Jefferson County
Board of Zoning Appeals
Thursday, November 9, 2017 2:00 p.m.

The Jefferson County Board of Zoning Appeals will meet in the Charles Town Library Conference Room located at 200 East Washington Street, at the side entrance pm Samuel Street, in Charles Town, West Virginia. Unless otherwise noted, all requests are pursuant to the Zoning & Land Development Ordinance.

1. Approval of the minutes from the October 26, 2017 meeting.
2. Swearing in of members of the public intending to provide testimony.
3. Postponed from the October 26, 2017 meeting. Action on the request for a Conditional Use Permit to allow for a propane distribution facility to consist of two (2) 30,000 gallon propane storage tanks for distribution to residential, commercial, and industrial properties; a 2,500 square foot structure to house an office, a warehouse and retail sales area; vehicle tank storage area; and associated customer/employee parking. Blossman Gas intends to employ approximately 20 people. Owner: Jefferson County Development Authority. Applicant: Blossman Gas. Location: Burr Industrial Park, Lot 12, fronts along War Admiral Blvd., Kearneysville, WV 25430. District: Charles Town (02); Map: 1; Parcel: 65; Size: 2.31 acres; Zone: Industrial-Commercial. File: CUP17-05.
4. Variance from Appendix B to reduce the side and rear setback from 50’ to 6’ to replace an existing 8’ x 16’ accessory structure with a 12’ x 20’ accessory structure. Owner: Middleway United Methodist Church. Applicant: Robert Brown, Trustee. Location: 7435 Queen Street, Kearneysville, WV 25430. District: Middleway (07); Map: 22A; Parcel: 43 & 44; Size: ~.78 ac (combined); Zone: Village; File: ZV17-17.
5. Zoning Administrator’s Report
   a. Monthly Zoning Certificate Activity Report
   b. Approval of the 2018 Board of Zoning Appeals Meeting Schedule.
6. Legal Update
   a. Possible executive session on the following pending lawsuits: None.
   b. Discussion with possible deliberative session and signing of draft findings/decisions.

      Meeting October 26, 2017

      i. Postponed from 09/28/17. Variance from Sec. 5.4(b). Owner: Beallair Homes, LLC. File: ZV17-14.
      ii. Postponed from 09/28/17. Variance from Sec. 5.4(b). Owner: Beallair Homes, LLC. File: ZV17-15.
      iii. Postponed from 09/28/17. Request for a CUP for Dollar General. Owner: SAGA Holdings, LLC. Applicant: Dolgencorp, LLC: File: CUP17-04.

Minutes
Jefferson County Board of Zoning Appeals

Meeting Date: October 26, 2017

Meeting Location: Jefferson County Maintenance Building Conference Room
128 Industrial Blvd, Kearneysville, West Virginia 25430

Board members present: Jeffrey Bannon, Vice Chair; Matt Knott, and Deirdre Catterton, Alternate

Absent members: Tyler Quynn, Chair, Jeff Bresee, and Ted Schiltz (with notification)

Staff members present: Alexandra Beaulieu, Zoning Administrator; Nathan Cochran, Assistant Prosecuting Attorney; and, Jennilee Hartman, Zoning Clerk

All requests are pursuant to the Jefferson County Zoning and Land Development Ordinance.

Mr. Bannon presided over the meeting. Mr. Knott moved to call the meeting to order at 2:00 p.m. The motion carried unanimously.

1. Approval of the September 28, 2017 meeting minutes.

   Ms. Catterton moved to approve the September 28, 2017 minutes. Mr. Bannon called for a vote, which carried two (2) in support and one (1) abstention (Mr. Knott did not attend the September meeting).

2. Ms. Hartman swore in members of the public who indicated they would be providing testimony.

3. Postponed from the September 28, 2017 meeting. Variance request from Section 5.4(b) to reduce the front setback for the townhome lots from 25' to 10' along a one-way alley (Clover Lea Way). Owner: Beallair Homes, LLC. Location: Beallair Subdivision, Lots 50 – 67 fronting on Lewis Washington Dr. & Claymont Hill St. & utilize Clover Lea Way for their access. District: Harpers Ferry (04); Map: 10A; Parcel: RESB / 50; Combined acreage: ~3.00 ac; Zone: Residential Growth; File: ZV17-14.

   As Items# 3 and #4 were submitted by the same applicant, they were addressed simultaneously.

4. Postponed from the September 28, 2017 meeting. Variance from Section 5.4(b) to reduce the front setback from 25' to 10' along the southern boundary for Lots 283 through 289; to reduce the front setback from 25' to 10' along the eastern boundary for Lot 283; to reduce the front setback from 25' to 10' along the northern boundary for Lots 290 through 296; to reduce the front setback from 25' to 10' along the eastern boundary for Lot 296; to reduce the front setback distance from 25' to 10' along the southern boundary for Lots 297 through 304; and to reduce the front setback distance from 25' to 18' along the eastern boundary for Lot 297. Owner: Beallair Homes, LLC. Location: Beallair Subdivision. District: Harpers Ferry (04); Map: 10A; Parcel: RESA; Current acreage: ~72 ac; Zone: Residential Growth; File: ZV17-15.

