STATE OF NEW HAMPSHIRE

SITE EVALUATION COMMITTEE

DOCKET NO. 2015-01

SEA-3, INC.'S REPLY TO OBJECTION OF COUNSEL FOR THE PUBLIC TO REQUEST FOR EXEMPTION

NOW COMES SEA-3, Inc. ("SEA-3"), through its counsel, Shaines & McEachern, P.A., and files the within Reply to the Objection of Counsel for the Public to SEA-3's Request for Exemption and states as follows:

In support of his Objection to SEA-3's Request for Exemption, Counsel for the Public raises various arguments that are not substantiated by the record in this matter, nor within the Committee's jurisdiction to resolve.

(a) The Facility is subject to existing federal, state and local laws that adequately protect the objectives of RSA 162-H:1.

In dismissing the extensive regulatory framework that governs SEA-3's facility without analysis of the cited provisions, Counsel for the Public claims the cited regulations are "ubiquitous in the modern world for property and business owners." See Obj. at p. 3.

Far from being ubiquitous, the regulations that govern SEA-3's facility are highly specialized and apply to very few properties in New Hampshire. For example, SEA's facility is subject to the federal government's Maritime Transportation Security Act of 2002, as codified in 46 U. S. C. Chapter 701, which requires SEA-3 to implement a Facility Security Plan that is approved by the Federal Maritime Security Coordinator. See 33 C. F. R. § 105.120(a). This Facility Security Plan must satisfy all of the requirements of 33 C. F. R. §§ 105.200-296, which are extensive and include requirements that SEA-3 train all Facility personnel in emergency procedures and contingency plans, conduct security drills every three months and maintain

fencing, lighting, surveillance and a backed-up communication system providing continuous communication between Facility security personnel and national and local authorities having security responsibility. These provisions are specifically directed at protecting public safety.

SEA-3's facility is also subject to the EPA's Risk Management Program regulations set forth at 40 C. F. R. § 68, et seq., and OSHA's Process Hazard Analysis regulations for liquefied petroleum gases set forth at 29 C. F. R. § 1910.110, et seq. which consist of 64 pages of rules specific to the handling of liquefied petroleum gas and govern such things as: (1) odorizing gases, (2) approval of equipment and systems, (3) requirements for construction and original test of containers, (4) welding of containers, (5) markings on containers, (6) location of containers and regulating equipment, (7) container valves and container accessories, (8) piping – including pipe, tubing and fittings, (9) hose specifications, (10) safety devices, (11) vaporizer and housing, (12) filling densities, (13) LP – gas in buildings, (14) transfer of liquids, (15) tank car or transport truck loading or unloading points and operations, (16) instructions, (17) electrical equipment and other sources of ignition, (18) fixed electrical equipment in classified areas and (19) liquid level gauging devices. See 29 C. F. R. § 1910.110 (b) (1)-(19).

SEA-3's facility must also comply with the National Fire Protection Association's Liquefied Petroleum Gas Code ("NFPA 58") as adopted by the New Hampshire State Fire Code and the Town of Newington's Zoning Ordinance. NFPA 58 is a model code developed by the National Fire Protection Association's Technical Committee on Liquefied Petroleum Gases for use by state and local government in regulating the storage, handling, transportation and use of liquefied petroleum gas. NFPA 58 sets forth specific requirements for the "design, construction, installation and operation of marine terminals whose primary purpose is the receipt of LP-gas for delivery to transporters, distributors or users." See NFPA 58, Section 1.3.1 (4). The specific

requirements for the installation of LP-Gas systems are set forth in Chapter 6 of NFPA 58, a copy of which is attached hereto as Exhibit A. For example, NFPA 58 Section 6.27, Fire Protection, mandates the preparation and submittal of a Fire Safety Analysis.

In this case, SEA-3 commissioned Philip R. Sherman, P. E., to prepare a Fire Safety Analysis for its proposed improvements and Mr. Sherman's Fire Safety Analysis was submitted to the Newington Planning Board as part of SEA-3's application for site review approval. See Certified Record of the Town of Newington Planning Board, Rockingham Superior Court, Dkt. No. 218-2014-CV-00654 ("C. R.") at p. 49. In response, the Town of Newington retained its own independent expert, SFC Engineering Partnership, Inc. ("SFC"), to review Mr. Sherman's analysis. Upon its review, SFC concluded that, "[t]his FSA document appears to be in general compliance with NFPA 58, and the NPGA FSA manual. No significant problems have been found with the proposed system or the FSA at this point however the above-listed detailed documentation should be submitted and reviewed prior to the issuing of a building permit and system commissioning." See C. R. at p. 378. The publication of SEA-3's Fire Safety Analysis is further evidence that a full and complete disclosure of SEA-3's plans was made available to the public.[1]

Following a review of the project by the Rockingham Planning Commission's Developments of Regional Impact Committee ("DRIC") on January 8, 2014, the DRIC issued its own recommendation to the Newington Planning Board, encouraging it "to engage in post development approval inspections to insure that the new site improvements at the Sea-3 [sic] facility are constructed in accordance with NFPA 58." See C. R. at p. 128.

[1] Despite Portsmouth's recent claims of concern over site safety, it has never challenged or even questioned the findings of SEA-3's Fire Safety Analysis or the conclusions of SFC.

Counsel for the Public would have the Committee believe that every property and business owner in New Hampshire operates under these requirements, but he offers no examples. The breadth and detail of these highly specialized regulations, which are designed to provide for the safe, secure handling and storage of a much needed fuel in our State, demonstrates recognition, concern and protection for the welfare and safety of the population, particularly those who rely on propane for their heating needs, while at the same time allowing for the further growth of industry and the overall economic growth of the state.

Counsel for the Public also invites the Committee to involve itself in the oversight of railroad operations as part of this application. See Obj. at p. 4 (". . . in considering whether to issue a certificate of site and facility for a ramped up operation at Sea-3's [sic] facility within its jurisdiction the Committee should evaluate the efficacy of railroad safety regulation.") Counsel's invitation to use RSA 162-H as a means to regulate rail traffic passing through the City of Portsmouth, is directly contrary to our own Supreme Court's ruling that, "Congress intended the federal government to exclusively occupy the field of railroad regulation." See In re Conservation Law Foundation, 147 N. H. 89, 94 (2001) (rejecting the Conservation Law Foundation's claim that the New Hampshire Public Utilities Commission had authority to regulate abandoned rail lines under RSA 365:24-a).

The New Hampshire Department of Transportation has already affirmed - in the context of this project - that it has "no jurisdiction over the commodities that Pan Am transports over the line. With respect to commodities that can be transported, Pan Am is subject to rules of the Surface Transportation Board." See Letter of Shelley Winters, Administrator, NHDOT Bureau of Rail & Transit, dated February 11, 2014, Req. for Exemption at Exhibit I.

Despite the clear pronouncements of our Supreme Court and Department of Transportation that the State lacks authority to regulate railroad operations, Counsel for the Public is urging the Committee to venture down those tracks and look for ways to regulate the claimed effects of rail traffic. At the same time Counsel for the Public is asking this Committee to regulate matters which have been held to be subject to exclusive federal jurisdiction, he is decrying the "multiple avenues of litigation" in this case. See Obj. at p. 5. If Counsel for the Public were truly concerned with limiting litigation in the context of this case, he would not ask this Committee to exercise jurisdiction over railroad operations.

In his Objection, Counsel for the Public goes out of his way to raise issues where none exist, even going so far as to claim that granting the Request for Exemption will somehow frustrate the statutory objective of avoiding undue delay in the construction of SEA-3's facility, apparently because of his view that a decision to grant the requested exemption would be appealed by the City of Portsmouth. See Obj. at p. 5. SEA-3 should not have to forgo a meritorious Request for Exemption simply because Portsmouth is intent on litigating any adverse decision it may receive in order to prevent rail traffic.

Counsel for the Public erroneously claims "there does not appear to be any attention paid to how the project affects the orderly development of the region, public health, aesthetics or historic sites." See Obj. at p. 5. As described in the Request for Exemption, New Hampshire had to declare a state of emergency due to the lack of propane at SEA-3's facility. The proposed improvements are necessary to eliminate the conditions that created this emergency. The expansion of SEA-3's existing rail capacity will once again provide New Hampshire with a stable, economical supply of propane for the 67,000+ New Hampshire households that rely on it

for their heating needs.[2] See Req. for Exemption at p's 6-9. As shown in the photographs attached to the Request for Exemption, these proposed improvements will be located on an existing, cleared, industrially-zoned property that has a hard-packed gravel surface, is devoid of vegetation, has no public access and is not even visible to the public. See Req. for Exemption, Exhibit E, Figures 1-7. To the extent that the railroad is alleged to be the cause of negative impacts to aesthetics or historic sites in Portsmouth or elsewhere, the Committee has no jurisdiction to regulate these alleged effects.

Counsel for the Public raises the claim that existing federal, state and local regulations do not examine whether SEA-3 has "adequate financial, managerial and technical capabilities" See Obj. at p. 5 (citing RSA 162-H:16, IV (a)). Leaving aside the fact that satisfaction of RSA 162-H:16, IV (a) is not part of the legal test to obtain an exemption under RSA 162-H:4, IV, the Committee is entitled to take notice of the fact, as pled in SEA-3's verified Request for Exemption, that SEA-3 has safely operated its Newington facility for 40 years in compliance with the existing federal, state and local regulations, during which time it has amply demonstrated its financial, managerial and technical capabilities to carry on its existing activities, which include offloading rail cars. Further evidence of SEA-3's technical and managerial capabilities is evident from the Statement of SEA-3, Inc., filed February 27, 2015, wherein SEA-3's Vice President of Operations, Paul N. Bogan, sets forth his extensive personal qualifications and training in the propane industry, which include service as: National Propane Gas Association Emergency Response Curriculum Development Task Force Member for the Propane Emergencies Program; Massachusetts Firefighting Academy LPG Emergency Response Training Course Instructor; Massachusetts Firefighting Academy LNG/LPG Firefighting Course,

[2] Counsel for the Public is statutorily charged by RSA 162-H:9 with representing the public "in seeking to protect the quality of the environment and in seeking to assure an adequate supply of energy," however his 13 page Objection does not address the impact which the proposed improvements will have on energy supplies.

Developer of Curriculum and Training Equipment; and NFPA Principal Committee Member on the Liquefied Petroleum Gas Code (NFPA 58).

In his Objection, Counsel for the Public asserts that the Newington Planning Board failed to require any safety study. See Obj. at p. 7. In fact, the Newington Planning Board did require a safety study which was prepared by Philip R. Sherman and submitted to the Planning Board. See C. R. at p. 49. Mr. Sherman's Fire Safety Analysis was prepared in accordance with the requirements of NFPA 58 and directly addressed all aspects of the site's fire safety. This study was submitted to the Board and reviewed and approved by its own independent expert. See C. R. at p. 378. Mr. Sherman also testified before the Planning Board regarding his findings and his testimony and his Fire Safety Analysis went unchallenged. See C. R. at p's 322-324. In fact, Portsmouth publicly acknowledged that its concerns "are not due to the site plan itself." See Letter of Mayor Lister to U. S. Senator Shaheen, dated February 18, 2014, Req. for Exemption at Exhibit K.

The safety of the proposed improvements and their potential impacts were also reviewed by area fire chiefs. As stated by the City of Portsmouth's own Fire Chief Steven E. Achilles:

> The Portsmouth Fire Department and other area fire departments are not debating or questioning the many concerns of our elected representatives or citizens. We met to review and discuss the project, the mode of transportation, our ability to respond, and other related fire and life safety concerns. **At this time the general consensus is that the risk of fire and the accidental release of product is extremely low, but not zero. Most fire departments are extremely familiar with the product and the emergency response required if there is an accidental release or fire.**

See Email correspondence of Steven E. Achilles to Proposed Intervener Richard DiPentima, dated March 24, 2014, C. R. at p. 577 (emphasis added); see also, C. R. at p. 275 (Seacoastonline news story dated March 22, 2014, reporting Chief Achilles' statement that additional propane tank car transportation does not pose an additional significant hazard.).

Chief Achilles' conclusions are consistent with those of Newington's then acting Fire Chief Dale Sylvia who inspected the Site with two State Fire Marshalls and concluded that, "[f]rom a fire department view I believe this is a positive for Newington, because it gives us the opportunity to update and increase fire protection systems that are already in place but outdated. The operation they are proposing in [sic] not dramatically different then [sic] their current operation." See Memorandum of Chief Sylvia to the Planning Board dated October 9, 2013, C. R. at p. 31. As noted by Chief Head, the proposed improvements would increase site safety. As found by the Newington Planning Board, "[t]he proposed site improvements will update and modernize the site's existing fire protection systems." See C. R. at p. 520.

In evaluating public safety issues, such as Portsmouth's current request for a new safety study of the site, it should be noted that the Committee's authority is subordinate to the determinations of the State Fire Marshall, who retains ultimate authority over public safety issues arising under the State Fire Code. RSA 162-H:16, II provides that, "[a] certificate shall be conclusive on all questions of siting, land use, air and water quality." Noticeably absent from this list are questions of public safety. RSA 162-H:16, I, further provides that, "the committee shall not issue any certificate under this chapter if any of the state agencies denies authorization for the proposed activity over which it has permitting or other regulatory authority."

The State Fire Marshall has both permitting and regulatory authority over the proposed improvements. Under RSA 155-A:2, I, "[a]ll buildings, building components, and structures constructed in New Hampshire shall comply with the state building code and state fire code." RSA 155-A:4, I requires that, "Before starting new construction . . . the person responsible for such construction shall obtain a permit," which can be obtained at the local level, RSA 155-A:4, II, or from the State Fire Marshall, RSA 155-A:4, III.

Under this regulatory scheme, the Committee cannot modify or change determinations made by the State Fire Marshall or Newington Fire Chief under the state fire code or the building code. Consequently, this Committee must yield to the decisions of the State Fire Marshall and the Newington Fire Chief with respect to whether the proposed improvements meet the State's Fire Code, including NFPA 58. Any inquiry by the Committee into whether the design of SEA-3's proposed improvements meet the State Fire Code, including but not limited to NFPA 58, would lack conclusive effect, would be an unnecessary waste of the Committee's time and resources and would result in undue delay in the construction of SEA-3's proposed improvements.

Contrary to the assertion of Counsel for the Public, there was no failure by the Town of Newington to require a safety study of the site. What Newington rejected was Portsmouth's repeated requests that it engage in a safety study *of the railroad.* After receiving testimony from representatives of both the Federal Railroad Administration, see C. R. at p's 233-241, and the New Hampshire Department of Transportation, see C. R. at p's 317-322, and the written opinion of the New Hampshire Department of Transportation and the advice of its own counsel, the Board correctly decided that it had no jurisdiction to require a safety study of the railroad. It was Newington's refusal to require a study of the railroad that caused Portsmouth to file suit. On June 18, 2014, Portsmouth sent a letter to the Governor of New Hampshire explaining its actions:

> While the Newington Planning Board performed a thoughtful and deliberate review of this application, there was reluctance on the part of the Planning Board to address the significant impacts on safety this project places on the abutting communities. During the public hearing process, **the City specifically requested that Newington require a safety/hazard assessment to identify the risks and hazards associated with the transporting LPG through the City and other affected communities. Unfortunately, no such stipulation was required of the**

applicant and the City has appealed the Newington Planning Board's approval of Sea-3's expansion to compel such study.

See Letter of Robert J. Lister, Mayor, dated June 18, 2014, Req. for Exemption at Exhibit L (emphasis added).

(a) Consideration of the proposed improvements by only select agencies on the Committee is required.

One of the stated objectives of RSA 162-H:1 is to resolve all environmental, economic and technical issues before the Committee in one integrated proceeding, instead of requiring the applicant to obtain multiple approvals from the individual state agencies in a piece-meal fashion. Counsel for the Public concedes in his Objection that the only agency represented on the Committee with regulatory jurisdiction over the proposed improvements is NHDES and that it has already issued the only two permits it requires prior to beginning construction. Requiring full certification under these circumstances would be a waste of the Committee's resources and would unduly delay the construction of a much needed project for no apparent reason.

(b) To the extent that members of the public seek to regulate rail traffic through the mechanism of the State's Site Evaluation Process, their response to the Request for Exemption must be given no weight.

Counsel for the Public cites letters written to the Committee by Portsmouth residents who oppose SEA-3's Request for Exemption as evidence that SEA-3 has failed to satisfy the requirement of RSA 162-H:4, IV (c). However, a review of these letters reveals that their opposition is unconnected to any valid objective of RSA 162-H:1 and is instead motivated by their desire to prevent any increase in rail traffic through the City of Portsmouth. Because their response is not connected to a valid objective of RSA 162-H:1, it must be given no weight by the Committee.

(c) All environmental impacts or effects are adequately regulated by other federal, state, or local statutes, rules or ordinance.

In his Objection, Counsel for the Public fails to acknowledge the existing, extensive regulatory framework that applies to SEA-3's facility, as described in the Request for Exemption. As found by the Newington Planning Board, the construction of additional rail unloading berths and associated equipment will result in "no adverse change to existing dust, erosion or run-off conditions." See C. R. at p. 523.

Respectfully submitted,

SEA-3, INC.

By Its Attorneys,

SHAINES & McEACHERN, P.A.

Dated: May 1, 2015

By: _____

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EXHIBIT A

NFPA 58

Liquefied Petroleum Gas Code

2014 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex M. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex M.

Chapter 1 Administration

1.1* Scope. This code shall apply to the storage, handling, transportation, and use of liquefied petroleum gas (LP-Gas).

1.2 Purpose. (Reserved)

1.3 Application.

1.3.1 Application of Code. This code shall apply to the operation of all LP-Gas systems, including the following:

(1) Containers, piping, and associated equipment, when delivering LP-Gas to a building for use as a fuel gas.
(2) Highway transportation of LP-Gas.
(3) The design, construction, installation, and operation of marine terminals whose primary purpose is the receipt of LP-Gas for delivery to transporters, distributors, or users, except for marine terminals associated with refineries, petrochemicals, gas plants, and marine terminals whose purpose is the delivery of LP-Gas to marine vessels.
(4)*The design, construction, installation, and operation of pipeline terminals that receive LP-Gas from pipelines under the jurisdiction of the U.S. Department of Transportation (DOT) whose primary purpose is the receipt of LP-Gas for delivery to transporters, distributors, or users. Coverage shall begin downstream of the last pipeline valve or tank manifold inlet.

1.3.2 Nonapplication of Code. This code shall not apply to the following:

(1) Frozen ground containers and underground storage in caverns, including associated piping and appurtenances used for the storage of LP-Gas
(2) Natural gas processing plants, refineries, and petrochemical plants
(3) LP-Gas at utility gas plants (including refrigerated storage) *(see* NFPA 59, *Utility LP-Gas Plant Code)*
(4)*Chemical plants where specific approval of construction and installation plans is obtained from the authority having jurisdiction
(5)*LP-Gas used with oxygen
(6)*The portions of LP-Gas systems covered by NFPA 54 (ANSI Z223.1), *National Fuel Gas Code,* where NFPA 54 (ANSI Z223.1) is adopted, used, or enforced
(7) Transportation by air (including use in hot air balloons), rail, or water under the jurisdiction of the DOT
(8)*Marine fire protection
(9) Refrigeration cycle equipment and LP-Gas used as a refrigerant in a closed cycle
(10) The manufacturing requirements for recreational vehicle LP-Gas systems that are addressed by NFPA 1192, *Standard on Recreational Vehicles*
(11) Propane vehicle fuel dispensers located at multiple fuel refueling stations *(see* NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages)*

1.4 Retroactivity. The provisions of this code reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this code at the time it was issued.

