions to areas not subject to DOT regulation. Vehicles and procedures under the jurisdiction of DOT shall comply with DOT Regulations.

6-1.1.2 The provisions of this chapter are not applicable to the transportation of LP-Gas on vehicles incident to its use on these vehicles as covered in 3-6.4, 3-6.5, 3-6.6 and Section 3-9.

6-1.1.3 If LP-Gas is used for engine fuel, the supply piping and regulating, vaporizing, gas-air mixing and carburetion equipment, shall be designed, constructed and installed in accordance with Section 3-6. Fuel systems (including fuel containers) shall be constructed and installed in accordance with Section 3-9. Fuel may be used from the cargo tank of tank trucks, but not from cargo tanks on trailers or semitrailers.

6-1.1.4 No artificial light other than electrical shall be used with the vehicles covered by this chapter. Wiring used shall have adequate mechanical strength and current-carrying capacity with suitable overcurrent protection (fuses or automatic circuit breakers) and shall be properly insulated and protected against physical damage.

6-2 Transportation in Portable Containers.

6-2.1 Application.

6-2.1.1 This section applies to the vehicular transportation of portable containers filled with LP-Gas delivered as "packages," including containers built to DOT Cylinder specifications and of other portable containers (such as DOT portable tank containers and skid tanks). The design and construction of these containers is covered in Chapter 2.

6-2.2 Transportation of DOT Specification Cylinders or Portable ASME Containers.

6-2.2.1 Portable containers having an individual water capacity not exceeding 1,000 lb (454 kg) [nominal 420 lb (191 kg) LP-Gas capacity], when filled with LP-Gas, shall be transported in accordance with 6-2.2.2 through 6-2.2.9

6-2.2.2 Containers shall be constructed as provided in Section 2-2 and equipped in accordance with Section 2-3 for transportation as portable containers.

6-2.2.3 The quantity of LP-Gas in containers shall be in accordance with Chapter 4.

6-2.2.4 Valves of containers shall be protected in accordance with 2-2.4.1. Screw-on type protecting caps or collars shall be secured in place.

6-2.2.5 The cargo space of the vehicle shall be isolated from the driver's compartment, the engine and its exhaust system, except as provided in 6-2.2.5(a). Open-bodied vehicles shall be considered as in compliance with this provision. Closed-bodied vehicles having separate cargo, driver's and engine compartments shall be considered as in compliance with this provision.

(a) Closed-bodied vehicles such as passenger cars, vans and station wagons shall not be used for transporting more than 215 lb (98 kg) water capacity [nominal 90 lb (41 kg) LP-Gas capacity] but not more than 108 lb (49 kg) water capacity [nominal 45 lb (20 kg) LP-Gas capacity] per container (see 6-2.2.6 and 6-2.2.7), unless the driver's and engine compartments are separated from the cargo space by a vapor-tight partition which contains no means of access to the cargo space.

6-2.2.6 Containers and their appurtenances shall be determined to be leak-free before being loaded into vehicles. Containers shall be loaded into vehicles with substantially flat floors or equipped with suitable racks for holding containers. Containers shall be securely fastened in position to minimize the possibility of movement, tipping over or physical damage.

6-2.2.7 Containers having an individual water capacity exceeding 108 lb (49 kg) [nominal 45 lb (20 kg) LP-Gas capacity] transported in open vehicles shall be transported with the relief devices in direct communication with the vapor spaces. Containers having an individual water capacity exceeding 10 lb (4.5 kg) [nominal 4.2 lb (2 kg) LP-Gas capacity] transported in enclosed spaces of the vehicle shall be transported with the relief device in direct communication with the vapor spaces.

6-2.2.8 Containers having an individual water capacity not exceeding 108 lb (49 kg) [nominal 45 lb (20 kg) LP-Gas capacity] transported in open vehicles may be transported in other than the upright position. Containers having an individual water capacity not exceeding 10 lb (4.5 kg) [nominal 4.2 lb (2 kg) LP-Gas capacity] transported in enclosed spaces of the vehicle may be transported in other than the upright position.

6-2.2.9 Vehicles transporting more than 1,000 lb (454 kg) of LP-Gas, including the weight of the containers, shall be placarded as required by DOT regulations and/or state law.

6-2.3.6 Containers and their appurtenances shall be determined to be leak-free before being loaded into vehicles. Containers shall be loaded onto a flat vehicle floor or platform, or onto a suitable vehicle frame. In either case, containers shall be securely blocked or held down to minimize movement, relative to each other or to the supporting structure, while in transit.

6-2.3.7 Containers shall be transported with relief devices in communication with the vapor space.

6-2.3.8 Vehicles carrying more than 1,000 lb (454 kg) of LP-Gas, including the weight of the containers, shall be placarded as required by DOT regulations and/or state law.

6-2.3.9 When portable containers complying with 6-2.3.1 through 6-2.3.8 are permanently or semipermanently mounted on vehicles to serve as cargo tanks, so that the assembled vehicular unit can be used for making liquid deliveries to other containers at points of use, the provisions of Section 6-3 shall apply.

6-2.4 Fire Extinguishers.

6-2.4.1 Each truck or trailer transporting portable containers as provided by 6-2.2 or 6-2.3 shall be equipped with at least one approved portable fire extinguisher having a minimum capacity of 20 lb dry chemical with a B:C rating. (*Also see NFPA 10.*)

6-3.6 Painting and Marking Liquid Cargo Vehicles.

6-3.6.1 Painting of cargo vehicles shall comply with CFR 49. Placarding and marking shall comply with CFR 49.