   As Items# 3 and #4 were submitted by the same applicant they were addressed simultaneously.

   Mr. Mike Wiley and Mr. Todd Abe, representatives for Beallair Homes, LLC, were present to address the Board. Ms. Beaulieu provided an overview of the staff report, combining Items #3 and #4 during her presentation, and addressed questions from the Board. Mr. Wiley and Mr. Abe presented the request and answered questions from the Board. Mr. Bannon opened the public hearing. There was no public comment. Mr. Bannon closed the public hearing.

   Mr. Knott moved to approve both of the above referenced variances, as requested. Mr. Bannon called for a vote, which carried unanimously.

5. Postponed from the September 28, 2017 meeting. Request for a Conditional Use Permit to add tobacco, beer, and wine sales to the existing Dollar General as a Retail Sales, Limited land use. Owner: SAGA Holdings, LLC. Applicant: Dolgencorp, LLC: Location: 4735 Middleway Pike, Kearneysville, WV 25430. District: Middleway (07); Map: 19; Parcel: 16.6; Size: 1.59 ac; Zone: Rural; File: CUP17-04.

Mr. Casey Usmani, representative for Dolgencorp, LLC was present to address the Board. Ms. Beaulieu presented the staff report, noting that the existing Dollar General was previously approved under a conditional use permit. Ms. Beaulieu explained that because the original conditional use permit application did not include alcohol sales that a new conditional use permit was required. Ms. Beaulieu addressed questions from the Board. Mr. Usmani presented the request and answered questions from the Board. Mr. Bannon opened the public hearing. There was no public comment. Mr. Bannon closed the public hearing. The Board agreed that a deliberative session was not necessary.

Mr. Knott moved to grant the Conditional Use Permit to add tobacco, beer, and wine sales to the existing Dollar General as a Retail Sales, Limited land use. Mr. Bannon called for a vote, which carried unanimously.

6. Request for a Conditional Use Permit to allow for a propane distribution facility to consist of two (2) 30,000 gallon propane storage tanks for distribution to residential, commercial, and industrial properties; a 2,500 square foot structure to house an office, a warehouse and retail sales area; vehicle tank storage area; and associated customer/employee parking. Blossman Gas intends to employ approximately 20 people. Owner: Jefferson County Development Authority. Applicant: Blossman Gas, LLC. Location: Burr Industrial Park, Lot 12, fronts along War Admiral Blvd., Kearneysville, WV 25430. District: Charles Town (02); Map: 1; Parcel: 65; Size: 2.31 acres; Zone: Industrial-Commercial. File: CUP17-05.

Mr. John Reisenweber, representative for the Jefferson County Development Authority, and Mr. Ellis Chapman, representative for Blossman Gas, LLC, were present to address the Board. Ms. Beaulieu presented the staff report and provided the Board with an email from the Division of Highways tentatively approving access to War Admiral Boulevard. Ms. Beaulieu addressed questions from the Board. Mr. Reisenweber and Mr. Chapman presented the request and answered questions from the Board regarding the safety of the tanks. Mr. Bannon opened the public hearing.

Ms. Melissa Hynes, president of the Parent Committee for the neighboring Children First Child Development Center, spoke in opposition to the request. Ms. Hynes expressed concern regarding the negative impact the proposed use may have on attendance at the school with regard to parent's concerns as to the safety of the propane tanks. Ms. Hynes also questioned if the applicant would be able to meet the distance and landscaping requirement outlined in the Zoning Ordinance. Ms. Hynes suggested, should the Board approve the application, that Blossman Gas be required to provide the school with an educational pamphlet that could be distributed to concerned parents and that a natural buffer be retained along the shared property line as opposed to clear cutting the site to plant new trees that would take years to fully grow.

Mr. Greg Mason, representative for the neighboring AMS, Inc., spoke in opposition to the request. Mr. Mason concurred with Ms. Hynes' concerns. Mr. Mason added that he was concerned for the safety of his employees, noting that the proposed tanks would be approximately 100' from his parking lot and building. Mr. Mason was also concerned that the proposed land use would increase his insurance rates and that the proposed entrance access would be a cost to taxpayers.

Mr. Bannon closed the public hearing.

In rebuttal, Mr. Reisenweber explained that there is very little danger associated with storage tanks because they are not equipped with a pilot light. Mr. Reisenweber stated that they hoped to retain the existing trees to provide a sufficient buffer. Mr. Chapman explained that the storage tanks must meet many state and federal regulations and that federal standards require the tanks to be 50’ from all buildings. Mr. Reisenweber noted that there were many businesses within the Park that had large propane tanks. Mr. Chapman stated he did not have information on a blast radius as the storage tanks do not have a history of exploding. Mr. Chapman explained that there is an evacuation requirement of approximately a half mile in the event of a tank breach.