1.4.1 Unless otherwise specified, the provisions of this code shall not apply to facilities, equipment, appliances, structures, or installations that existed or were approved for construction or installation prior to the effective date of the code. Equipment and appliances include stocks in manufacturers' storage, distribution warehouses, and dealers' storage and showrooms in compliance with the provisions of this code in effect at the time of manufacture. Where specified, the provisions of this code shall be retroactive.

1.4.2 In those cases where the authority having jurisdiction determines that the existing situation presents a distinct hazard to life and property, the authority having jurisdiction shall be permitted to apply retroactively any portions of this code that are deemed appropriate.

1.4.3 Where the application of the retroactivity requirements of this code are determined to be impractical in the judgment of the authority having jurisdiction, alternate requirements that provide a reasonable degree of safety shall be provided by the authority having jurisdiction.

1.5 Equivalency. Nothing in this code is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this code.

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.5.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

5.21.9 Vaporizer Pressure Relief Valve.

5.21.9.1 The minimum rate of discharge in cubic feet of air per minute for pressure relief valves for LP-Gas vaporizers, either of the indirect type or direct-fired type, shall comply with 5.21.9.2 through 5.21.9.4.

5.21.9.2 Based on conservative heat transfer calculations (assuming that the vaporizing chamber is liquid full), the maximum vapor generating capacity (rate) shall be determined when maximum heat is available. That vapor rate shall be converted to an equivalent air rate.

5.21.9.3 If the vaporizer is direct fired or if a substantial exterior surface is in contact with the LP-Gas, the sum of the vaporizer surface and the LP-Gas wetted exterior surface shall be used in conjunction with Table 5.7.2.6 to determine the required relief valve capacity.

5.21.9.4 The minimum rate of discharge in cubic feet of air per minute for pressure relief valves for LP-Gas vaporizers, of either the indirect type or direct-fired type, shall be at least 150 percent of the rated vaporizing capacity.

5.22 Vehicle Fuel Dispensers.

5.22.1 The dispenser shall have a maximum design pressure rating equal to or greater than the maximum discharge pressure from the pump and bypass valve, if provided.

5.22.2 The maximum design pressure and all equipment downstream from the pump shall be in accordance with Table 5.17.2.1.

Chapter 6 Installation of LP-Gas Systems

6.1 Scope.

6.1.1* Application. This chapter applies to the following:

(1) Location and field installation of LP-Gas systems that use components, subassemblies, container assemblies, and container systems that are fabricated in accordance with Chapter 5
(2) Location of containers and liquid transfer systems
(3) Installation of container appurtenances and regulators
(4) Installation of piping (including flexible connectors and hose), hydrostatic relief valves, and piping service limitations
(5) Installation of equipment
(6) Testing of piping systems

6.1.2 Nonapplication. This chapter does not apply to the following:

(1) Refrigerated containers
(2) Installation of systems used in the highway transportation of LP-Gas

6.1.3* Additional Features. For any purpose or application addressed within the scope of this chapter, if the requirements of the chapter are met, any or all additional features or components of equipment not prohibited by the chapter shall be permitted to be used.

6.2 Location of Containers.

6.2.1 LP-Gas containers shall be located outside of buildings unless they are specifically allowed to be located inside of buildings.

6.2.2 LP-Gas containers shall be allowed in buildings only for the following applications:

(1) Cylinders as specifically provided for in Section 6.20
(2) Containers of less than 125 gal (0.5 m^3) water capacity for the purposes of being filled in buildings or structures complying with Chapter 10
(3) Containers on LP-Gas vehicles complying with, and parked or garaged in accordance with, Chapter 9
(4) Containers used with LP-Gas portable engine fuel systems complying with 11.15.1
(5) Containers used with LP-Gas stationary engine fuel systems complying with 6.26
(6) Containers used with LP-Gas–fueled industrial trucks complying with 11.13.4
(7) Containers on LP-Gas–fueled vehicles garaged in accordance with Section 11.16
(8) Cylinders awaiting use, resale, or exchange when stored in accordance with Chapter 8

6.3 Container Separation Distances.

6.3.1 Aboveground Containers.

6.3.1.1* 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 adjacent containers, important building, group of buildings, or line of adjoining property that can be built upon, in accordance with Table 6.3.1.1, Table 6.4.1.2, 6.3.1.2 through 6.3.1.3, 6.3.3, 6.3.4.1 through 6.3.4.4, and 6.4.4.6 through 6.4.4.11.

6.3.1.2 When the provisions of 6.28.3 through 6.28.5 are met, the minimum distance from an ASME container to a building shall be reduced by one-half for ASME containers of 2001 gal through 30,000 gal (7.6 m^3 through 114 m^3) water capacity.

6.3.1.3 The 25 ft (7.6 m) minimum distance from aboveground ASME containers of 501 gal through 2000 gal (1.9 m^3 through 7.6 m^3) water capacity to buildings, a group of buildings, or the line of adjoining property that can be built upon shall be reduced to 10 ft (3 m) for a single ASME container of 1200 gal (4.5 m^3) or less water capacity where such container is at least 25 ft (7.6 m) from any other LP-Gas container of more than 125 gal (0.5 m^3) water capacity.

6.3.2 Underground or Mounded ASME Containers.

6.3.2.1 Minimum distances for underground or mounded ASME containers of 2001 gal through 30,000 gal (7.6 m^3 through 114 m^3) water capacity, incorporating all the provisions of Section 6.28, shall be reduced to 10 ft (3 m).

6.3.2.2 Distances for all underground and mounded ASME containers shall be measured from the container surface.

6.3.2.3 No part of an underground or mounded ASME container shall be less than 10 ft (3 m) from a building or line of adjoining property that can be built upon.

6.3.3 Minimum Separation Distances for ASME Containers.

6.3.3.1 The minimum separation distances specified in Table 6.3.1.1 between containers and buildings of other than woodframe construction devoted exclusively to gas manufacturing and distribution operations shall be reduced to 10 ft (3 m).

6.3.3.2 If the aggregate water capacity of a multicontainer installation is 501 gal (1.9 m^3) or more and the installation is comprised of individual containers, each with a water capacity of less than 125 gal (0.5 m^3), the minimum distance shall comply with Table 6.3.1.1 and 6.3.3.2(A) through 6.3.3.2(C).

(A) The aggregate capacity shall be used rather than the capacity per container.

Table 6.3.1.1 Separation Distances Between Containers, Important Buildings, and Line of Adjoining Property That Can Be Built Upon

Water Capacity per Container		Minimum Distances					
		Mounded or Underground Containers[a]		Aboveground Containers		Between Containers[b]	
gal	m^3	ft	m	ft	m	ft	m
<125[c]	<0.5[c]	10	3	0[d]	0[d]	0	0
125–250	0.5–1.0	10	3	10	3	0	0
251–500	>1.0–1.9	10	3	10	3	3	1
501–2,000	>1.9–7.6	10	3	25[e]	7.6	3	1
2,001–30,000	>7.6–114	50	15	50	15	5	1.5
30,001–70,000	>114–265	50	15	75	23	¼ of sum of diameters of adjacent containers	
70,001–90,000	>265–341	50	15	100	30		
90,001–120,000	>341–454	50	15	125	38		
120,001–200,000	>454–757	50	15	200	61		
200,001–1,000,000	>757–3,785	50	15	300	91		
>1,000,000	>3,785	50	15	400	122		

[a]See 6.3.2.1.
[b]See 6.3.4.5.
[c]See 6.3.4.4.
[d]See 6.3.4.1, 6.3.4.2, 6.3.4.3, and 6.3.4.4.
[e]See 6.3.1.3.

(B) 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).

(C) The minimum distances between containers shall not be applied to installations covered by 6.3.3.2.

6.3.4 Separation Distance Between Container Pressure Relief Valve and Building Openings.

6.3.4.1 Cylinders shall not be located and installed underneath any building unless the space is open to the atmosphere for 50 percent of its perimeter or more.

6.3.4.2 ASME containers of less than 125 gal (0.5 m^3) water capacity shall be located and installed so that the discharge from pressure relief devices shall not terminate in or beneath any building.

6.3.4.3* The distance measured horizontally from the point of discharge of a container pressure relief valve to any building opening below the level of such discharge shall be in accordance with Table 6.3.4.3.

6.3.4.4 The distance measured in any direction from the point of discharge of a container pressure relief valve, vent of a fixed maximum liquid level gauge on a container, and the container filling connection to exterior sources of ignition, openings into direct-vent (sealed combustion system) appliances, and mechanical ventilation air intakes shall be in accordance with Table 6.3.4.3.

6.3.4.5 Access at the ends or sides of individual underground containers having a water capacity of 125 gal (0.5 m^3) or more shall be provided in multicontainer installations to facilitate working with cranes or hoists.

Table 6.3.4.3 Separation Distance Between Container Pressure Relief Valve and Building Openings

Container Type	Exchange or Filled on Site at Point of Use	Distance Horizontally from Relief Valve Discharge to Opening Below Discharge		Discharge from Relief Valve, Vent Discharge, and Filling Connection to Exterior Source of Ignition, Openings into Direct-Vent Appliances, and Mechanical Ventilation Air Intakes	
		ft	m	ft	m
Cylinder	Exchange	3	0.9	5	1.5
Cylinder	Filled on site at the point of use	3	0.9	10	3.0
ASME	Filled on site at the point of use	5	1.5	10	3.0

6.4 Other Container Location Requirements.

6.4.1 ASME Multicontainer Requirements.

6.4.1.1 Where storage containers having an aggregate water capacity of more than 4000 gal (15.2 m^3) are located in heavily populated or congested areas, the siting provisions of 6.3.1.1 and Table 6.3.1.1 shall be permitted to be modified as indicated by the fire safety analysis described in 6.27.3.

6.4.1.2 Aboveground multicontainer installations comprised of ASME containers having an individual water capacity of 12,000 gal (45 m^3) or more and installed for use in a single location shall be limited to the number of containers in one group, with each group separated from the next group in accordance with the degree of fire protection provided in Table 6.4.1.2.

Table 6.4.1.2 Maximum Number of Containers in a Group and Their Separation Distances

Fire Protection Provided by	Maximum Number of Containers in One Group	Minimum Separation Between Groups	
		ft	m
Hose streams only *(see 6.4.1.2 and 6.27.3.1)*	6	50	15
Fixed monitor nozzles per 6.27.6.3	6	25	7.6
Fixed water spray per 6.27.6.1	9	25	7.6
Insulation per 6.27.5.1	9	25	7.6

6.4.1.3 Where the provisions of 6.28.3 and 6.28.4 are met, the minimum separation distance between groups of ASME containers protected by hose stream only shall be one-half the distances required in Table 6.4.1.2.

6.4.2 Underground and Mounded ASME Containers.

6.4.2.1 Underground or mounded ASME containers shall be located in accordance with 6.4.2.2 and 6.4.2.3.

6.4.2.2 Underground or mounded containers shall be located outside of any buildings.

6.4.2.3 Buildings shall not be constructed over any underground or mounded containers.

6.4.3 General Requirements.

6.4.3.1 The sides of adjacent containers shall be separated in accordance with Table 6.3.1.1 but shall not be separated by less than 3 ft (1 m).

6.4.3.2 Where containers are installed parallel with ends in line, the number of containers in one group shall not be limited.

6.4.3.3 Where more than one row of containers is installed, the adjacent ends of the containers in each row shall be separated by not less than 10 ft (3 m).

6.4.4 Additional Container Installation Requirements.

6.4.4.1 Additional container installation requirements shall comply with 6.4.4.2 through 6.4.4.14 and 6.4.5.

6.4.4.2 Containers shall not be stacked one above the other.

6.4.4.3* Combustible materials shall not accumulate or be stored within 10 ft (3 m) of a container.

6.4.4.4* The area under containers shall be graded or shall have dikes or curbs installed so that the flow or accumulation of flammable liquids with flash points below 200°F (93.4°C) is prevented.

6.4.4.5 LP-Gas containers shall be located at least 10 ft (3 m) from the centerline of the wall of diked areas containing flammable or combustible liquids.

6.4.4.6 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).

6.4.4.7 The requirements of 6.4.4.6 shall not apply where LP-Gas containers of 125 gal (0.5 m^3) or less water capacity are installed adjacent to fuel oil supply tanks of 660 gal (2.5 m^3) or less capacity.

6.4.4.8 No horizontal separation shall be 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.*

6.4.4.9* The minimum separation between LP-Gas containers and oxygen or gaseous hydrogen containers shall be in accordance with NFPA 55, *Compressed Gases and Cryogenic Fluids Code.*

6.4.4.10 Where protective structures having a minimum fire resistance rating of 2 hours interrupt the line of sight between uninsulated portions of the oxygen or hydrogen containers and the LP-Gas containers, no minimum distance shall apply.

6.4.4.11 The minimum separation between LP-Gas containers and liquefied hydrogen containers shall be in accordance with NFPA 55, *Compressed Gases and Cryogenic Fluids Code.*

6.4.4.12 Where LP-Gas cylinders are to be stored or used in the same area with other compressed gases, the cylinders shall be marked to identify their content in accordance with ANSI/CGA C-7, *Guide to the Preparation of Precautionary Labeling and Marking of Compressed Gas Containers.*

6.4.4.13 An aboveground LP-Gas container and any of its parts shall not be located within 6 ft (1.8 m) of a vertical plane beneath overhead electric power lines that are over 600 volts, nominal.

6.4.4.14* Refrigerated LP-Gas containers shall be located within an impoundment in accordance with Section 12.5.

6.4.5* Structure Requirements.

6.4.5.1 Structures such as fire walls, fences, earth or concrete barriers, and other similar structures shall not be permitted around or over installed nonrefrigerated containers unless specifically allowed.

6.4.5.2 Structures partially enclosing containers shall be permitted if designed in accordance with a sound fire protection analysis.

6.4.5.3 Structures used to prevent flammable or combustible liquid accumulation or flow shall be permitted in accordance with 6.4.4.4.

6.4.5.4 Structures between LP-Gas containers and gaseous hydrogen containers shall be permitted in accordance with 6.4.4.10.

6.4.5.5 Structures such as fences shall be permitted in accordance with 6.19.4.

6.5 Location of Transfer Operations.

6.5.1 Transfer of Liquids.

6.5.1.1* Liquid shall be transferred into containers, including containers mounted on vehicles, only outdoors or in structures specially designed for such purpose.

6.5.1.2 The transfer of liquid into containers mounted on vehicles shall not take place within a building but shall be permitted to take place under a weather shelter or canopy. *(See 6.25.3.3.)*

6.5.1.3 Structures housing transfer operations or converted for such use after December 31, 1972, shall comply with Chapter 10.

6.5.1.4 The transfer of liquid into containers on the roofs of structures shall be permitted, provided that the installation conforms to the requirements specified in 6.6.7 and 6.20.11.

6.5.1.5 The transfer hose shall not be routed in or through any buildings except those specified in 6.5.1.3.

6.5.1.6 Filling of containers located outdoors in stationary installations in accordance with Section 6.3 shall be permitted to be filled at that location.

6.5.2 Container Point of Transfer Location Requirements.

6.5.2.1 If the point of transfer of containers located outdoors in stationary installations is not located at the container, it shall be located in accordance with Table 6.5.2.1.

6.5.2.2 Containers not located in stationary installations shall be filled at a location determined by the point of transfer in accordance with Table 6.5.2.1.

6.5.3 Separation Distance from Point of Transfer.

6.5.3.1 If the point of transfer is a component of a system covered by Section 6.24 or Chapter 11, the requirements of parts A, B, and C of Table 6.5.2.1 shall not apply to the structure containing the point of transfer.

6.5.3.2 If LP-Gas is vented to the atmosphere under the conditions stipulated in 7.3.1(5), the distances in Table 6.5.2.1 shall be doubled.

6.5.3.3 If the point of transfer is housed in a structure complying with Chapter 10, and the common walls comply with 10.2.1, separation distances in Table 6.5.2.1 shall not be required where the common walls comply with 10.3.1.3.

6.5.3.4 The distances in Table 6.5.2.1, parts B, C, D, E, F(2), and J, shall be reduced by one-half where the system incorporates the provisions of low emission transfer as provided in 6.28.5.

Table 6.5.2.1 Distance Between Point of Transfer and Exposures

Part	Exposure	Minimum Horizontal Distance	
		ft	m
A	Buildings,[a] mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls[b]	10[c]	3.1
B	Buildings[a] with other than at least 1-hour fire-rated walls[b]	25[c]	7.6[c]
C	Building wall openings or pits at or below the level of the point of transfer	25[c]	7.6[c]
D	Line of adjoining property that can be built upon	25[c]	7.6[c]
E	Outdoor places of public assembly, including schoolyards, athletic fields, and playgrounds	50[c]	15[c]
F	Public ways, including public streets, highways, thoroughfares, and sidewalks		
	(1) From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers	10	3.1
	(2) From other points of transfer	25[c]	7.6[c]
G	Driveways[d]	5	1.5
H	Mainline railroad track centerlines	25	7.6
I	Containers[e] other than those being filled	10	3.1
J	Flammable and Class II combustible liquid[f] dispensers and the fill connections of containers	10[c]	3.1[c]
K	Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers	20	6.1

[a]For the purpose of the table, buildings also include structures such as tents and box trailers at construction sites.

[b]See ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests for Building Construction and Materials*.

[c]See 6.5.3.4.

[d]Not applicable to driveways and points of transfer at vehicle fuel dispensers.

[e]Not applicable to filling connections at the storage container or to dispensing vehicle fuel dispenser units of 4000 gal (15.2 m^3) water capacity or less when used for filling containers not mounted on vehicles.

[f]NFPA 30, *Flammable and Combustible Liquids Code*, defines these as follows: Flammable liquids include those having a flash point below 100°F (37.8°C) and having a vapor pressure not exceeding 40 psia (276 kPa) at 100°F (37.8°C). Class II combustible liquids include those having a flash point at or above 100°F (37.8°C) and below 140°F (60°C).

6.6 Installation of Containers.

6.6.1 General Requirements.

6.6.1.1 Containers shall be positioned so that the pressure relief valve is in direct communication with the vapor space of the container.

6.6.1.2 LP-Gas containers or systems of which they are a part that are installed within 10 ft (3 m) of public vehicular thoroughfares shall be provided with a means of vehicular barrier protection.

6.6.1.3 Field welding on containers shall be limited to nonpressure parts such as saddle plates, wear plates, or brackets installed by the container manufacturer.

6.6.1.4* Aboveground containers shall be painted.

6.6.1.5 Containers shall be installed so that all container operating appurtenances are accessible.

6.6.1.6 Where necessary to prevent flotation due to possible high flood waters around aboveground or mounded containers, or high water table for those underground and partially underground, containers shall be securely anchored.