6-3.7 Fire Extinguishers.

6-3.7.1 Each tank truck or tractor shall be provided with at least one approved portable fire extinguisher having a minimum capacity of 20 lb dry chemical with a B:C rating. (*Also see NFPA 10*).

6-3.8 Chock Blocks for Liquid Cargo Vehicles.

6-3.8.1 Each tank truck and trailer shall carry chock blocks which shall be used to prevent rolling of the vehicle whenever it is being loaded or unloaded, or is parked.

SOME SUGGESTED PROCEDURES FOR THE
INVESTIGATION OF LP GAS EXPLOSIONS

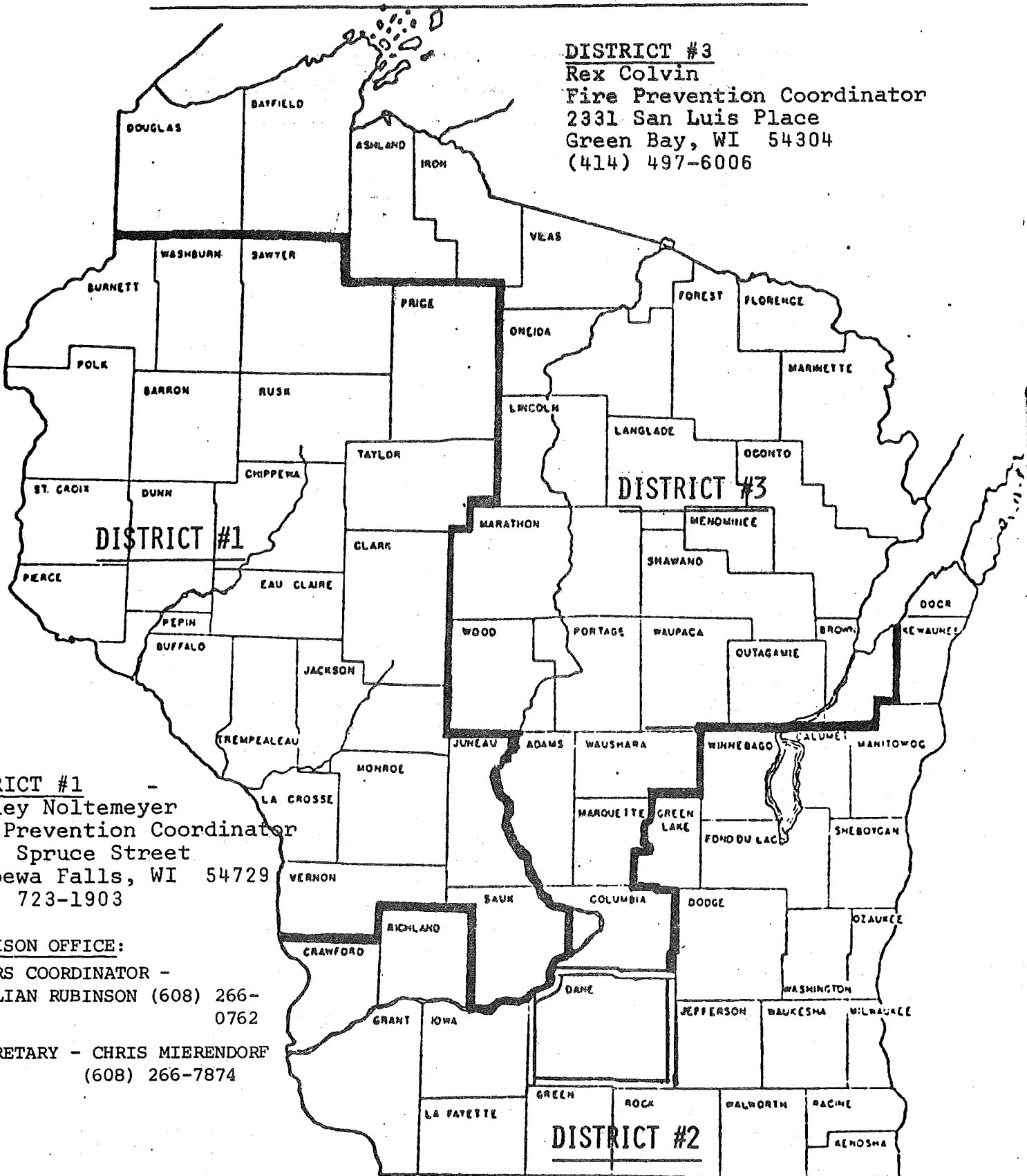
1. Determine gas supplier and notify if this has not already been done.
2. Take camera to the scene and obtain pictures of all equipment and anything else you feel that may be pertinent to the explosion. Record the date and hour of the day pictures were taken.
3. Interview owner or manager where explosion took place.
4. Interview all witnesses.
5. Record what work was being done at the time of the explosion. Did work involve the use of propane.
6. Record identification of all LP gas equipment, make - model - serial numbers. Also record the type of pipe or tubing used.
7. Record all information from identification plate on storage tank. If DOT container, record all information imprinted on the container.
8. Did any injuries occur? If so, record names and addresses. Interview if physical condition permits.
9. Obtain all facts possible.
10. Check for odorization of gas, container to be locked or sealed until this has been done.
11. All equipment to remain intact until all concerned persons have made their investigation.
12. If absolutely sure (do not assume) write cause of explosion.

For further assistance, contact your Fire Prevention Coordinator.

STATE/DILHR FIRE PREVENTION COORDINATOR DISTRICTS

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