6.6.2 Installation of Cylinders.

6.6.2.1 Cylinders shall be installed only aboveground and shall be set upon a firm foundation or otherwise be firmly secured. *(See 6.6.2.2.)*

6.6.2.2 The cylinder shall not be in contact with the soil.

6.6.2.3 Flexibility shall be provided in the connecting piping. *(See 6.6.2.4.)*

6.6.2.4 Where flexible connectors are used, they shall comply with 6.9.6.

6.6.3 Installation of Horizontal Aboveground ASME Containers.

6.6.3.1 Horizontal ASME containers designed for permanent installation in stationary aboveground service shall be placed on masonry or other noncombustible structural supports located on concrete or masonry foundations with the container supports.

(A) Where saddles are used to support the container, they shall allow for expansion and contraction and prevent an excessive concentration of stresses.

(B) Where structural steel supports are used, they shall comply with 6.6.3.3.

(C) Containers of more than 2000 gal (7.6 m^3) water capacity shall be provided with concrete or masonry foundations formed to fit the container contour or, if furnished with saddles in compliance with Table 6.6.3.3(A), shall be placed on flat-topped foundations.

(D) Containers of 2000 gal (7.6 m^3) water capacity or less shall be installed either on concrete or masonry foundations formed to fit the container contour or in accordance with 6.6.3.1(E).

(E) Containers of 2000 gal (7.6 m^3) water capacity or less and equipped with attached supports complying with Table 6.6.3.3(A) shall be installed on a fire-resistive foundation if the bottoms of the horizontal members of the container saddles, runners, or skids are more than 12 in. (300 mm) above grade.

(F) Containers of 2000 gal (7.6 m^3) water capacity or less 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.

(G) Containers of 4000 gal (15.2 m^3) water capacity or less installed with combined container-pump assemblies on a common base complying with Table 6.6.3.3(A) shall be placed either on paved surfaces or on concrete pads at ground level within 4 in. (100 mm) of ground level.

6.6.3.2 ASME containers that have liquid interconnections shall be installed so that the maximum permitted filling level of each container is at the same elevation.

6.6.3.3 Support of horizontal ASME containers shall comply with 6.6.3.3(A) through 6.6.3.3(D).

(A) Horizontal ASME containers with attached supports and designed for permanent installation in stationary service shall be installed in accordance with Table 6.6.3.3(A).

Table 6.6.3.3(A) Installation of Permanently Installed Horizontal ASME Containers with Attached Supports

Container Size			
gal	m^3	Attached Support	Height of Container Bottom
≥4000	≥15.2	Non-fireproofed steel on flat-topped concrete foundations	6 in. (150 mm) maximum above concrete foundations
≤4000	≤15.2	Non-fireproofed steel on masonry or concrete foundations more than 12 in. (300 mm) above the ground	2 in. to 12 in. (51 mm to 300 mm) above concrete foundation
≤4000	≤15.2	Non-fireproofed steel on paved surfaces or concrete pads within 4 in. (100 mm) of the ground	24 in. (610 mm) maximum above paved surface or top of concrete pads
≤4000	≤15.2	Foundations or supports for horizontal LP-Gas containers per 6.6.3.3(B)	24 in. (610 mm) maximum above paved surface

(B) Steel supports shall be protected against fire exposure with a material having a fire resistance rating of at least 2 hours if the height limits specified in Table 6.6.3.3(A) are exceeded.

(C) The test to determine the fire resistance rating shall be ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials.*

(D) Horizontal ASME containers of 2000 gal (7.6 m^3) or less, on foundations in their installed condition, shall meet the following conditions:

(1) Structurally support the containers when subject to deteriorating environmental effects including, but not limited to, ambient temperature of −40°F to 150°F (−40°C to 66°C) or local conditions if outside this range, ultraviolet rays, radiant heat from fires, and moisture
(2) Be of either noncombustible or self-extinguishing material (per the definition in NFPA 99, *Health Care Facilities Code*, 3.3.163)

6.6.3.4 Where a single ASME container complying with Table 6.6.3.3(A) is installed in isolated locations with nonfireproofed steel supports resting on concrete pads or footings and the outside bottom of the container shell is not more than 5 ft (1.5 m) above the ground level, the approval of the authority having jurisdiction shall be obtained.

6.6.3.5 The part of an ASME container in contact with saddles, foundations, or masonry shall be coated or protected to minimize corrosion.

6.6.3.6 In locations where the monthly maximum depth of snow accumulation, as determined from the National Weather Service or other published statistics, is more than the height of aboveground containers, excluding the dome cover, the following requirements shall apply:

(1) A stake or other marking shall be installed higher than the average snow cover depths, up to a height of 15 ft (4.6 m).
(2) The container shall be installed to prevent its movement resulting from snow accumulation.

6.6.3.7 If the container is mounted on or is part of a vehicle in accordance with 5.2.7.2(B), the unit shall be located in accordance with 6.3.1.1.

(A) The surface on which the vehicle is parked shall be level and, if not paved, shall be able to support heavy vehicular traffic and shall be clear of dry grass, weeds, and other combustible material within 10 ft (3 m) of the container.

(B) Flexibility shall be provided in the connecting piping in accordance with 6.9.6.

6.6.3.8 Portable tanks of 2000 gal (7.6 m^3) water capacity or less that comply with 5.2.7.3 shall be installed in accordance with 6.6.3.1(E).

6.6.4 Installation of Vertical ASME Containers.

6.6.4.1 Vertical ASME containers of over 125 gal (0.5 m^3) water capacity designed for permanent installation in stationary aboveground service shall be installed on reinforced concrete or steel structural supports on reinforced concrete foundations that are designed to meet the loading provisions established in 5.2.4.3.

6.6.4.2 The requirements in 6.6.4.3 through 6.6.4.5 shall also apply to the installation of vertical ASME containers.

6.6.4.3 Steel supports shall be protected against fire exposure with a material that has a fire resistance rating of at least 2 hours, except that continuous steel skirts that have only one opening that is 18 in. (460 mm) or less in diameter shall have fire protection applied to the outside of the skirts.

6.6.4.4 Vertical ASME containers used in liquid service shall not be manifolded to horizontal ASME containers.

6.6.4.5 Vertical ASME containers of different dimensions shall not be manifolded together.

6.6.5 Temporary Container Installations.

6.6.5.1 Single containers constructed as portable storage containers for temporary stationary service in accordance with 5.2.7.2 shall be placed on concrete pads, paved surfaces, or firm earth for such temporary service (not more than 12 months at a given location).

6.6.5.2 The surface on which the containers are placed shall be level and, if not paved, shall be clear of dry grass, weeds, and other combustible material within 10 ft (3 m) of the container.

6.6.5.3 Flexibility shall be provided in the connecting piping in accordance with 6.9.6.

6.6.5.4 Where portable storage containers are installed at isolated locations with the bottoms of the skids or runners above the ground, either fire-resistive supports shall be provided or non–fire-resistive supports shall be permitted when all the following conditions are met:

(1) The height of the outside bottom of the container does not exceed 5 ft (1.5 m) above the ground.
(2) The approval of the authority having jurisdiction is obtained.

6.6.6 Installation of Underground and Mounded Containers.

6.6.6.1* ASME container assemblies intended for underground installation, including interchangeable aboveground–underground container assemblies, shall be installed underground in accordance with 6.6.6.1(A) through 6.6.6.1(M).

(A) Containers installed in areas with no vehicular traffic shall be installed at least 6 in. (150 mm) below grade.

(B) At installations within 10 ft (3 m) of a public vehicular thoroughfare or designated parking location, a noninterchangeable underground container shall be installed 18 in. (460 mm) below grade or vehicular barrier protection shall be provided.

(C) Installations within 10 ft (3 m) of a public vehicular thoroughfare or designated parking location shall be provided with vehicular barrier protection for the container's fitting housing, housing cover, container connections, and piping.

(D) Approved interchangeable aboveground–underground container assemblies installed underground shall not be placed with the container shell more than 12 in. (300 mm) below grade.

(E) The installation of a buried container shall include protection for the container and piping against physical damage from vehicular traffic.

(F) Prior to digging, the location of underground and mounded containers and piping in the vicinity of construction and excavation activities shall be determined and the installation shall be protected from damage.

(G) Where a container is to be abandoned underground, the following procedure shall be followed:

(1) As much liquid LP-Gas as practical shall be removed through the container liquid withdrawal connection.
(2)*As much of the remaining LP-Gas vapor as practical shall be removed through a vapor connection.
(3) The vapor shall be either recovered, burned, or vented to the atmosphere.
(4) Where only vapor LP-Gas at atmospheric pressure remains in the container, the container shall be filled with water, sand, or foamed plastic or shall be purged with an inert gas.
(5) If purged, the displaced vapor shall be either recovered, burned, or vented to the atmosphere.

(H)* The discharge of the regulator vent shall be above the highest probable water level.

(I)* A corrosion protection system shall be installed on new installations of underground steel containers, unless technical justification is provided to and is approved by the authority having jurisdiction. The corrosion protection system shall include the following:

(1) A container coating complying with 5.2.1.11
(2) A cathodic protection system that consists of a sacrificial anode(s) or an impressed current anode
(3) A means to test the performance of the cathodic protection system in accordance with 6.17.3

(J) Prior to burial, the container shall be visually examined for damage to the coating. Damaged areas shall be repaired with a coating recommended for underground service and compatible with the existing coating.

(K)* Containers shall be set level and shall be surrounded by earth or sand firmly tamped in place.

(L)* Where electrical isolation is provided between buried metallic piping and an underground container, the dielectric connection shall comply with the applicable requirements of Section 5.9 or shall be listed.

(M) Backfill shall be free of rocks and abrasives.

6.6.6.2 Partially underground, unmounded ASME containers shall be installed in accordance with 6.6.6.2(A) through 6.6.6.2(F).

(A) The portion of the container below the surface of the ground, and for a vertical distance of at least 3 in. (75 mm) above that surface, shall comply with the corrosion protection requirements of 6.6.6.1(I) through (J).

(B) The aboveground portion of the container shall be painted to comply with 6.6.1.4.

(C) Containers shall be set level and shall be surrounded by earth or sand firmly tamped in place.

(D) Backfill shall be free of rocks and abrasives.

(E) Spacing provisions shall be as specified for aboveground containers in 6.3.1.1 and Table 6.3.1.1.

(F) The container shall be located so as not to be subject to vehicular damage or shall be protected against such damage.

6.6.6.3 Mounded containers shall be installed in accordance with 6.6.6.3(A) through 6.6.6.3(F).

(A)* Mounding material shall be earth, sand, or other noncombustible, noncorrosive materials and shall provide a minimum thickness of cover for the container of at least 1 ft (0.3 m).

(B) A protective cover shall be provided on top of mounding materials subject to erosion.

(C) Container valves and appurtenances shall be accessible for operation or repair, without disturbing mounding material.

(D) Where containers are mounded and the bottom of the container is 30 in. (0.76 m) or more above the surrounding grade, access to bottom connections shall be provided by an opening or tunnel with a 4 ft (1.2 m) minimum diameter and a 3 ft (0.9 m) minimum clear area.

(E) Bottom connections that extend beyond the mound shall be part of the ASME container or shall be installed in compliance with the ASME Code and shall be designed for the forces that can act on the connections.

(F) Mounded containers shall comply with the corrosion protection requirements of 6.6.6.1(I) and 6.6.6.1(J).

6.6.7 Installation of Containers on Roofs of Buildings.

6.6.7.1 Installation of containers on roofs of buildings shall be prohibited, unless approved by the authority having jurisdiction and the fire department.

6.6.7.2 Where the authority having jurisdiction and the fire department have approved an installation of a container, it shall comply with 6.6.7.2(A) through 6.6.7.2(S).

(A) The building shall be of Type I, 443 or 332, or Type II, 222, construction as specified in NFPA 220, *Standard on Types of Building Construction.*

(B) LP-Gas containers installed on roofs shall be of 2000 gal (7.6 m^3) water capacity or less.

(C) The aggregate water capacity of LP-Gas containers installed on the roof or terrace of a building shall meet the following criteria:

(1) It shall not exceed 4000 gal (15.2 m^3) in one location.
(2) Additional installations on the same roof or terrace shall be located at least 50 ft (15 m) apart.

(D) An ASME container installed on the roof of a building shall always be filled by two operators, one at the controls of the vehicle supplying LP-Gas and another at the controls of the container.

(E) Containers shall be installed in external locations only.

(F) Where a fill line to the container is required, it shall be located entirely outside the building.

(G) The fill connection shall be located entirely outside the building.

(H) The fill connection shall be located at least 8 ft (2.4 m) above ground level.

(I) Containers shall be installed on a level surface.

(J) The container shall be secured to the building structure.

(K) The support of the container shall be designed to the same seismic criteria as the building.

(L) The roof on which the container is located shall be able to support the weight of the container filled with water, with the safety margins required by local codes.

(M) Containers shall be located in areas that have free air circulation, are at least 10 ft (3 m) from building openings (such as windows and doors), and are at least 20 ft (6.1 m) from air intakes of air-conditioning and ventilating systems.

(N) The location of containers shall allow access to all valves and controls and shall have enough surrounding area to allow the required maintenance.

(O) The location of the container shall have fixed stairs or another method to reach it.

(P) If the installation requires the use of more than one container, the distances between containers from Table 6.3.1.1 shall apply.

(Q) If the container location is higher than 23 ft (7 m) from the ground, or if the filling hose cannot be observed by the operators in its entire length, the container shall have a filling line constructed to withstand liquid transfer, and it shall have the following appurtenances:

(1) Filler valve *[see 5.7.4.1(D)]*
(2) Filler valve cap
(3) Two control valves
(4) Hydrostatic relief valve
(5) Venting line

(R) The liquid fill and vapor connections shall be conspicuously marked or labeled.

(S) A fire safety analysis shall be prepared in accordance with 6.27.3.

6.7 Installation of Container Appurtenances.

6.7.1 Reserved.

6.7.2 Installation of Pressure Relief Devices.

6.7.2.1 Pressure relief devices shall be installed so that the relief device is in direct communication with the vapor space of the container.

6.7.2.2 Pressure relief devices on cylinders shall be installed to minimize the possibility of relief device discharge impingement on the cylinder.

6.7.2.3 Pressure relief devices on the following ASME containers shall be so installed that any gas released is vented away from the container upward and unobstructed to the open air:

(1) Containers of 125 gal (0.5 m^3) or more water capacity installed in stationary service
(2) Portable storage containers
(3) Portable tanks
(4) Cargo tanks

6.7.2.4 Rain caps or other means shall be provided to minimize the possibility of the entrance of water or other extraneous matter into the relief device or any discharge piping. Provision shall be made for drainage where the accumulation of water is anticipated.

6.7.2.5 The rain cap or other protector shall be designed to remain in place, except during pressure relief device operation, and shall not restrict pressure relief device flow.

6.7.2.6 The design of the pressure relief valve drain opening shall provide the following:

(1) Protection of the container against flame impingement resulting from ignited product escaping from the drain opening
(2) Direction of the pressure relief valve drain opening so that an adjacent container, piping, or equipment is not subjected to flame impingement

6.7.2.7 Pressure relief valve discharge on each container of more than 2000 gal (7.6 m^3) water capacity shall be directed vertically upward and unobstructed to the open air.

6.7.2.8 Shutoff valves shall not be installed between pressure relief devices and the container unless a listed pressure relief valve manifold meeting the requirements of 6.7.2.9 is used.

6.7.2.9 Listed pressure relief valve manifolds shall be exempt from the requirements of 6.7.2.8 when the following conditions are met:

(1) Two or more pressure relief devices are installed in the manifold.
(2) Only one pressure relief device in the manifold is designed to shut off at any one time.
(3) The remaining pressure relief device(s) remains open and provides the rated relieving capacity required for the container.

6.7.2.10 Shutoff valves shall not be installed at the outlet of a pressure relief device or at the outlet of the discharge piping where discharge piping is installed.

6.7.2.11 The pressure relief valve discharge piping from underground containers of 2000 gal (7.6 m^3) or less water capacity shall extend beyond the manhole or housing or shall discharge into the manhole or housing, where the manhole or housing is equipped with ventilated louvers or their equivalent, in accordance with 5.7.8.4.

6.7.2.12 Pressure relief valve discharge on underground containers of more than 2000 gal (7.6 m^3) water capacity shall be piped vertically and directly upward to a point at least 7 ft (2.1 m) above the ground. *(See 6.7.2.13.)*

6.7.2.13 Pressure relief devices installed in underground containers in dispensing stations shall be piped vertically upward to a point at least 10 ft (3 m) above the ground.

6.7.2.14 Where installed, the discharge piping shall comply with 6.7.2.14(A) through 6.7.2.14(F).

(A) Piping shall be supported and protected against physical damage.

(B) Piping from aboveground containers shall be sized to provide the rate of flow specified in Table 5.7.2.6.

(C) Piping from underground containers shall be sized to provide the rate of flow specified in 5.7.2.8.

(D) Piping shall be metallic and have a melting point over 1500°F (816°C).

(E) Discharge piping shall be so designed that excessive force applied to the discharge piping results in breakage on the discharge side of the valve, rather than on the inlet side, without impairing the function of the valve.

(F) Return bends and restrictive pipe or tubing fittings shall not be used.

6.7.3 Reserved.

6.7.4 Reserved.

6.7.5 Reserved.

6.7.6 Reserved.

6.7.7 Reserved.

6.7.8 Reserved.

6.7.9 Reserved.

6.8 Regulators.

6.8.1 Regulator Installation.

6.8.1.1 First-stage, high-pressure, automatic changeover, integral 2 psi service, integral two-stage, and single-stage regulators where allowed shall be installed in accordance with 6.8.1.1(A) through 6.8.1.1(D).

(A) Regulators connected to single container permanent installations shall be installed with one of the following methods:

(1) Directly attached to the vapor service valve
(2) Attached to the vapor service valve with a flexible metallic connector

(B) Regulators connected to cylinders in other than stationary installations shall be installed with one of the following methods:

(1) Directly attached to the vapor service valve
(2) Attached to the vapor service valve with a flexible metallic connector
(3) Attached to the vapor service valve with a flexible hose connector

(C) Regulators connected to manifolded containers shall be installed with the following methods:

(1) Installations shall comply with 6.9.3.8.
(2) The regulator shall be directly attached or attached with a flexible metallic connector to the vapor service manifold piping outlet.
(3) The connection between the container service valve outlet and the inlet side of the manifold piping shall be installed with one of the following methods:
    (a) Directly attached
    (b) Attached with a flexible metallic connector
    (c) Attached with a flexible hose connector connected to a cylinder in other than stationary installations

(D) Regulators installed on vaporizer outlets shall be installed with one of the following methods:

(1) Directly attached
(2) Attached with a flexible metallic connector

(E) Regulators connected to underground or mounded containers shall be permitted to be attached to the vapor service valve with a flexible hose connector providing electrical isolation between the container and metallic piping system that complies with ANSI/UL 569, *Standard for Pigtails and Flexible Hose Connectors for LP-Gas*, and is recommended by the manufacturer for underground service.

6.8.1.2 First-stage regulators installed downstream of high-pressure regulators shall be exempt from the requirement of 6.8.1.1.

6.8.1.3* First-stage and high-pressure regulators shall be installed outside of buildings, except as follows:

(1) Regulators on cylinders installed indoors in accordance with Section 6.20
(2) Regulators on containers of less than 125 gal (0.5 m^3) water capacity for the purpose of being filled or in structures complying with Chapter 10
(3) Regulators on containers on LP-Gas vehicles complying with, and parked or garaged in accordance with, Chapter 11
(4) Regulators on containers used with LP-Gas stationary or portable engine fuel systems complying with Chapter 11
(5) Regulators on containers used with LP-Gas–fueled industrial trucks complying with 11.13.4
(6) Regulators on containers on LP-Gas–fueled vehicles garaged in accordance with Section 11.16
(7) Regulators on cylinders awaiting use, resale, or exchange when stored in accordance with Chapter 8

6.8.1.4 All regulators for outdoor installations shall be designed, installed, or protected so their operation will not be affected by the elements (freezing rain, sleet, snow, ice, mud, or debris).

(A) This protection shall be permitted to be integral with the regulator.

(B) Regulators used for portable industrial applications shall be exempt from the requirements of 6.8.1.4.

6.8.1.5 The point of discharge from the required pressure relief device on regulated equipment installed outside of buildings or occupiable structures in fixed piping systems shall be located not less than 3 ft (1 m) horizontally away from any building or occupiable structure opening below the level of discharge, and not beneath or inside any building or occupiable structure unless this space is not enclosed for more than 50 percent of its perimeter.

6.8.1.6 The point of discharge shall also be located not less than 5 ft (1.5 m) in any direction from any source of ignition, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes.

6.8.1.7 The discharge from the required pressure relief device of a second-stage regulator, other than a line pressure regulator, installed inside of buildings in fixed piping systems shall comply with the following:

(1) The discharge shall be directly vented with supported piping to the outside air.
(2) The vent line shall be at least the same nominal pipe size as the regulator vent connection pipe size.
(3) Where there is more than one regulator at a location, either each regulator shall have a separate vent to the outside or the vent lines shall be manifolded in accordance with accepted engineering practices to minimize back pressure in the event of high vent discharge.
(4) The material of the vent line shall comply with 5.8.3.
(5) The discharge outlet shall be located not less than 3 ft (1 m) horizontally away from any building opening below the level of such discharge.
(6) The discharge outlet shall also be located not less than 5 ft (1.5 m) in any direction from any source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes.
(7) The discharge outlet shall be designed, installed, or protected from blockage so it will not be affected by the elements (freezing rain, sleet, snow, ice, mud, or debris) or insects.

6.8.1.8 The requirement in 6.8.1.7 shall not apply to appliance regulators otherwise protected, to line pressure regulators listed as complying with ANSI Z21.80/CSA 6.22, *Standard for Line Pressure Regulators*, or to regulators used in connection with containers in buildings as provided for in 6.2.2(1), 6.2.2(2), 6.2.2(4), 6.2.2(5), and 6.2.2(6).

6.8.1.9 The requirement in 6.8.1.7 shall not apply to vaporizers.

6.8.1.10 Single-stage regulators shall be permitted to be used only on portable appliances and outdoor cooking appliances with input ratings of 100,000 Btu/hr (29 kW) maximum.

6.8.1.11 Line pressure regulators shall be installed in accordance with the requirements of NFPA 54, *National Fuel Gas Code.*

6.8.2 Selection of Pressure Regulators.

6.8.2.1 A two-stage regulator system, an integral two-stage regulator, or a 2 psi regulator system shall be required on all fixed piping systems that serve ½ psig (3.4 kPag) appliance systems [normally operated at 11 in. water column (2.7 kPag) pressure].

6.8.2.2 The requirement for two-stage regulation shall include fixed piping systems for appliances on recreational vehicles, mobile home installations, manufactured home installations, catering vehicles, and food service vehicle installations.

6.8.2.3 Single-stage regulators shall not be installed in fixed piping systems after June 30, 1997, except for installations covered in 6.8.2.4.

6.8.2.4 Single-stage regulators shall be permitted on small portable appliances and outdoor cooking appliances with input ratings of 100,000 Btu/hr (29 kW) or less.

6.8.2.5 Gas distribution systems utilizing multiple second-stage regulators shall be permitted to use a high-pressure regulator installed at the container, provided that a first-stage regulator is installed downstream of the high-pressure regulator and ahead of the second-stage regulators.

6.8.2.6 High-pressure regulators with an overpressure protection device and a rated capacity of more than 500,000 Btu/hr (147 kW) shall be permitted to be used in two-stage systems where the second-stage regulator incorporates an integral or separate overpressure protection device.

6.8.2.7 The overpressure protection device described in 6.8.2.6 shall limit the outlet pressure of the second-stage regulator to 2.0 psig (14 kPag) when the regulator seat disc is removed and with an inlet pressure equivalent to the maximum outlet pressure setting of the high-pressure regulator.

6.8.2.8 Systems consisting of listed components that provide an equivalent level of overpressure protection shall be exempt from the requirements of 6.8.2.6 and 6.8.2.7.

6.8.2.9 A 2 psi regulator system shall consist of a first-stage regulator and a 2 psi service regulator in compliance with the requirements of 5.8.1.14 in conjunction with a line pressure regulator that is in compliance with ANSI Z21.80/CSA 6.22, *Standard for Line Pressure Regulators.*

6.9 Piping Systems.

6.9.1 Piping System Service Limitations.

6.9.1.1 The physical state (vapor or liquid) and pressure at which LP-Gas is transmitted through piping systems shall be in accordance with 6.9.1.1(A) through 6.9.1.1(E).

(A) Outdoor LP-Gas liquid or vapor metallic piping systems shall have no pressure limitations.

(B) Outdoor underground LP-Gas liquid or vapor polyamide piping systems shall have pressure limitations as defined by the design pressure of the piping being installed.

(C) Polyethylene piping systems shall be limited to the following:

(1) Vapor service not exceeding 30 psig (208 kPag)
(2) Installation outdoors and underground

(D)* LP-Gas vapor at pressures exceeding 20 psig (138 kPag) or LP-Gas liquid shall not be piped into any building unless the installation is in accordance with one of the following:

(1) The buildings or structures are under construction or undergoing major renovation, and the temporary piping systems are in accordance with 6.20.2 and 6.20.12.
(2) The buildings or separate areas of the buildings are constructed in accordance with Chapter 10 and used exclusively to house the following:
   (a) Equipment for vaporization, pressure reduction, gas mixing, gas manufacturing, or distribution
   (b) Internal combustion engines, industrial processes, research and experimental laboratories, or equipment or processing having a similar hazard
   (c) Engine-mounted fuel vaporizers
(3) Industrial occupancies are in accordance with 6.9.1.2.

(E)* Corrugated stainless steel piping systems shall be limited to vapor service not exceeding the listed pressure rating of the product.

6.9.1.2* LP-Gas vapor fixed piping systems at pressures of 20 psig through 50 psig (138 kPag through 345 kPag) in industrial occupancies shall be approved and shall comply with 6.9.1.2(A) through 6.9.1.2(D).

(A) The industrial equipment shall require inlet pressures greater than 20 psig (138 kPag).

(B) Pressure relief valve protection shall be provided for the vapor piping system that will limit any overpressure in the piping system to not more than 10 percent of the design pressure of the system.

(C) Pressure relief valve discharge shall be vented directly to the outdoors.

(D) A low-temperature control system shall positively shut off the flow of LP-Gas into the vapor piping system when the temperature of the LP-Gas vapor is reduced to its condensation point at the maximum design operating pressure of the system.

6.9.1.3 Liquid piping systems in buildings or structures feeding a vaporizer other than those covered by 6.9.1.1(D) shall comply with the material requirements of Chapters 5 and 6.

6.9.2 Sizing of LP-Gas Vapor Piping Systems.

6.9.2.1 LP-Gas vapor piping systems downstream of the first-stage pressure regulator shall be sized so that all appliances operate within their manufacturer's specifications.

6.9.2.2 LP-Gas vapor piping systems shall be sized and installed to provide a supply of gas to meet the maximum demand of all gas utilization equipment using Table 15.1(a) through Table 15.1(q) or engineering methods.

6.9.3 Installation of Metallic Pipe, Tubing, and Fittings.

6.9.3.1* All metallic LP-Gas piping shall be installed in accordance with ASME B31.3, *Process Piping,* for normal fluid service, or in accordance with Section 6.9.

6.9.3.2 All welding and brazing of metallic piping shall be in accordance with ASME *Boiler and Pressure Vessel Code,* Section IX.

6.9.3.3 Metallic piping shall comply with 6.9.3.3(A) through 6.9.3.3(C).

(A) Piping used at pressures higher than container pressure, such as on the discharge side of liquid transfer pumps, shall be designed for a pressure rating of at least 350 psig (2.4 MPag).

(B) Vapor LP-Gas piping with operating pressures in excess of 125 psig (0.9 MPag) and liquid piping not covered by 6.9.3.3(A) shall be designed for a working pressure of at least 250 psig (1.7 MPag).

(C) Vapor LP-Gas piping subject to pressures of not more than 125 psig (0.9 MPag) shall be designed for a pressure rating of at least 125 psig (0.9 MPag).

6.9.3.4 Pressure relief valve discharge piping shall be exempt from the requirement of 6.9.3.3(C).

6.9.3.5 Metallic pipe joints shall be permitted to be threaded, flanged, welded, or brazed using pipe and fittings that comply with 5.9.3, 5.9.4, and 6.9.3.5(A) through 6.9.3.5(H).

(A) Metallic threaded, welded, and brazed pipe joints shall be in accordance with Table 6.9.3.5(A).

Table 6.9.3.5(A) Types of Metallic Pipe Joints in LP-Gas Service

Service	Schedule 40	Schedule 80
Liquid	Welded or brazed	Threaded, welded, or brazed
Vapor, ≤125 psig (≤0.9 MPag)	Threaded, welded, or brazed	Threaded, welded, or brazed
Vapor, ≥125 psig (≥0.9 MPag)	Welded or brazed	Threaded, welded, or brazed

(B) Fittings and flanges shall be designed for a pressure rating equal to or greater than the required working pressure of the service for which they are used.

(C) Brazed joints shall be made with a brazing material having a melting point exceeding 1000°F (538°C).

(D) Gaskets used to retain LP-Gas in flanged connections in piping shall be resistant to the action of LP-Gas.

(E) Gaskets shall be made of metal or material confined in metal having a melting point over 1500°F (816°C) or shall be protected against fire exposure.

(F) When a flange is opened, the gasket shall be replaced.

(G) Aluminum O-rings and spiral-wound metal gaskets shall be permitted to be used.

(H) Nonmetallic gaskets used in insulating fittings shall be permitted to be used.

6.9.3.6 Metallic tubing joints shall be flared or brazed using tubing and fittings in accordance with 5.9.3 and 5.9.4.

6.9.3.7 Piping in systems shall be run as directly as is practical from one point to another, with as few fittings as practical.

6.9.3.8 Where condensation of vapor can occur, piping shall be sloped back to the container or means shall be provided for revaporizing the condensate.

6.9.3.9 Piping systems, including the interconnection of permanently installed containers, shall compensate for expansion, contraction, jarring, vibration, and settling.

(A) Flexible metallic connectors shall be permitted to be used.

(B) The use of nonmetallic pipe, tubing, or hose for permanently interconnecting containers shall be prohibited.

6.9.3.10 Aboveground piping shall be supported and protected against physical damage by vehicles.

6.9.3.11 The portion of aboveground piping in contact with a support or a corrosion-causing substance shall be protected against corrosion.

6.9.3.12 Buried metallic pipe and tubing shall be installed underground with a minimum 12 in. (300 mm) of cover.

(A) The minimum cover shall be increased to 18 in. (460 mm) if external damage to the pipe or tubing from external forces is likely to result.

(B) If a minimum 12 in. (300 mm) of cover cannot be maintained, the piping shall be installed in conduit or shall be bridged (shielded).

6.9.3.13 Where underground piping is beneath driveways, roads, or streets, possible damage by vehicles shall be taken into account.

6.9.3.14 Metallic piping shall be protected against corrosion in accordance with 6.9.3.14(A) through 6.9.3.14(C).

(A) Piping and tubing of 1 in. (25 mm) nominal diameter or smaller shall be protected in accordance with 6.17.1 or 6.17.2.

(B) Piping and tubing larger than 1 in. (25 mm) nominal diameter and installed above ground shall be protected in accordance with 6.17.1.

(C) Steel piping larger than 1 in. (25 mm) nominal diameter installed underground shall have a cathodic protection system in accordance with 6.17.2(C) unless technical justification is approved by the authority having jurisdiction.

6.9.3.15 LP-Gas piping shall not be used as a grounding electrode.

6.9.3.16 Underground metallic piping, tubing, or both that convey LP-Gas from a gas storage container shall be provided with dielectric fittings installed above ground and outdoors at the building to electrically isolate it from the aboveground portion of the fixed piping system that enters a building.

6.9.4 Installation of Polyamide and Polyethylene Pipe, Tubing, and Fittings.

6.9.4.1 Polyethylene and polyamide pipe, tubing, and fittings shall be installed outdoors underground only.

6.9.4.2 Polyethylene and polyamide pipe and tubing shall be buried as follows:

(1) With a minimum of 12 in. (300 mm) of cover
(2) With a minimum of 18 in. (460 mm) of cover if external damage to the pipe or tubing is likely to result
(3) With piping installed in conduit or bridged (shielded) if a minimum of 12 in. (300 mm) of cover cannot be provided

6.9.4.3 Assembled anodeless risers shall be used to terminate underground polyamide and polyethylene fixed piping systems above ground.

(A) The horizontal portion of risers shall be buried at least 12 in. (300 mm) below grade, and the casing material used for the risers shall be protected against corrosion in accordance with Section 6.17.

(B) Either the aboveground portion of the riser casing shall be provided with a plastic sleeve inside the riser casing, or the pipe or tubing shall be centered in the riser casing.

(C) Factory-assembled risers shall be sealed and leak tested by the manufacturer.

6.9.4.4 Field-assembled risers shall be supplied only in kit form with all necessary hardware for installation.

(A) Field-assembled risers shall comply with the following:

(1) They shall be design certified.
(2) They shall be sealed and pressure tested by the installer.
(3) They shall be assembled and installed in accordance with the riser manufacturer's instructions.

(B) The casing of the riser shall be constructed of one of the following materials:

(1) ASTM A 53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless,* Schedule 40 steel pipe
(2) ASTM A 513, *Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing,* mechanical steel tubing with a minimum wall thickness of 0.073 in. (1.9 mm)
(3) Flexible metal tubing with a minimum crush strength of 1000 lb (453.6 kg) and a tensile strength of 300 lb (136 kg), including the transition connection as tested by the manufacturer

6.9.4.5* Polyamide and polyethylene piping shall be designed to sustain and minimize the thrust forces caused by contraction or expansion of the piping or by anticipated external or internal loading.

6.9.4.6 An electrically continuous corrosion-resistant tracer wire (minimum AWG 14) or tape shall be buried with the polyamide or polyethylene pipe to facilitate locating the pipe.

(A) One end of the tracer wire shall be brought above ground at a building wall or riser.

(B) The tracer wire or tape shall not be in direct contact with the polyamide or polyethylene pipe.

6.9.4.7 Polyamide and polyethylene piping that is installed in a vault, the dome of an underground container, or any other belowground enclosure shall be completely encased in one of the following:

(1) Gastight metal pipe and fittings that are protected from corrosion
(2) An anodeless riser

6.9.4.8 Polyamide and polyethylene piping shall be installed in accordance with the manufacturer's installation instructions.

6.9.4.9 Where polyamide or polyethylene pipe or tubing is inserted into an existing steel pipe, it shall comply with 6.9.4.9(A) and 6.9.4.9(B).

(A) The polyamide or polyethylene pipe or tubing shall be protected from being damaged during the insertion process.

(B) The leading end of the polyamide or polyethylene pipe or tubing being inserted shall also be closed prior to insertion.

6.9.4.10 Polyamide and polyethylene pipe that is not encased shall have a minimum wall thickness of 0.090 in. (2.3 mm).

6.9.4.11 Polyamide or polyethylene pipe with an outside diameter of 0.875 in. (22.2 mm) or less shall be permitted to have a minimum wall thickness of 0.062 in. (1.6 mm).

6.9.4.12 Each imperfection or damaged piece of polyamide or polyethylene pipe shall be replaced by fusion or mechanical fittings.

6.9.4.13 Repair clamps shall not be used to cover damaged or leaking sections.

6.9.5 Valves in Polyamide and Polyethylene Piping Systems.

6.9.5.1 Valves in polyamide and polyethylene piping shall comply with following:

(1) Valves shall protect the pipe from excessive torsional or shearing loads when the valve is operated.
(2) Valve boxes shall be installed so as to minimize transmitting external loads to the valve or pipe.

6.9.5.2 Valves shall be recommended for LP-Gas service by the manufacturer.

6.9.5.3 Valves shall be manufactured from thermoplastic materials fabricated from materials listed in ASTM D 2513, *Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings,* that have been shown to be resistant to the action of LP-Gas, or from metals protected to minimize corrosion in accordance with Section 6.17.

6.9.6 Flexible Connectors.

6.9.6.1 Flexible connectors shall be installed in accordance with the manufacturer's instructions.

6.9.6.2 Flexible metallic connectors shall not exceed 5 ft (1.5 m) in overall length when used with liquid or vapor piping on stationary containers of 2000 gal (7.6 m^3) water capacity or less.

6.10 Remote Shutoff Actuation.

6.10.1 Where LP-Gas vapor is used as a pressure source for activating the remote shutoff mechanisms of internal valves and emergency shutoff valves, the following shall apply:

(1) Actuators and pressure supply line components shall be compatible with LP-Gas vapor.
(2) Supply line piping materials shall be limited to a maximum of ⅜ in. (9.0 mm) outside diameter.
(3)*Supply pressure shall be controlled to prevent condensation of the LP-Gas vapor.
(4) The LP-Gas supply maximum flow rate to the system shall not exceed that from a No. 54 drill orifice.

6.10.2 Where compressed air is used as a pressure source for activating internal valves and emergency shutoff valves, the air shall be clean and kept at a moisture level that will not prevent the system from operating.

6.11 Internal Valves.

6.11.1 The requirements of 6.11.2 through 6.11.5 shall be required for internal valves in liquid service that are installed in containers of over 4000 gal (15.2 m^3) water capacity by July 1, 2003.

6.11.2 Internal valves shall be installed in accordance with 5.7.4.2 and Table 5.7.4.2 on containers of over 4000 gal (15.2 m^3) water capacity.

6.11.3 Thermal Activation.

6.11.3.1 Automatic shutdown of internal valves in liquid service shall be provided using thermal (fire) actuation.

6.11.3.2 The thermal sensing element of the internal valve shall be within 5 ft (1.5 m) of the internal valve.

6.11.4 Remote Shutdown Station.

6.11.4.1 At least one remote shutdown station for internal valves in liquid service shall be installed not less than 25 ft (7.6 m) or more than 100 ft (30 m) from the liquid transfer point.

6.11.4.2 This requirement shall be retroactive to all internal valves required by the code.

6.11.5 Emergency remote shutdown stations shall be identified by a sign, visible from the point of transfer, incorporating the words "Propane — Container Liquid Valve Emergency Shutoff" in block letters of not less than 2 in. (51 mm) in height on a background of contrasting color to the letters.

6.12 Emergency Shutoff Valves.

6.12.1 On new installations and on existing installations, stationary container storage systems with an aggregate water capacity of more than 4000 gal (15.2 m^3) utilizing a liquid transfer line that is 1½ in. (39 mm) or larger, and a pressure equalizing vapor line that is 1¼ in. (32 mm) or larger, shall be equipped with emergency shutoff valves.

6.12.2 An emergency shutoff valve shall be installed in the transfer lines of the fixed piping transfer system within 20 ft (6 m) of lineal pipe from the nearest end of the hose or swivel-type piping connections.

6.12.3 When the flow is only into the container, a backflow check valve shall be permitted to be used in lieu of an emergency shutoff valve if installed in the piping transfer system downstream of the hose or swivel-type piping connections.

6.12.4 The backflow check valve shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with combustible material, and shall be designed for this specific application.

6.12.5 Where there are two or more liquid or vapor lines with hoses or swivel-type piping connected of the sizes designated, an emergency shutoff valve or a backflow check valve, where allowed, shall be installed in each leg of the piping.

6.12.6 Emergency shutoff valves shall be installed so that the temperature-sensitive element in the valve, or a supplemental temperature-sensitive element that operates at a maximum temperature of 250°F (121°C) that is 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.

6.12.7 Temperature-sensitive elements of emergency shutoff valves shall not be painted, nor shall they have any ornamental finishes applied after manufacture.

6.12.8* The emergency shutoff valves or backflow check valves shall be installed in the fixed 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.

Paragraph 6.12.9 was revised by a tentative interim amendment (TIA). See page 1.

6.12.9 Where emergency shutoff valves are required to be installed in accordance with 6.12.2, a means shall be incorporated to actuate the emergency shutoff valves in the event of a break of the fixed piping resulting from a pull on the hose.

6.12.10 Emergency shutoff valves required by the code shall be tested annually for the functions required by 5.12.2.3(2) and (3), and the results of the test shall be documented.

6.12.11 Backflow check valves installed in lieu of emergency shutoff valves shall be checked annually for proper operation, and the results of the test shall be documented.

6.12.12 All new and existing emergency shutoff valves shall comply with 6.12.12.1 through 6.12.12.3.

6.12.12.1 Each emergency shutoff valve shall have at least one clearly identified and easily accessible manually operated remote emergency shutoff device.

6.12.12.2 The shutoff device shall be located not less than 25 ft (7.6 m) or more than 100 ft (30 m) in the path of egress from the emergency shutoff valve.

6.12.12.3 Where an emergency shutoff valve is used in lieu of an internal valve in compliance with 5.7.4.2(D)(2), the remote shutoff device shall be installed in accordance with 6.11.4 and 6.11.5.

6.12.13 Emergency shutoff valves for railroad tank car transfer systems shall be in accordance with 6.19.2.6, 6.28.4, 7.2.3.7, and 7.2.3.8.

6.13 Hydrostatic Relief Valve Installation. A hydrostatic relief valve or a device providing pressure-relieving protection shall be installed in each section of piping and hose in which liquid LP-Gas can be isolated between shutoff valves, so as to relieve the pressure that could develop from the trapped liquid to a safe atmosphere or product-retaining section.

6.14 Testing New or Modified Piping Systems.

6.14.1 Piping Systems.

6.14.1.1 After installation or modification, piping systems (including hose) shall be proven free of leaks by performing a pressure test at not less than the normal operating pressure.

6.14.1.2 LP-Gas shall be permitted to be used as the test medium.

6.14.2 Branches.

6.14.2.1 Where new branches are installed, only the newly installed branch(es) shall be required to be pressure tested.

6.14.2.2 Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or approved leak-detecting methods.

6.14.3 Piping within the scope of NFPA 54, *National Fuel Gas Code*, shall be pressure tested in accordance with that code.

6.14.4 Tests shall not be made with a flame.

6.15 Leak Check for Vapor Systems.

6.15.1* All vapor piping systems operating at 20 psig (138 kPag) or less in stationary installations shall be checked for leakage in accordance with 6.15.2 through 6.15.5.

6.15.2* Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage.

6.15.3 Piping within the scope of NFPA 54, *National Fuel Gas Code*, shall be checked for leakage in accordance with that code.

6.15.4* Gas systems within the scope of 49 CFR 192 or those outside the scope of NFPA 54 shall be exempt from the requirements of this section.

6.15.5 Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

6.16 Installation in Areas of Heavy Snowfall.

6.16.1* In areas where the ground snow load is equal to or exceeds 175 psf (855 kg/m^2), piping, regulators, meters, and other equipment installed in the piping system shall be protected from the forces of accumulated snow.

6.17* Corrosion Protection.

6.17.1 All materials and equipment installed above ground shall be of corrosion-resistant material or shall be coated or protected to minimize exterior corrosion.

6.17.2 Except for underground and mounded containers (*see 6.6.6*), all materials and equipment that are buried or mounded shall comply with one of the requirements in 6.17.2(A) through 6.17.2(C).

(A) Materials and equipment shall be made of corrosion-resistant material that are suitable for the environment in which they will be installed.

(B) Materials and equipment shall be manufactured with a corrosion-resistant coating or have a coating applied prior to being placed into service.

(C) Materials and equipment shall have a cathodic protection system installed and maintained in accordance with 6.17.3.

6.17.3 Where installed, cathodic protection systems shall comply with 6.17.3.1 through 6.17.3.3.

6.17.3.1* Cathodic protection systems installed in accordance with this code shall be monitored by testing, the results shall be documented, and confirming tests shall be described by one of the following:

(1) Producing a voltage of –0.85 volt or more negative, with reference to a saturated copper–copper sulfate half cell
(2) Producing a voltage of –0.78 volt or more negative, with reference to a saturated KCl calomel half cell
(3) Producing a voltage of –0.80 volt or more negative, with reference to a silver–silver chloride half cell
(4) Any other method described in Appendix D of 49 CFR 192

6.17.3.2* Sacrificial anodes shall be tested in accordance with the following schedule.

(1) Upon installation of the cathodic protection system, unless prohibited by climatic conditions, in which case testing shall be done within 180 days after the installation of the system.
(2) For continued verification of the effectiveness of the system, 12 to 18 months after the initial test.
(3) Upon successful verification testing and in consideration of previous test results, periodic follow-up testing shall be performed at intervals not to exceed 36 months.
(4) Systems failing a test shall be repaired as soon as practical unless climatic conditions prohibit this action, in which case the repair shall be made not more than 180 days thereafter. The testing schedule shall be restarted as required in 6.17.3.2(1) and 6.17.3.2(2), and the results shall comply with 6.17.3.2.
(5) Documentation of the results of the two most recent tests shall be retained.

6.17.3.3* Where an impressed current cathodic protection system is installed, it shall be inspected and tested in accordance with the schedule described in 6.17.3.3(A) and 6.17.3.3(B).

(A) All sources of impressed current shall be inspected and tested at intervals not exceeding 2 months.

(B) All impressed current cathodic protection installations shall be inspected and tested annually.

6.17.4 Corrosion protection of all other materials shall be in accordance with accepted engineering practice.

6.18 Equipment Installation.

6.18.1 Reserved.

6.18.2 Pump Installation.

6.18.2.1 Pumps shall be installed in accordance with the pump manufacturers' installation instructions.

6.18.2.2 Installation shall be made so that the pump casing is not subjected to excessive strains transmitted to it by the suction and discharge piping, which shall be accomplished as follows:

(1) By piping design
(2) By the use of flexible metallic connectors that do not exceed 36 in. (1 m) in overall length
(3) By other means

6.18.2.3 Positive displacement pumps shall incorporate a bypass valve or recirculating device to limit the normal operating discharge pressure.

(A) The bypass valve or recirculating device to limit the normal operating discharge pressure shall discharge either into a storage container or into the pump inlet.

(B) If the bypass valve or recirculating device is equipped with a shutoff valve, a secondary device shall be required and designed to do one of the following:

(1) Operate at not more than 400 psig (2.8 MPag)
(2) Operate at a pressure of 50 psig (345 kPag) above the operating pressure where the design pressure exceeds 350 psig (2.4 MPag)

(C) The secondary device shall be incorporated, if not integral with the pump, in the pump piping and shall be designed or installed so that it cannot be rendered inoperative and shall discharge either into a storage container or into the pump inlet.

(D) A pump operating control or disconnect switch shall be located near the pump, and remote control points shall be provided for other plant operations such as container filling, loading or unloading of cargo tank vehicles and railroad tank cars, or operation of the engine fuel dispenser.

6.18.3 Compressor Installation.

6.18.3.1 Compressors shall be installed in accordance with the compressor manufacturers' installation instructions.

6.18.3.2 Installation shall be made so that the compressor housing is not subjected to excessive stresses transmitted to it by the suction and discharge piping. Where used to provide flexibility in the piping system, flexible metallic connectors or metallic-protected flexible hose connectors shall not exceed 36 in. (1 m) in overall total length.

6.18.3.3 Engines used to drive portable compressors shall be equipped with exhaust system spark arresters and shielded ignition systems.

6.18.3.4 Where the compressor is not equipped with an integral means to prevent the LP-Gas liquid from entering the suction, a liquid trap shall be installed in the suction piping as close to the compressor as practical.

6.18.3.5 Portable compressors used with temporary connections shall be excluded from the requirement in 6.18.3.4 unless used to unload railroad tank cars.

6.18.4 Installation of Strainers. Strainers shall be installed so that the strainer element can be removed without removing equipment or piping.

6.18.5 Installation of Meters.

6.18.5.1 Liquid or vapor meters shall be installed in accordance with the manufacturers' installation instructions.

6.18.5.2 Liquid meters shall be installed so that the meter housing is not subject to excessive strains from the connecting piping. If not provided in the piping design, the use of flexible connectors shall be permitted.

6.18.5.3 Vapor meters shall be installed so as to minimize the possibility of physical damage.

6.19 Bulk Plant and Industrial Plant LP-Gas Systems.

6.19.1 Operations and Maintenance. The provisions of Chapter 14 shall apply to new and existing bulk plants and industrial plants.

6.19.2 Installation of Liquid Transfer Facilities.

6.19.2.1 Points of transfer or the nearest part of a structure housing transfer operations shall be located in accordance with 6.5.2.1 and 6.5.2.2.

6.19.2.2 Buildings used exclusively for housing pumps or vapor compressors shall be located in accordance with 6.5.2.2, considering the building as one that houses a point of transfer.

6.19.2.3 Liquid transfer facilities at rail sidings shall comply with 6.19.2.3(A) through 6.19.2.3(C).

(A) The track of the railroad siding or the roadway surface at the transfer points shall be relatively level.

(B) Clearances from buildings, structures, or stationary containers shall be provided for the siding or roadway approaches to the unloading or loading points to prevent the railroad tank car or cargo tank vehicle from contacting buildings, structures, or stationary containers.

(C) Barriers shall be provided at the ends of railroad sidings.

6.19.2.4 Pumps and compressors shall comply with 6.19.2.4(A) through 6.19.2.4(C).

(A) Compressors used for liquid transfer normally shall withdraw vapor from the vapor space of the container being filled and discharge into the vapor space of the container from which the withdrawal is being made.

(B) An operating control or disconnect switch shall be located nearby.

(C) Remote shutoff controls shall be provided as necessary in other liquid transfer systems.

6.19.2.5* Bulk plant and industrial plant liquid inlet piping shall be designed to prevent debris from impeding the action of valves and other components of the piping system. This requirement shall be effective for existing installations on July 1, 2011.

6.19.2.6 Where a hose or swivel-type piping is used for liquid transfer, it shall be protected as follows:

(1) An emergency shutoff valve shall be installed at the railroad tank car end of the hose or swivel-type piping where flow into or out of the railroad tank car is possible.
(2) An emergency shutoff valve or a backflow check valve shall be installed on the railroad tank car end of the hose or swivel-type piping where flow is only into the railroad tank car.
(3)*Where a facility hose is used at a LP-Gas bulk plant or industrial plant to transfer LP-Gas liquid from a cargo tank vehicle in non-metered service to a bulk plant or industrial plant, the facility hose or the facility shall be equipped with an emergency discharge control system that provides a means to shut down the flow of LP-Gas caused by the complete separation of the facility hose within 20 seconds and without the need for human intervention.

6.19.2.7 Transfer hose larger than ½ in. (12 mm) internal diameter shall not be used for making connections to individual containers being filled indoors.

6.19.2.8 If gas is to be discharged from containers inside a building, the provisions of 7.3.2.1 shall apply.

6.19.3 Installation of Electrical Equipment. Installation of electrical equipment shall comply with 6.23.2.

6.19.4 Security and Protection Against Tampering for Section 6.19 and Section 6.25 Systems.

6.19.4.1 The following security measures shall be provided to minimize the possibility of entry by unauthorized persons:

(1) Security awareness training
(2) Limitation of unauthorized access to plant areas that include container appurtenances, pumping equipment, loading and unloading facilities, and container filling facilities

6.19.4.2 Areas that include features required in 6.19.4.1(2) shall be enclosed with a minimum 6 ft (1.8 m) high industrial-type fence, chain-link fence, or equivalent protection.

(A) The enclosure shall have at least two means of emergency egress, except as follows:

(1) The fenced or otherwise enclosed area is not over 100 ft^2 (9 m^2).
(2) The point of transfer is within 3 ft (1 m) of the gate.
(3) Containers are not filled within the enclosure.

(B) Clearance of at least 3 ft (1 m) shall be provided to allow emergency access to the required means of egress.

(C) Fencing shall not be required where devices are provided that can be locked in place and prevent unauthorized operation of valves, equipment, and appurtenances.

6.19.4.3 Where guard service is provided, it shall be extended to the LP-Gas installation, and the requirements of Section 4.4 shall apply to guard personnel.

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

6.19.6 Ignition Source Control. Ignition source control shall comply with Section 6.23.

6.20 LP-Gas Systems in Buildings or on Building Roofs or Exterior Balconies.

6.20.1 Application.

6.20.1.1 Section 6.20 shall apply to the installation of the following LP-Gas systems in buildings or structures:

(1) Cylinders inside of buildings or on the roofs or exterior balconies of buildings
(2) Systems in which the liquid is piped from outside containers into buildings or onto the roof

6.20.1.2 The phrase *cylinders in use* shall mean connected for use.

(A) The use of cylinders indoors shall be only for the purposes specified in 6.20.4 through 6.20.10.

(B) The use of cylinders indoors shall be limited to those conditions where operational requirements make the indoor use of cylinders necessary and location outside is impractical.

(C) The use of cylinders on roofs shall be limited to those conditions where operational requirements make the use of cylinders necessary and location other than on roofs of buildings or structures is impractical.

(D) Liquid LP-Gas shall be piped into buildings or structures only for the purposes specified in 6.9.1.1(D).

6.20.1.3 Storage of cylinders awaiting use shall be in accordance with Chapter 8.

6.20.1.4 Transportation of cylinders within a building shall be in accordance with 6.20.3.6.

6.20.1.5 The following provisions shall be required in addition to those specified in Sections 6.2 and 6.3:

(1) Liquid transfer systems shall be in accordance with Chapter 7.
(2) Engine fuel systems used inside buildings shall be in accordance with Chapter 11.
(3) LP-Gas transport or cargo tank vehicles stored, serviced, or repaired in buildings shall be in accordance with Chapter 9.

6.20.2 Additional Equipment Requirements for Cylinders, Equipment, Piping, and Appliances Used in Buildings, Building Roofs, and Exterior Balconies.

6.20.2.1 Cylinders shall be in accordance with the following:

(1) Cylinders shall not exceed 245 lb (111 kg) water capacity [nominal 100 lb (45 kg) propane capacity] each.
(2) Cylinders shall comply with other applicable provisions of Section 5.2, and they shall be equipped as provided in Section 5.7.
(3) Cylinders shall be marked in accordance with 5.2.8.1 and 5.2.8.2.
(4) Cylinders with propane capacities greater than 2 lb (0.9 kg) shall be equipped as provided in Table 5.7.4.1(D), and an excess-flow valve shall be provided for vapor service when used indoors.
(5) Cylinder valves shall be protected in accordance with 5.2.6.1.
(6) Cylinders having water capacities greater than 2.7 lb (1.2 kg) and connected for use shall stand on a firm and substantially level surface.
(7) Cylinders shall be secured in an upright position if necessary.
(8) Cylinders and the valve-protecting devices used with them shall be oriented to minimize the possibility of impingement of the pressure relief device discharge on the cylinder and adjacent cylinders.

6.20.2.2 Manifolds and fittings connecting cylinders to pressure regulator inlets shall be designed for at least 250 psig (1.7 MPag) service pressure.

6.20.2.3 Piping shall comply with Section 5.9 and shall have a pressure rating of 250 psig (1.7 MPag).

6.20.2.4 Liquid piping and vapor piping at pressures above 125 psig (0.9 MPag) shall be installed in accordance with 6.9.3.

6.20.2.5 Hose, hose connections, and flexible connectors shall comply with the following:

(1) Hose used at pressures above 5 psig (34 kPag) shall be designed for a pressure of at least 350 psig (2.4 MPag).
(2) Hose used at a pressure of 5 psig (34 kPag) or less and used in agricultural buildings not normally occupied by the public shall be designed for the operating pressure of the hose.
(3) Hose shall comply with 5.9.6.
(4) Hose shall be installed in accordance with 6.21.3.
(5) Hose shall be as short as practical, without kinking or straining the hose or causing it to be close enough to a burner to be damaged by heat.
(6) Hoses greater than 10 ft (3 m) in length shall be protected from damage.

6.20.2.6* Portable heaters, including salamanders, shall comply with the following:

(1) Portable heaters shall be equipped with an approved automatic device to shut off the flow of gas to the main burner and to the pilot, if used, in the event of flame extinguishment or combustion failure.
(2) Portable heaters shall be self-supporting unless designed for cylinder mounting.
(3) Portable heaters shall not be installed utilizing cylinder valves, connectors, regulators, manifolds, piping, or tubing as structural supports.
(4) Portable heaters having an input of more than 50,000 Btu/hr (53 MJ/hr) shall be equipped with either a pilot that must be lighted and proved before the main burner can be turned on or an approved electric ignition system.

6.20.2.7 The provisions of 6.20.2.6 shall not be applicable to the following:

(1) Tar kettle burners, hand torches, or melting pots
(2) Portable heaters with less than 7500 Btu/hr (8 MJ/hr) input if used with cylinders having a maximum water capacity of 2.7 lb (1.2 kg) and filled with not more than 16.8 oz (0.522 kg) of LP-Gas

6.20.3 Installation Requirements for Cylinders, Equipment, Piping, and Appliances in Buildings, Building Roofs, and Exterior Balconies.

6.20.3.1 Cylinders having water capacities greater than 2.7 lb (1.2 kg) and connected for use shall stand on a firm and substantially level surface, and, if necessary, they shall be secured in an upright position.

6.20.3.2 Cylinders, regulating equipment, manifolds, pipe, tubing, and hose shall be located to minimize exposure to the following:

(1) Abnormally high temperatures (such as might result from exposure to convection and radiation from heating equipment or installation in confined spaces)
(2) Physical damage
(3) Tampering by unauthorized persons

6.20.3.3 Heat-producing equipment shall be installed with clearance to combustibles in accordance with the manufacturer's installation instructions.

6.20.3.4 Heat-producing equipment shall be located and used to minimize the possibility of the ignition of combustibles.

6.20.3.5 Where located on a floor, roof, or balcony, cylinders shall be secured to prevent falling over the edge.

6.20.3.6 Transportation (movement) of cylinders having water capacities greater than 2.7 lb (1.2 kg) within a building shall be restricted to movement directly associated with the uses covered by Section 6.20.

(A) Valve outlets on cylinders having water capacities greater than 2.7 lb (1.2 kg) shall be tightly plugged, capped, or sealed with a listed quick-closing coupling or a listed quick-connect coupling.

(B) Only emergency stairways not normally used by the public shall be used, and precautions shall be taken to prevent the cylinder from falling down the stairs.

(C) Freight or passenger elevators shall be permitted to be used when occupied only by those engaged in moving the cylinder.

6.20.4 Buildings Under Construction or Undergoing Major Renovation.

6.20.4.1 Where cylinders are used and transported in buildings or structures under construction or undergoing major renovation and such buildings are not occupied by the public, the requirements of 6.20.4.2 through 6.20.4.10 shall apply.

6.20.4.2 The use and transportation of cylinders in the unoccupied portions of buildings or structures under construction or undergoing major renovation that are partially occupied by the public shall be approved by the authority having jurisdiction.

6.20.4.3 Cylinders, equipment, piping, and appliances shall comply with 6.20.2.

6.20.4.4 Heaters used for temporary heating shall be located at least 6 ft (1.8 m) from any cylinder. *(See 6.20.4.5 for an exception to this requirement.)*

6.20.4.5 Integral heater-cylinder units specifically designed for the attachment of the heater to the cylinder, or to a supporting standard attached to the cylinder, and designed and installed to prevent direct or radiant heat application to the cylinder shall be exempt from the spacing requirement of 6.20.4.4.

6.20.4.6 Blower-type and radiant-type units shall not be directed toward any cylinder within 20 ft (6.1 m).

6.20.4.7 If two or more heater-cylinder units of either the integral or nonintegral type are located in an unpartitioned area on the same floor, the cylinder(s) of each such unit shall be separated from the cylinder(s) of any other such unit by at least 20 ft (6.1 m).

6.20.4.8 If heaters are connected to cylinders manifolded together for use in an unpartitioned area on the same floor, the total water capacity of cylinders manifolded together serving any one heater shall not be greater than 735 lb (333 kg) [nominal 300 lb (136 kg) propane capacity]. If there is more than one such manifold, it shall be separated from any other by at least 20 ft (6.1 m).

6.20.4.9 Where cylinders are manifolded together for connection to a heater(s) on another floor, the following shall apply:

(1) Heaters shall not be installed on the same floors with manifolded cylinders.
(2) The total water capacity of the cylinders connected to any one manifold shall not be greater than 2450 lb (1111 kg) [nominal 1000 lb (454 kg) propane capacity].
(3) Manifolds of more than 735 lb (333 kg) water capacity [nominal 300 lb (136 kg) propane capacity], if located in the same unpartitioned area, shall be separated from each other by at least 50 ft (15 m).

6.20.4.10 Where compliance with the provisions of 6.20.4.6 through 6.20.4.9 is impractical, alternate installation provisions shall be allowed with the approval of the authority having jurisdiction.

6.20.5 Buildings Undergoing Minor Renovation When Frequented by the Public.

6.20.5.1 Cylinders used and transported for repair or minor renovation in buildings frequented by the public during the hours the public normally occupies the building shall comply with the following:

(1) The maximum water capacity of individual cylinders shall be 50 lb (23 kg) [nominal 20 lb (9.1 kg) propane capacity], and the number of cylinders in the building shall not exceed the number of workers assigned to the use of the propane.
(2) Cylinders having a water capacity greater than 2.7 lb (1.2 kg) shall not be left unattended.

6.20.5.2 During the hours the building is not open to the public, cylinders used and transported within the building for repair or minor renovation and with a water capacity greater than 2.7 lb (1.2 kg) shall not be left unattended.

6.20.6 Buildings Housing Industrial Occupancies.

6.20.6.1 Cylinders used in buildings housing industrial occupancies for processing, research, or experimental purposes shall comply with 6.20.6.1(A) and 6.20.6.1(B).

(A) If cylinders are manifolded together, the total water capacity of the connected cylinders shall be not more than 735 lb (333 kg) [nominal 300 lb (136 kg) propane capacity]. If there is more than one such manifold in a room, it shall be separated from any other by at least 20 ft (6.1 m).

(B) The amount of LP-Gas in cylinders for research and experimental use in the building shall be limited to the smallest practical quantity.

6.20.6.2 The use of cylinders to supply fuel for temporary heating in buildings housing industrial occupancies with essentially noncombustible contents shall comply with the requirements in 6.20.4 for cylinders in buildings under construction.

6.20.6.3 The use of cylinders to supply fuel for temporary heating shall be permitted only where portable equipment for space heating is essential and a permanent heating installation is not practical.

6.20.7 Buildings Housing Educational and Institutional Occupancies.

6.20.7.1 The use of cylinders in classrooms shall be prohibited unless they are used temporarily for classroom demonstrations in accordance with 6.20.9.1.

6.20.7.2 Where cylinders are used in buildings housing educational and institutional laboratory occupancies for research and experimental purposes, the following shall apply:

(1) The maximum water capacity of individual cylinders used shall be 50 lb (23 kg) [nominal 20 lb (9.1 kg) propane capacity] if used in educational occupancies and 12 lb (5.4 kg) [nominal 5 lb (2 kg) propane capacity] if used in institutional occupancies.
(2) If more than one such cylinder is located in the same room, the cylinders shall be separated by at least 20 ft (6.1 m).
(3) Cylinders not connected for use shall be stored in accordance with Chapter 8.
(4) Cylinders shall not be stored in a laboratory room.

6.20.8 Temporary Heating and Food Service Appliances in Buildings in Emergencies.

6.20.8.1 Cylinders shall not be used in buildings for temporary emergency heating purposes except when all of the following conditions are met:

(1) The permanent heating system is temporarily out of service.
(2) Heat is necessary to prevent damage to the buildings or contents.
(3) The cylinders and heaters comply with, and are used and transported in accordance with, 6.20.2 through 6.20.4.
(4) The temporary heating equipment is not left unattended.
(5) Air for combustion and ventilation is provided in accordance with NFPA 54, *National Fuel Gas Code.*

6.20.8.2 When a public emergency has been declared and gas, fuel, or electrical service has been interrupted, portable listed LP-Gas commercial food service appliances meeting the requirements of 6.20.9.4 shall be permitted to be temporarily used inside affected buildings.

6.20.8.3 The portable appliances used shall be discontinued and removed from the building at the time the permanently installed appliances are placed back in operation.

6.20.9 Use in Buildings for Demonstrations or Training, and Use of Small Cylinders for Self-Contained Torch Assemblies and Food Service Appliances.

6.20.9.1 Cylinders used temporarily inside buildings for public exhibitions or demonstrations, including use in classroom demonstrations, shall be in accordance with the following:

(1) The maximum water capacity of a cylinder shall be 12 lb (5.4 kg) [nominal 5 lb (2 kg) propane capacity].
(2) If more than one such cylinder is located in a room, the cylinders shall be separated by at least 20 ft (6.1 m).

6.20.9.2 Cylinders used temporarily in buildings for training purposes related to the installation and use of LP-Gas systems shall be in accordance with the following:

(1) The maximum water capacity of individual cylinders shall be 245 lb (111 kg) [nominal 100 lb (45 kg) propane capacity], but not more than 20 lb (9.1 kg) of propane shall be placed in a single cylinder.
(2) If more than one such cylinder is located in the same room, the cylinders shall be separated by at least 20 ft (6.1 m).
(3) The training location shall be acceptable to the authority having jurisdiction.
(4) Cylinders shall be promptly removed from the building when the training class has terminated.

6.20.9.3* Cylinders used in buildings as part of approved self-contained torch assemblies or similar appliances shall be in accordance with the following:

(1) Cylinders used in buildings shall comply with ANSI/UL 147A, *Standard for Nonrefillable (Disposable) Type Fuel Gas Cylinder Assemblies.*
(2) Cylinders shall have a maximum water capacity of 2.7 lb (1.2 kg).

6.20.9.4 Cylinders used with commercial food service appliances shall be used inside restaurants and in attended commercial food catering operations in accordance with the following:

(1) Cylinders and appliances shall be listed.
(2) Commercial food service appliances shall not have more than two 10 oz (296 ml) nonrefillable butane gas cylinders, each having a maximum capacity of 1.08 lb (0.490 kg).
(3) Cylinders shall comply with ANSI/UL 147B, *Standard for Nonrefillable (Disposable) Type Metal Container Assemblies for Butane.*
(4) Cylinders shall be connected directly to the appliance and shall not be manifolded.
(5) Cylinders shall be an integral part of the listed, approved, commercial food service device and shall be connected without the use of a rubber hose.
(6) Storage of cylinders shall be in accordance with 8.3.1.

6.20.10 Use in Building for Flame Effects Before a Proximate Audience.

6.20.10.1 Where cylinders are used temporarily in buildings for flame effects before an audience, the flame effect shall be in accordance with NFPA 160, *Standard for the Use of Flame Effects Before an Audience.*

6.20.10.2 The maximum water capacity of individual cylinders shall be 48 lb (22 kg) [nominal 20 lb (9.1 kg) propane capacity].

6.20.10.3* If more than one cylinder is located in the same room, the cylinders shall be separated by at least 20 ft (6.1 m).

6.20.10.4 Where a separation of 20 ft (6.1 m) is not practical, reduction of distances shall be permitted with the approval of the authority having jurisdiction.

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

6.20.11 Cylinders on Roofs or Exterior Balconies.

6.20.11.1 Where cylinders are installed permanently on roofs of buildings, the buildings shall be of fire-resistant construction

or noncombustible construction having essentially noncombustible contents, or of other construction or contents that are protected with automatic sprinklers.

(A) The total water capacity of cylinders connected to any one manifold shall be not greater than 980 lb (445 kg) [nominal 400 lb (181 kg) propane capacity]. If more than one manifold is located on the roof, it shall be separated from any other by at least 50 ft (15 m).

(B) Cylinders shall be located in areas where there is free air circulation, at least 10 ft (3 m) from building openings (such as windows and doors), and at least 20 ft (6.1 m) from air intakes of air-conditioning and ventilating systems.

(C) Cylinders shall not be located on roofs that are entirely enclosed by parapets more than 18 in. (460 mm) high unless the parapets are breached with low-level ventilation openings not more than 20 ft (6.1 m) apart, or unless all openings communicating with the interior of the building are at or above the top of the parapets.

(D) Piping shall be in accordance with 6.20.2.3 through 6.20.2.5.

(E) Hose shall not be used for connection to cylinders.

(F) The fire department shall be advised of each installation.

6.20.11.2 Cylinders having water capacities greater than 2.7 lb (1 kg) [nominal 1 lb (0.5 kg) LP-Gas capacity] shall not be located on decks or balconies of dwellings of two or more living units above the first floor unless they are served by exterior stairways.

6.20.12 Liquid LP-Gas Piped into Buildings or Structures.

6.20.12.1 Buildings or separate areas of buildings into which LP-Gas liquid at pressures exceeding 20 psig (138 kPag) is piped shall be constructed in accordance with Chapter 10 and shall be used for the purposes listed in 6.9.1.1(D)(2).

6.20.12.2 Liquid LP-Gas piped into buildings under construction or major renovation in accordance with 6.9.1.1(D)(1) shall comply with 6.20.12.2(A) through 6.20.12.2(J).

(A) Liquid piping shall not exceed ¾ in. (20 mm) and shall comply with 6.9.1 and 6.9.3.

(B) Copper tubing with a maximum outside diameter of ¾ in. (20 mm) shall be used where approved by the authority having jurisdiction.

(C) Liquid piping in buildings shall be kept to a minimum length and shall be protected against construction hazards by fastening it to walls or other surfaces to provide protection against breakage and by locating it so as to avoid exposure to high ambient temperatures.

(D) A readily accessible shutoff valve shall be located at each intermediate branch line where it leaves the main line.

(E) A second shutoff valve shall be located at the appliance end of the branch and upstream of any flexible appliance connector.

(F) Excess-flow valves shall be installed downstream of each branch line shutoff valve.

(G) Excess-flow valves shall be located at any point in the piping system where branch lines are used and the pipe size of the branch line is reduced. The excess flow valve shall be sized for the reduced size of the branch line piping.

(H) Hose shall not be used to carry liquid between the container and building and shall not be used at any point in the liquid line.

(I) Hydrostatic relief valves shall be installed where required.

(J) The release of fuel when any section of piping or appliances is disconnected shall be minimized either by using an approved automatic quick-closing coupling that shuts off the gas on both sides when uncoupled or by closing the shutoff valve closest to the point to be disconnected and allowing the appliances on that line to operate until the fuel in the line is consumed.

6.21 Installation of Appliances.

6.21.1 Application.

6.21.1.1 Section 6.21 shall apply to the installation of LP-Gas appliances.

6.21.1.2 Installation of appliances on commercial vehicles shall be in accordance with 6.24.7.

6.21.2 Installation of Patio Heaters.

6.21.2.1 Patio heaters utilizing an integral LP-Gas container greater than 1.08 lb (0.49 kg) propane capacity shall comply with 6.21.2.2 and 6.21.2.3.

6.21.2.2 Patio heaters shall be listed and used in accordance with their listing and the manufacturer's instructions.

6.21.2.3 Patio heaters shall not be located within 5 ft (1.5 m) of exits from an assembly occupancy.

6.21.3 Hose for Portable Appliances.

6.21.3.1 The requirements of Section 6.21 shall apply to hoses used on the low-pressure side of regulators to connect portable appliances.

6.21.3.2 Where used inside buildings, the following shall apply:

(1) The hose shall be the minimum practical length and shall be in accordance with 6.20.2.5.
(2) The hose shall not extend from one room to another or pass through any partitions, walls, ceilings, or floors except as provided by 6.20.4.9.
(3) The hose shall not be concealed from view or used in concealed locations.

6.21.3.3 Where installed outside of buildings, the hose length shall be permitted to exceed 10 ft (3 m) but shall be as short as practical.

6.21.3.4 Hose shall be securely connected to the appliance.

6.21.3.5 The use of rubber slip ends shall not be permitted.

6.21.3.6 A shutoff valve shall be provided in the piping immediately upstream of the inlet connection of the hose.

6.21.3.7 Where more than one such appliance shutoff is located near another, the valves shall be marked to indicate which appliance is connected to each valve.

6.21.3.8 Hose shall be protected against physical damage.

6.22 Vaporizer Installation.

6.22.1 Nonapplication. Section 6.22 shall not apply to engine fuel vaporizers or to integral vaporizing burners such as those used for weed burners or tar kettles.

6.22.2 Installation of Indirect-Fired Vaporizers.

6.22.2.1 Indirect-fired vaporizers shall be installed outdoors, or in separate buildings or structures that comply with Section 10.2, or in attached structures or rooms that comply with Section 10.3.

6.22.2.2 The separate building or structure shall not have any unprotected drains to sewers or sump pits.

6.22.2.3 Pressure relief valves on vaporizers within buildings in industrial or gas manufacturing plants shall be piped to a point outside the building or structure and shall discharge vertically upward.

6.22.2.4 If the heat source of an indirect-fired vaporizer is gas fired and is located within 15 ft (4.6 m) of the vaporizer, the vaporizer and its heat source shall be installed as a direct-fired vaporizer and shall be subject to the requirements of 6.22.3.

6.22.2.5 The installation of a heat source serving an indirect-fired vaporizer that utilizes a flammable or combustible heat transfer fluid shall comply with one of the following:

(1) It shall be located outdoors.
(2) It shall be located within a structure that complies with Section 10.2.
(3) It shall be located within a structure attached to, or in rooms within, a building or structure that complies with Section 10.3.

6.22.2.6 Gas-fired heating systems supplying heat for vaporization purposes shall be equipped with automatic safety devices to shut off gas to the main burners if ignition fails to occur.

6.22.2.7 The installation of a heat source serving an indirect-fired vaporizer that utilizes a noncombustible heat transfer fluid, such as steam, water, or a water-glycol mixture, shall be installed outdoors or in industrial occupancies.

6.22.2.8 Industrial occupancies in which a source of heat for an indirect-fired vaporizer is installed shall comply with Chapter 40 of NFPA *101, Life Safety Code*, and Section 10.3 of NFPA 54, *National Fuel Gas Code* (ANSI Z223.1).

6.22.2.9 The following shall apply to indirect-fired vaporizers installed in buildings:

(1) The heat transfer fluid shall be steam or hot water.
(2) The heat transfer fluid shall not be recirculated.
(3) A backflow preventer shall be installed between the vaporizer and the heat source.

6.22.2.10 If the heat transfer fluid is recirculated after leaving the vaporizer, the heat source shall be installed in accordance with 6.22.2.5 and a phase separator shall be installed with the gas vented.

6.22.2.11 Indirect-fired vaporizers employing heat from the atmosphere shall be installed outdoors and shall be located in accordance with Table 6.22.3.6.

6.22.2.12 Where atmospheric vaporizers of less than 1 qt (0.9 L) capacity are installed in industrial occupancies, they shall be installed as close as practical to the point of entry of the supply line in the building.

6.22.2.13 Atmospheric vaporizers of less than 1 qt (0.9 L) capacity shall not be installed in other than industrial occupancies.

6.22.3 Installation of Direct-Fired Vaporizers.

6.22.3.1 Where a direct-fired vaporizer is installed in a separate structure, the separate structure shall be constructed in accordance with Chapter 10.

6.22.3.2 The housing for direct-fired vaporizers shall not have any drains to a sewer or a sump pit that is shared with any other structure.

6.22.3.3 Pressure relief valve discharges on direct-fired vaporizers shall be piped to a point outside the structure or building.

6.22.3.4 Direct-fired vaporizers shall be connected to the liquid space or to the liquid and vapor space of the ASME container.

6.22.3.5 A manually operated shutoff valve shall be installed in each connection of the ASME container supplying the vaporizer.

6.22.3.6 Direct-fired vaporizers of any capacity shall be located in accordance with Table 6.22.3.6.

Table 6.22.3.6 Minimum Separation Distances Between Direct-Fired Vaporizers and Exposures

Exposure	Minimum Distance Required	
	ft	m
Container	10	3.0
Container shutoff valves	15	4.6
Point of transfer	15	4.6
Nearest important building or group of buildings or line of adjoining property that can be built upon	25	7.6
Nearest Chapter 10 building or room housing gas–air mixer	10	3.0
Cabinet housing gas–air mixer outdoors	0	0

Note: Do not apply distances to the building in which a direct-fired vaporizer is installed.

6.22.4 Installation of Tank Heaters.

6.22.4.1 Direct-type tank heaters shall be installed only on aboveground ASME containers.

6.22.4.2 Direct gas-fired tank heaters shall only be installed on steel containers.

6.22.4.3 Tank heaters containing sources of ignition, together with the container upon which they are installed, shall be located in accordance with Table 6.22.4.3 with respect to the nearest important building, group of buildings, or line of adjoining property that can be built upon.

6.22.4.4 If the tank heater is similar in operation to an indirect-fired vaporizer, the heat source shall comply with 6.22.2.8 and 6.22.2.11.

6.22.4.5 If a point of transfer is located within 15 ft (4.6 m) of a tank heater having a source of ignition, the source of ignition shall be shut off during product transfer and a caution notice in letters ¾ in. (19 mm) high or larger that reads as follows shall be displayed immediately adjacent to the filling connections:

Table 6.22.4.3 Minimum Separation Between Tank Heaters and Exposures

Container Water Capacity		Minimum Distance Required	
gal	m^3	ft	m
≤500	≤1.9	10	3.0
501–2,000	>1.9–7.6	25	7.6
2,001–30,000	>7.6–114	50	15.0
30,001–70,000	>114–265	75	23.0
70,001–90,000	>265–341	100	30.5
90,001–120,000	>341–454	125	38.1

CAUTION: A device that contains a source of ignition is connected to this container. The source of ignition must be shut off before filling the container.

6.22.4.6* Annual Inspection.

(A) Direct-type tank heaters shall be removed annually and the container surface shall be inspected.

(B) If corrosion or coating damage other than discoloration is found, the container shall be removed from service and tested in accordance with 5.2.1.2(B).

6.22.5 Installation of Vaporizing Burners.

6.22.5.1 Vaporizing burners shall be installed outside of buildings.

6.22.5.2 The minimum distance between any container and a vaporizing burner shall be in accordance with Table 6.22.5.2.

Table 6.22.5.2 Minimum Separation Distance Between Containers and Vaporizing Burners

Container Water Capacity		Minimum Distance Required	
gal	m^3	ft	m
≤500	≤1.9	10	3.0
501–2000	1.9–7.6	25	7.6
>2000	>7.6	50	15.0

6.22.5.3 Manually operated positive shutoff valves shall be located at the containers to shut off all flow to the vaporizing burners.

6.22.6 Installation of Waterbath Vaporizers.

6.22.6.1 If a waterbath vaporizer is electrically heated and all electrical equipment is designed for Class I, Group D locations, the unit shall be treated as an indirect-fired vaporizer and shall be installed in accordance with 6.22.2.

6.22.6.2 All other waterbath vaporizers shall be treated as direct-fired vaporizers and shall be installed in accordance with 6.22.3.

6.22.7 Installation of Electric Vaporizers. Electric vaporizers, whether direct immersion or indirect immersion, shall be treated as indirect-fired and shall be installed in accordance with 6.22.2.

6.22.8 Installation of Gas–Air Mixers.

6.22.8.1 Piping and equipment installed with a gas–air mixer shall comply with 6.9.1, 6.9.3, and Section 6.14.

6.22.8.2 Where used without a vaporizer, a mixer shall be installed outdoors or in a building complying with Chapter 10.

6.22.8.3 Where used with an indirect-fired vaporizer, a mixer shall be installed as follows:

(1) In an outdoor location
(2) In the same compartment or room with the vaporizer
(3) In a building complying with Chapter 10
(4) In a location that is both remote from the vaporizer and in accordance with 6.22.2

6.22.8.4 Where used with a direct-fired vaporizer, a mixer shall be installed as follows:

(1) With a listed or approved mixer in a common cabinet with the vaporizer outdoors in accordance with 6.22.3.6
(2) Outdoors on a common skid with the vaporizer in accordance with 6.22.3
(3) Adjacent to the vaporizer to which it is connected in accordance with 6.22.3
(4) In a building complying with Chapter 10 without a direct-fired vaporizer in the same room

6.23 Ignition Source Control.

6.23.1 Scope.

6.23.1.1 This section shall apply to the minimization of ignition of flammable LP-Gas–air mixtures resulting from the normal or accidental release of nominal quantities of liquid or vapor from LP-Gas systems installed and operated in accordance with this code.

6.23.1.2* The installation of lightning protection equipment shall not be required on LP-Gas storage containers.

6.23.1.3* Grounding and bonding shall not be required on LP-Gas systems.

6.23.2 Electrical Equipment.

6.23.2.1 Electrical equipment and wiring installed in unclassified areas shall be in accordance with *NFPA 70, National Electrical Code.*

6.23.2.2* The extent of electrically classified areas shall be in accordance with Table 6.23.2.2.

6.23.2.3* The provisions of 6.23.2.2 shall apply to vehicular fuel operations.

6.23.2.4 The provisions of 6.23.2.2 shall not apply to fixed electrical equipment at residential or commercial installations of LP-Gas systems or to systems covered by Section 6.24.

6.23.2.5 Fired vaporizers, calorimeters with open flames, and other areas where open flames are present either intermittently or constantly shall not be considered electrically classified areas.

6.23.2.6 Electrical equipment installed on LP-Gas cargo tank vehicles shall comply with Section 9.2.

6.23.3 Other Sources of Ignition.

6.23.3.1 Open flames or other sources of ignition shall not be used or installed in pump houses, cylinder filling rooms, or other similar locations.

Table 6.23.2.2 Electrical Area Classification

Part	Location	Extent of Classified Area[a]	Equipment Shall Be Approved for Compliance with NFPA 70, *National Electrical Code*, Class I[a], Group D[b]
A	Unrefrigerated containers other than cylinders and ASME vertical containers of less than 1000 lb (454 kg) water capacity	Within 15 ft (4.6 m) in all directions from connections, except connections otherwise covered in this table	Division 2
B	Refrigerated storage containers	Within 15 ft (4.6 m) in all directions from connections otherwise covered in this table	Division 2
		Area inside dike to the level of the top of the dike	Division 2
C[c]	Tank vehicle and tank car loading and unloading	Within 5 ft (1.5 m) in all directions from connections regularly made or disconnected for product transfer	Division 1
		Beyond 5 ft (1.5 m) but within 15 ft (4.6 m) in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and grade	Division 2
D	Gauge vent openings other than those on cylinders and ASME vertical containers of less than 1000 lb (454 kg) water capacity	Within 5 ft (1.5 m) in all directions from point of discharge	Division 1
		Beyond 5 ft (1.5 m) but within 15 ft (4.6 m) in all directions from point of discharge	Division 2
E	Relief device discharge other than those on cylinders and ASME vertical containers of less than 1000 lb (454 kg) water capacity and vaporizers	Within direct path of discharge	Fixed electrical equipment not permitted to be installed
F[c]	Pumps, vapor compressors, gas–air mixers and vaporizers (other than direct-fired or indirect-fired with an attached or adjacent gas-fired heat source)		
	Indoors without ventilation	Entire room and any adjacent room not separated by a gastight partition	Division 1
		Within 15 ft (4.6 m) of the exterior side of any exterior wall or roof that is not vaportight or within 15 ft (4.6 m) of any exterior opening	Division 2
	Indoors with ventilation	Entire room and any adjacent room not separated by a gastight partition	Division 2
	Outdoors in open air at or above grade	Within 15 ft (4.6 m) in all directions from this equipment and within the cylindrical volume between the horizontal equator of the sphere and grade	Division 2
G	Vehicle fuel dispenser	Entire space within dispenser enclosure, and 18 in. (460 mm) horizontally from enclosure exterior up to an elevation 4 ft (1.2 m) above dispenser base; entire pit or open space beneath dispenser	Division 1
		Up to 18 in. (460 mm) above ground within 20 ft (6.1 m) horizontally from any edge of enclosure (Note: For pits within this area, see part H of this table.)	Division 2

Table 6.23.2.2 Continued

Part	Location	Extent of Classified Area[a]	Equipment Shall Be Approved for Compliance with NFPA 70, *National Electrical Code*, Class I[a], Group D[b]
H	Pits or trenches containing or located beneath LP-Gas valves, pumps, vapor compressors, regulators, and similar equipment		
	Without mechanical ventilation	Entire pit or trench	Division 1
		Entire room and any adjacent room not separated by a gastight partition	Division 2
		Within 15 ft (4.6 m) in all directions from pit or trench when located outdoors	Division 2
	With mechanical ventilation	Entire pit or trench	Division 2
		Entire room and any adjacent room not separated by a gastight partition	Division 2
		Within 15 ft (4.6 m) in all directions from pit or trench when located outdoors	Division 2
I	Special buildings or rooms for storage of cylinders	Entire room	Division 2
J	Pipelines and connections containing operational bleeds, drips, vents, or drains	Within 5 ft (1.5 m) in all directions from point of discharge	Division 1
		Beyond 5 ft (1.5 m) from point of discharge, same as part F of this table	
K[c]	Cylinder filling		
	Indoors with ventilation	Within 5 ft (1.5 m) in all directions from a point of transfer	Division 1
		Beyond 5 ft (1.5 m) and entire room	Division 2
	Outdoors in open air	Within 5 ft (1.5 m) in all directions from a point of transfer	Division 1
		Beyond 5 ft (1.5 m) but within 15 ft (4.6 m) in all directions from point of transfer and within the cylindrical volume between the horizontal equator of the sphere and grade	Division 2
L	Piers and wharves	Within 5 ft (1.5 m) in all directions from connections regularly made or disconnected for product transfer	Division 1
		Beyond 5 ft (1.5 m) but within 15 ft (4.6 m) in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and the vessel deck	Division 2

[a]The classified area is prohibited from extending beyond an unpierced wall, roof, or solid vaportight partition.
[b]See Article 500, Hazardous (Classified) Locations, in NFPA 70, *National Electrical Code*, for definitions of classes, groups, and divisions.
[c]See A.6.23.2.2.

6.23.3.2 Direct-fired vaporizers or indirect-fired vaporizers attached or installed adjacent to gas-fired heat sources shall not be installed in pump houses or cylinder filling rooms.

6.23.3.3 Open flames, cutting or welding tools, portable electric tools, and extension lights capable of igniting LP-Gas shall not be installed or used within classified areas specified in Table 6.23.2.2.

6.23.3.4 Open flames or other sources of ignition shall not be prohibited where containers, piping, and other equipment containing LP-Gas have been purged of all liquid and vapor LP-Gas.

6.24 LP-Gas Systems on Vehicles (Other Than Engine Fuel Systems).

6.24.1* Application. Section 6.24 shall apply to the following:

(1) Nonengine fuel systems on all vehicles
(2) Installations served by exchangeable (removable) cylinder systems and by permanently mounted containers

6.24.2 Nonapplication. Section 6.24 shall not apply to the following:

(1) Systems installed on mobile homes
(2) Systems installed on recreational vehicles
(3) Cargo tank vehicles, including trailers and semitrailers, and similar units used to transport LP-Gas as cargo, which are covered by Chapter 9
(4) LP-Gas engine fuel systems on the vehicles, which are covered by Chapter 11

6.24.3 Container Installation Requirements.

6.24.3.1 Containers shall comply with 6.24.3.1(A) through 6.24.3.1(D).

(A) ASME mobile containers shall be in accordance with one of the following:

(1) A MAWP of 312 psig (2.2 MPag) or higher where installed in enclosed spaces of vehicles
(2) A MAWP of 312 psig (2.2 MPag) or higher where installed on passenger vehicles
(3) A MAWP of 250 psig (1.7 MPag) or higher for containers where installed on the exterior of nonpassenger vehicles

(B) LP-Gas fuel containers used on passenger-carrying vehicles shall not exceed 200 gal (0.8 m^3) aggregate water capacity.

(C) The capacity of individual LP-Gas containers on highway vehicles shall be in accordance with Table 6.24.3.1(C).

Table 6.24.3.1(C) Maximum Capacities of Individual LP-Gas Containers Installed on LP-Gas Highway Vehicles

Vehicle	Maximum Container Water Capacity	
	gal	m^3
Passenger vehicle	200	0.8
Nonpassenger vehicle	300	1.1
Road surfacing vehicle	1000	3.8
Cargo tank vehicle	Not limited by this code	

(D) Containers designed for stationary service only and not in compliance with the container appurtenance protection requirements of 5.2.6 shall not be used.

6.24.3.2 ASME containers and cylinders utilized for the purposes covered by Section 6.24 shall not be installed, transported, or stored (even temporarily) inside any vehicle covered by Section 6.24, except for ASME containers installed in accordance with 6.24.3.4(I), Chapter 9, or DOT regulations.

6.24.3.3 The LP-Gas supply system, including the containers, shall be installed either on the outside of the vehicle or in a recess or cabinet vaportight to the inside of the vehicle but accessible from and vented to the outside, with the vents located near the top and bottom of the enclosure and 3 ft (1 m) horizontally away from any opening into the vehicle below the level of the vents.

6.24.3.4 Containers shall be mounted securely on the vehicle or within the enclosing recess or cabinet.

(A) Containers shall be installed with road clearance in accordance with 11.8.3.

(B) Fuel containers shall be mounted to prevent jarring loose and slipping or rotating, and the fastenings shall be designed and constructed to withstand, without permanent visible deformation, static loading in any direction equal to four times the weight of the container filled with fuel.

(C) Where containers are mounted within a vehicle housing, the securing of the housing to the vehicle shall comply with this provision. Any removable portions of the housing or cabinet shall be secured while in transit.

(D) 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.

(E) All container valves, appurtenances, and connections shall be protected to prevent damage from accidental contact with stationary objects; from loose objects, stones, mud, or ice thrown up from the ground or floor; and from damage due to overturn or similar vehicular accident.

(F) Permanently mounted ASME containers shall be located on the vehicle to provide the protection specified in 6.24.3.4(E).

(G) Cylinders shall have permanent protection for cylinder valves and connections.

(H) Where cylinders are located on the outside of a vehicle, weather protection shall be provided.

(I) Containers mounted on the interior of passenger-carrying vehicles shall be installed in compliance with Section 11.9. Pressure relief valve installations for such containers shall comply with 11.8.5.

6.24.3.5 Cylinders installed on portable tar kettles alongside the kettle, on the vehicle frame, or on road surface heating equipment shall be protected from radiant or convected heat from open flame or other burners by the use of a heat shield or by the location of the cylinder(s) on the vehicle. In addition, the following shall apply:

(1) Cylinder valves shall be closed when burners are not in use.
(2) Cylinders shall not be refilled while burners are in use as provided in 7.2.3.2(B).

6.24.4 Installation of Container Appurtenances.

6.24.4.1 Container appurtenances shall be installed in accordance with the following:

(1) Pressure relief valve installation on ASME containers installed in the interior of vehicles complying with Section 11.9 shall comply with 11.8.5.
(2) Pressure relief valve installations on ASME containers installed on the outside of vehicles shall comply with 11.8.5 and 6.24.3.3.
(3) Main shutoff valves on containers for liquid and vapor shall be readily accessible.
(4) Cylinders shall be designed to be filled in either the vertical or horizontal position, or if they are the universal type, they are permitted to be filled in either position.
(5) All container inlets, outlets, or valves installed in container inlets or outlets, except pressure relief devices and gauging devices, shall be labeled to designate whether they communicate with the vapor or liquid space.
(6) Containers from which only vapor is to be withdrawn shall be installed and equipped with connections to minimize the possibility of the accidental withdrawal of liquid.

6.24.4.2 Regulators shall be installed in accordance with 6.8.2 and 6.24.4.2(A) through 6.24.4.2(E).

(A) Regulators shall be installed with the pressure relief vent opening pointing vertically downward to allow for drainage of moisture collected on the diaphragm of the regulator.

(B) Regulators not installed in compartments shall be equipped with a durable cover designed to protect the regulator vent opening from sleet, snow, freezing rain, ice, mud, and wheel spray.

(C) If vehicle-mounted regulators are installed at or below the floor level, they shall be installed in a compartment that provides protection against the weather and wheel spray.

(D) Regulator compartments shall comply with the following:

(1) The compartment shall be of sufficient size to allow tool operation for connection to and replacement of the regulator(s).
(2) The compartment shall be vaportight to the interior of the vehicle.
(3) The compartment shall have a 1 in.^{2} (650 mm^2) minimum vent opening to the exterior located within 1 in. (25 mm) of the bottom of the compartment.
(4) The compartment shall not contain flame or spark-producing equipment.

(E) A regulator vent outlet shall be at least 2 in. (51 mm) above the compartment vent opening.

6.24.5 Piping.

6.24.5.1 Piping shall be installed in accordance with 6.9.3 and 6.24.5.1(A) through 6.24.5.1(M).

(A) Steel tubing shall have a minimum wall thickness of 0.049 in. (1.2 mm).

(B) A flexible connector shall be installed between the regulator outlet and the fixed piping system to protect against expansion, contraction, jarring, and vibration strains.

(C) Flexibility shall be provided in the piping between a cylinder and the gas piping system or regulator.

(D) Flexible connectors shall be installed in accordance with 6.9.6.

(E) Flexible connectors longer than the length allowed in the code, or fuel lines that incorporate hose, shall be used only where approved.

(F) The fixed piping system shall be designed, installed, supported, and secured to minimize the possibility of damage due to vibration, strains, or wear and to preclude any loosening while in transit.

(G) Piping shall be installed in a protected location.

(H) Where piping is installed outside the vehicle, it shall be installed as follows:

(1) Piping shall be under the vehicle and below any insulation or false bottom.
(2) Fastening or other protection shall be installed to prevent damage due to vibration or abrasion.
(3) At each point where piping passes through sheet metal or a structural member, a rubber grommet or equivalent protection shall be installed to prevent chafing.

(I) Gas piping shall be installed to enter the vehicle through the floor directly beneath or adjacent to the appliance served.

(J) If a branch line is installed, the tee connection shall be located in the main gas line under the floor and outside the vehicle.

(K) Exposed parts of the fixed piping system either shall be of corrosion-resistant material or shall be coated or protected to minimize exterior corrosion.

(L) Hydrostatic relief valves shall be installed in isolated sections of liquid piping as provided in Section 6.13.

(M) Piping systems, including hose, shall be pressure tested and proven free of leaks in accordance with Section 6.14.

6.24.5.2 There shall be no fuel connection between a tractor and trailer or other vehicle units.

6.24.6 Equipment Installation. Equipment shall be installed in accordance with Section 6.18, 6.24.6.1, and 6.24.6.2.

6.24.6.1 Installation shall be made in accordance with the manufacturer's recommendations and, in the case of approved equipment, as provided in the approval.

6.24.6.2 Equipment installed on vehicles shall be protected against vehicular damage as provided for container appurtenances and connections in 6.24.3.4(E).

6.24.7 Appliance Installation on Vehicles.

6.24.7.1 Subsection 6.24.7 shall apply to the installation of all appliances on vehicles. It shall not apply to engines.

6.24.7.2 All appliances covered by 6.24.7 installed on vehicles shall be approved.

6.24.7.3 Where the device or appliance, such as a cargo heater or cooler, is designed to be in operation while the vehicle is in transit, means, such as an excess-flow valve, to stop the flow of gas in the event of a line break shall be installed.

6.24.7.4 Gas-fired heating appliances shall be equipped with shutoffs in accordance with 5.20.7(A), except for portable heaters used with cylinders having a maximum water capacity of 2.7 lb (1.2 kg), portable torches, melting pots, and tar kettles.

6.24.7.5 Gas-fired heating appliances, other than ranges and illuminating appliances installed on vehicles intended for human occupancy, shall be designed or installed to provide for a

complete separation of the combustion system from the atmosphere inside the vehicle.

6.24.7.6* Where unvented-type heaters that are designed to protect cargo are used on vehicles not intended for human occupancy, provisions shall be made to provide air from the outside for combustion and dispose of the products of combustion to the outside.

6.24.7.7 Appliances installed in the cargo space of a vehicle shall be readily accessible whether the vehicle is loaded or empty.

6.24.7.8 Appliances shall be constructed or otherwise protected to minimize possible damage or impaired operation due to cargo shifting or handling.

6.24.7.9 Appliances shall be located so that a fire at any appliance will not block egress of persons from the vehicle.

6.24.7.10 A permanent caution plate shall be affixed to either the appliance or the vehicle outside of any enclosure, shall be adjacent to the container(s), and shall include the following instructions:

CAUTION:
(1) Be sure all appliance valves are closed before opening container valve.
(2) Connections at the appliances, regulators, and containers shall be checked periodically for leaks with soapy water or its equivalent.
(3) Never use a match or flame to check for leaks.
(4) Container valves shall be closed when equipment is not in use.

6.24.7.11 Gas-fired heating appliances and water heaters shall be equipped with automatic devices designed to shut off the flow of gas to the main burner and the pilot in the event the pilot flame is extinguished.

6.24.8 General Precautions.

6.24.8.1 Mobile units including mobile kitchens and catering vehicles that contain hot plates and other cooking equipment shall be provided with at least one approved portable fire extinguisher rated in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, at not less than 10-B:C.

6.24.8.2 Where fire extinguishers have more than one letter classification, they shall be considered as meeting the requirements of each letter class.

6.24.9 Parking, Servicing, and Repair.

6.24.9.1 Where vehicles with LP-Gas fuel systems used for purposes other than propulsion are parked, serviced, or repaired inside buildings, the requirements of 6.24.9.2 through 6.24.9.4 shall apply.

6.24.9.2 The fuel system shall be leak-free, and the container(s) shall not be filled beyond the limits specified in Chapter 7.

6.24.9.3 The container shutoff valve shall be closed, except that the container shutoff valve shall not be required to be closed when fuel is required for test or repair.

6.24.9.4 The vehicle shall not be parked near sources of heat, open flames, or similar sources of ignition, or near unventilated pits.

6.24.9.5 Vehicles having containers with water capacities larger than 300 gal (1.1 m^3) shall comply with the requirements of Section 9.7.

6.25 Vehicle Fuel Dispenser and Dispensing Stations.

6.25.1 Application.

6.25.1.1 Section 6.25 includes the location, installation, and operation of vehicle fuel dispensers and dispensing stations.

6.25.1.2 The provisions of Sections 6.2 and 6.3, as modified by Section 6.25, shall apply.

6.25.2 Location.

6.25.2.1 Location of vehicle fuel dispensers and dispensing stations shall be in accordance with Table 6.5.2.1.

6.25.2.2 Vehicle fuel dispensers and dispensing stations shall be located away from pits in accordance with Table 6.5.2.1, with no drains or blow-offs from the unit directed toward or within 15 ft (4.6 m) of a sewer system's opening.

6.25.3 General Installation Provisions.

6.25.3.1 Vehicle fuel dispensers and dispensing stations shall be installed in accordance with the manufacturer's installation instructions.

6.25.3.2 Vehicle fuel dispensers and dispensing stations shall not be located within an enclosed building or structure, unless they comply with Chapter 10.

6.25.3.3 Where a vehicle fuel dispenser is installed under a weather shelter or canopy, the area shall be ventilated and shall not be enclosed for more than 50 percent of its perimeter.

6.25.3.4 Control for the pump used to transfer LP-Gas through the unit into containers shall be provided at the device in order to minimize the possibility of leakage or accidental discharge.

6.25.3.5 An excess-flow check valve or a differential back pressure valve shall be installed in or on the dispenser at the point at which the dispenser hose is connected to the liquid piping.

6.25.3.6 Piping and the dispensing hose shall be provided with hydrostatic relief valves in accordance with Section 6.13.

6.25.3.7 Protection against trespassing and tampering shall be in accordance with 6.19.4.

6.25.3.8 The container liquid withdrawal opening used with vehicle fuel dispensers and dispensing stations shall be equipped with one of the following:

(1) An internal valve fitted for remote closure and automatic shutoff using thermal (fire) actuation
(2) A positive shutoff valve that is located as close to the container as practical in combination with an excess-flow valve installed in the container, plus an emergency shutoff valve that is fitted for remote closure and installed downstream in the line as close as practical to the positive shutoff valve

6.25.3.9 An identified and accessible remote emergency shutoff device for either the internal valve or the emergency shutoff valve required by 6.25.3.8(1) or (2) shall be installed not less than 3 ft (1 m) or more than 100 ft (30 m) from the liquid transfer point.

6.25.3.10 Emergency shutoff valves and internal valves that are fitted for remote closure as required in this section shall be tested annually for proper operation.

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

6.25.3.12 All dispensers shall be installed on a concrete foundation or shall be part of a complete storage and dispensing unit mounted on a common base and installed in accordance with 6.6.3.1(G).

6.25.3.13 Vehicular barrier protection (VBP) shall be provided for containers serving liquid dispensers where those containers are located within 10 ft (3 m) of a vehicle thoroughfare or parking location in accordance with 6.25.3.13(A) or 6.25.3.13(B).

(A) Concrete filled guard posts shall be constructed of steel not less than 4 in. (100 mm) in diameter with the following characteristics:

(1) Spaced not more than 4 ft (1200 mm) between posts on center
(2) Set not less than 3 ft (900 mm) deep in a concrete footing of not less than 15 in. (380 mm) diameter
(3) Set with the top of the posts not less than 3 ft (900 mm) above ground
(4) Located not less than 3 ft (900 mm) from the protected installation

(B) Equivalent protection in lieu of guard posts shall be a minimum of 3 ft (900 mm) in height and shall resist a force of 12,000 lb (53,375 N) applied 3 ft (900 mm) above the adjacent ground surface.

6.25.3.14 Where the dispenser is not mounted on a common base with its storage container and the dispensing unit is located within 10 ft (3 m) of a vehicle thoroughfare, parking location, or an engine fuel filling station, the dispenser shall be provided with VBP.

6.25.3.15 Dispensers shall be protected from physical damage.

6.25.3.16 A listed quick-acting shutoff valve shall be installed at the discharge end of the transfer hose.

6.25.3.17 An identified and readily accessible switch or circuit breaker shall be installed outside at a location not less than 20 ft (6 m) or more than 100 ft (30 m) from the dispensing device(s) to shut off the power in the event of a fire, an accident, or other emergency.

6.25.3.18 The markings for the switches or breakers shall be visible at the point of liquid transfer.

6.25.4 Installation of Vehicle Fuel Dispensers.

6.25.4.1 Hose shall comply with the following:

(1) Hose length shall not exceed 18 ft (5.5 m) unless approved by the authority having jurisdiction.
(2) All hose shall be listed.
(3) When not in use, the hose shall be secured to protect the hose from damage.

6.25.4.2 A listed emergency breakaway device shall be installed and shall comply with ANSI/UL 567, *Standard for Emergency Breakaway Fittings, Swivel Connectors, and Pipe-Connection Fittings for Petroleum Products and LP-Gas,* and be designed to retain liquid on both sides of the breakaway point, or other devices affording equivalent protection approved by the authority having jurisdiction.

6.25.4.3 Dispensing devices for LP-Gas shall be located as follows:

(1) Conventional systems shall be at least 10 ft (3.0 m) from any dispensing device for Class I liquids.
(2) Low-emission transfer systems in accordance with 6.28.5 shall be at least 5 ft (2 m) from any dispensing device for Class I liquids.

New Section 6.26 was formerly Paragraph 11.15.2, relocated by a tentative interim amendment (TIA). See page 1.

6.26 Containers for Stationary Engines.

6.26.1 LP-Gas containers for stationary installations shall be located outside of buildings unless the buildings comply with the requirements of Chapter 10.

6.26.2 Containers for stationary engines shall be installed to meet the separation requirements of Section 6.3.

6.26.3 Where containers for stationary engines have a fill valve with an integral manual shutoff valve, the minimum separation distances shall be one-half of the distances specified in Section 6.3.

6.27 Fire Protection.

6.27.1 Application. Section 6.27 applies to fire protection for industrial plants, bulk plants, and dispensing stations.

6.27.2* Planning.

6.27.2.1 The planning for the response to incidents including the inadvertent release of LP-Gas, fire, or security breach shall be coordinated with local emergency response agencies.

6.27.2.2 Planning shall include consideration of the safety of emergency personnel, workers, and the public.

6.27.3* Protection of ASME Containers.

6.27.3.1* Fire protection shall be provided for installations with an aggregate water capacity of more than 4000 gal (15.2 m^3) and for ASME containers on roofs.

6.27.3.2 The modes of fire protection shall be specified in a written fire safety analysis for new installations, for existing installations that have an aggregate water capacity of more than 4000 gal (15.2 m^3), and for ASME containers on roofs. Existing installation shall comply with this requirement within 2 years of the effective date of this code.

6.27.3.3 The fire safety analysis shall be submitted by the owner, operator, or their designee to the authority having jurisdiction and local emergency responders.

6.27.3.4 The fire safety analysis shall be updated when the storage capacity or transfer system is modified.

6.27.3.5 The fire safety analysis shall be an evaluation of the total product control system, such as the emergency shutoff and internal valves equipped for remote closure and automatic shutoff using thermal (fire) actuation, pullaway protection where installed, and the optional requirements of Section 6.28.

6.27.3.6 If in the preparation for the fire safety analysis it is determined that a hazard to adjacent structures exists that exceeds the protection provided by the provisions of this code, special protection shall be provided in accordance with 6.27.5.

6.27.4 Other Protection Requirements.

6.27.4.1 Roadways or other means of access for emergency equipment, such as fire department apparatus, shall be provided.

6.27.4.2 Each industrial plant, bulk plant, and distributing point shall be provided with at least one approved portable fire extinguisher having a minimum capacity of 18 lb (8.2 kg) of dry chemical with a B:C rating.

6.27.4.3 Where fire extinguishers have more than one letter classification, they shall be considered to satisfy the requirements of each letter class.

6.27.4.4* LP-Gas fires shall not be extinguished until the source of the burning gas has been shut off.

6.27.4.5 Emergency controls shall be conspicuously marked, and the controls shall be located so as to be readily accessible in emergencies.

6.27.5 Special Protection.

6.27.5.1* If insulation is used, it shall be capable of limiting the container temperature to not over 800°F (430°C) for a minimum of 50 minutes as determined by test, with insulation applied to a steel plate and subjected to a test flame applied substantially over the area of the test plate.

6.27.5.2 The insulation system shall be inherently resistant to weathering and the action of hose streams.

6.27.5.3 If mounding is utilized, the provisions of 6.6.6.3 shall be required.

6.27.5.4 If burial is utilized, the provisions of 6.6.6.1 shall be required.

6.27.6 Water Spray Systems.

6.27.6.1 If water spray fixed systems and monitors are used, they shall comply with NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection.*

6.27.6.2 Where water spray fixed systems and monitors are used, they shall be automatically actuated by fire-responsive devices and shall also have a capability for manual actuation.

6.27.6.3 Where monitor nozzles are used, they shall be located and arranged so that all container surfaces that can be exposed to fire are wetted.

6.28 Alternate Provisions for Installation of ASME Containers.

6.28.1 Application. Section 6.28 shall apply to alternate provisions for the location and installation of ASME containers that incorporate the use of redundant fail-safe product control measures and low-emission transfer concepts for the purpose of enhancing safety and to mitigate distance and special protection requirements.

6.28.2 Spacing Requirements for Underground and Mounded ASME Containers.

6.28.2.1 Where all the provisions of Section 6.28 are complied with, the minimum distances from important buildings and the line of adjoining property that can be built upon to underground and mounded ASME containers of 2001 gal through 30,000 gal (7.6 m^3 through 114 m^3) water capacity shall be reduced to 10 ft (3 m).

6.28.2.2 Distances for all underground and mounded ASME containers shall be measured from the container surface.

6.28.2.3 No part of an underground or mounded ASME container shall be less than 10 ft (3 m) from a building or line of adjoining property that can be built upon.

6.28.3 ASME Container Appurtenances. The provisions in 6.28.3.1 through 6.28.3.5 shall be required for ASME containers of 2001 gal through 30,000 gal (7.6 m^3 through 114 m^3) water capacity referenced in Section 6.28.

6.28.3.1 All liquid withdrawal openings and all vapor withdrawal openings that are 1¼ in. (32 mm) or larger shall be equipped with an internal valve.

6.28.3.2 The internal valves shall remain closed except during periods of operation.

6.28.3.3 Internal valves shall be equipped for remote closure and automatic shutoff through thermal (fire) actuation.

6.28.3.4 A positive manual shutoff valve shall be installed as close as practical to each internal valve.

6.28.3.5 All liquid and vapor inlet openings shall be equipped in accordance with 6.28.3.1 through 6.28.3.4 or shall be equipped with a backflow check valve that is designed for the intended application and a positive manual shutoff valve installed as close as practical to the backflow check valve.

6.28.4 Redundant Fail-Safe Product Control.

6.28.4.1 At cargo tank vehicle and railroad tank car transfer points, protection shall be provided in accordance with Section 6.12 using approved emergency shutoff valves or backflow check valves or a combination of the two.

6.28.4.2 Automatic system shutdown of all primary valves (internal valves and emergency shutoff valves) shall be provided through thermal (fire) actuation and in the event of a hose pull-away.

6.28.4.3 Remote shutdown capability, including power supply for the transfer equipment and all primary valves (internal and emergency shutoff), shall be provided.

(A) A remote shutdown station shall be installed within 15 ft (4.6 m) of the point of transfer.

(B) At least one additional remote shutdown station shall be installed not less than 25 ft (7.6 m), or more than 100 ft (30 m), from the transfer point.

(C) Emergency remote shutdown stations shall be identified as such by a sign incorporating the words "Propane" and "Emergency Shutoff" in block letters not less than 2 in. (51 mm) in height on a background of contrasting color to the letters. The sign shall be visible from the point of transfer.

6.28.5 Low Emission Transfer.

6.28.5.1 The transfer distance requirements of Table 6.5.2.1 and 6.25.4.3(1) shall be reduced by one-half where the installation is in accordance with 6.28.5.

6.28.5.2 The transfer site shall be identified as "Low Emission Transfer Site" by having a sign or other marking posted in the area.

6.28.5.3 Transfer into permanently mounted ASME engine fuel containers on vehicles shall meet the provisions of 6.28.5.3(A) through 6.28.5.3(D).

(A) The delivery valve and nozzle combination shall mate with the filler valve in the receiving container in such a manner that, when they are uncoupled following a transfer of product, not more than 0.24 $in.^3$ (4 cm^3) of product (liquid equivalent) is released to the atmosphere.

(B) Fixed maximum liquid level gauges that are installed on engine fuel and mobile containers in accordance with Table 5.7.4.1(D) shall not be used to determine the maximum permitted filling limit at a low emission transfer site.

(C) The maximum permitted filling limit shall be in accordance with Section 11.5 and shall be determined by an overfilling prevention device or other approved means.

(D) A label shall be placed near the fixed maximum liquid level gauge providing the following instructions: "Do not use this fixed maximum liquid level gauge at low emission transfer stations."

6.28.5.4 Transfer into a stationary ASME container shall meet the provisions of 6.28.5.4(A) through 6.28.5.4(F).

(A) Where transfer is made through a hose of nominal 1 in. (25 mm) size or smaller, the delivery valve and nozzle combination shall not contain an interstitial volume greater than 0.24 in.^{3} (4 cm^3).

(B) Where transfer is made through hose larger than 1 in. (25 mm) nominal size, no more than 0.91 in.^{3} (15 cm^3) of LP-Gas (liquid equivalent) shall be released to the atmosphere during the transfer operation, including the uncoupling of the transfer hose.

(C) Fixed maximum liquid level gauges on low emission transfer systems shall be installed and used to verify the (function) accuracy of liquid level gauges or other liquid level gauging devices.

(D) Fixed maximum liquid level gauges shall not be used in the routine filling of low emission transfer systems.

(E) The use of a float gauge or other approved nonventing device for containers of 2001 gal (7.6 m^3) or larger water capacity shall be the only means for determining the maximum filling limit.

(F) The maximum filling limit for containers of less than 2001 gal (7.6 m^3) water capacity in low emission transfer systems shall be controlled through the use of an overfilling prevention device or other device approved for this service.

Chapter 7 LP-Gas Liquid Transfer

7.1* Scope.

7.1.1 This chapter applies to transfers of liquid LP-Gas from one container to another wherever this transfer involves connections and disconnections in the transfer system or the venting of LP-Gas to the atmosphere.

7.1.2 This chapter also applies to operational safety and methods for determining the quantity of LP-Gas permitted in containers.

7.2 Operational Safety.

7.2.1 Transfer Personnel.

7.2.1.1 Transfer operations shall be conducted by qualified personnel meeting the provisions of Section 4.4.

7.2.1.2 At least one qualified person shall remain in attendance at the transfer operation from the time connections are made until the transfer is completed, shutoff valves are closed, and lines are disconnected.

7.2.1.3 Transfer personnel shall exercise caution to ensure that the LP-Gases transferred are those for which the transfer system and the containers to be filled are designed.

7.2.2 Filling and Evacuating of Containers.

7.2.2.1 Transfer of LP-Gas to and from a container shall be accomplished only by qualified individuals trained in proper handling and operating procedures meeting the requirements of Section 4.4 and in emergency response procedures.

7.2.2.2 When noncompliance with Section 5.2 and Section 5.7 is found, the container owner and user shall be notified in writing.

7.2.2.3 Injection of compressed air, oxygen, or any oxidizing gas into containers to transfer LP-Gas liquid shall be prohibited.

7.2.2.4 When evacuating a container owned by others, the qualified person(s) performing the transfer shall not inject any material other than LP-Gas into the container.

7.2.2.5* Valve outlets on refillable cylinders of 108 lb (49 kg) water capacity [nominal 45 lb (20 kg) propane capacity] or less shall be equipped with a redundant pressuretight seal or one of the following listed connections: CGA 790, CGA 791, or CGA 810, as described in CGA V-1, *Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections.*

7.2.2.6 Where redundant pressure seals are used, they shall be in place whenever the cylinder is not connected for use.

7.2.2.7 Nonrefillable (disposable) and new unused cylinders shall not be required to be equipped with valve outlet seals.

7.2.2.8 Containers shall be filled only after determination that they comply with the design, fabrication, inspection, marking, and requalification provisions of this code.

7.2.2.9 Prior to refilling a cylinder that has a cylinder sleeve, the cylinder sleeve shall be removed to facilitate the visual inspection of the cylinder.

7.2.2.10 "Single trip," "nonrefillable," or "disposable" cylinders shall not be refilled with LP-Gas.

7.2.2.11 Containers shall comply with the following with regard to service or design pressure requirements:

(1) The service pressure marked on the cylinder shall be not less than 80 percent of the vapor pressure of the LP-Gas for which the cylinder is designed at 130°F (54°C).
(2) The maximum allowable working pressure (MAWP) for ASME containers shall be in accordance with Table 5.2.4.2.

7.2.2.12 Transfer of refrigerated product shall be made only into systems that are designed to accept refrigerated product.

7.2.2.13 A container shall not be filled if the container assembly does not meet the requirements for continued service.

7.2.2.14 Transfer hoses larger than ½ in. (12 mm) internal diameter shall not be used for making connections to individual cylinders being filled indoors.