Ms. Catterton motioned to go into deliberative session at 3:10 p.m., which carried unanimously. Mr. Knott motioned to come out of deliberative session at 3:42 p.m., which carried unanimously.

Ms. Catterton moved to postpone action on the Conditional Use Permit until the next Board meeting on November 9, 2017 for the purpose of obtaining additional information. Ms. Catterton stated that the Board requested the following information: 1) documentation of any State and Federal Regulations regarding propane storage tanks and how the proposed use would meet said regulations; and, 2) information on what the blast radius is for propane storage tanks. The motion carried unanimously.

7. Zoning Administrator’s Report

   a. Monthly Zoning Certificate Activity Report. This report was provided to the Board in the mailed packet.

      Ms. Beaulieu reported on the status of pending text amendments and stated the next BZA meeting would be November 9, 2017.

8. Legal Update.

   a. Possible executive session on the follow pending lawsuits: None.

   b. Discussion with possible deliberative session and signing of draft findings/decisions.

      Meeting September 28, 2017

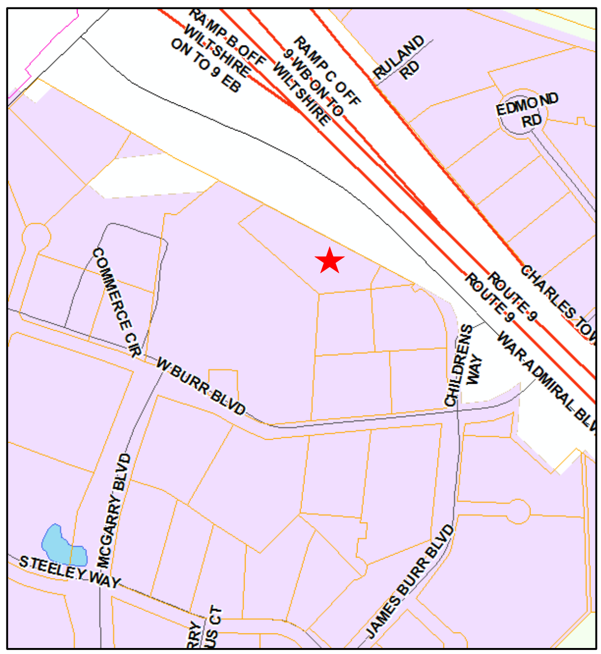
      i. Variance from Sec. 9.7. Owners: Russell & Janet Lloyd. File: ZV17-16.

Mr. Knott moved to adjourn the meeting at 3:53 p.m. Mr. Bannon called for a vote, which carried unanimously.

Staff Report
Jefferson County Board of Zoning Appeals Meeting
October 26, 2017

Blossman Gas
Conditional Use Permit Request (#CUP17-05)

Item #6 Request for a Conditional Use Permit to allow for a propane distribution facility to consist of two (2) 30,000 gallon propane storage tanks for distribution to residential, commercial, and industrial properties; a 2,500 square foot structure to house an office, a warehouse and retail sales area; vehicle tank storage area; and associated customer/employee parking. Blossman Gas intends to employ approximately 20 people.

<table>
<tr><td>Applicant:</td><td>Blossman Gas</td></tr>
<tr><td>Owner:</td><td>Jefferson County Development Authority</td></tr>
<tr><td>Developer:</td><td>N/A</td></tr>
<tr><td>Consultant:</td><td>N/A</td></tr>
<tr><td>Property Location:</td><td>Burr Industrial Park, Lot 12, fronts along War Admiral Blvd Kearneysville, WV 25430</td></tr>
<tr><td>Legal Description & Zoning District:</td><td>District: Charles Town (02); Map: 1; Parcel: 65
Size: 2.31 acres; Zone: Industrial-Commercial


</td></tr>
<tr><td>Surrounding Properties:</td><td>Zoning Map Designation:
North: Industrial-Commercial *South:* Industrial-Commercial
East: Industrial-Commercial *West:* Industrial-Commercial</td></tr>
<tr><td>Approved Use:</td><td>Burr Industrial Park, Phase 1 (Lots 1-44) Industrial-Commercial (88-68)</td></tr>
<tr><td>Waivers/Variances:</td><td>07/26/16: BZA approved a variance to reduce building setback requirements for commercial/industrial uses within the Park to 25’ for all vacant JCDA lots; to reduce the landscape buffer for commercial/industrial sites adjacent to commercial/industrial uses; to allow a modified planting standard; and to reduce the parking and drive aisle setbacks for a proposed industrial use (ZV16-14).</td></tr>
</table>

Staff Report
Jefferson County Board of Zoning Appeals Meeting
October 26, 2017

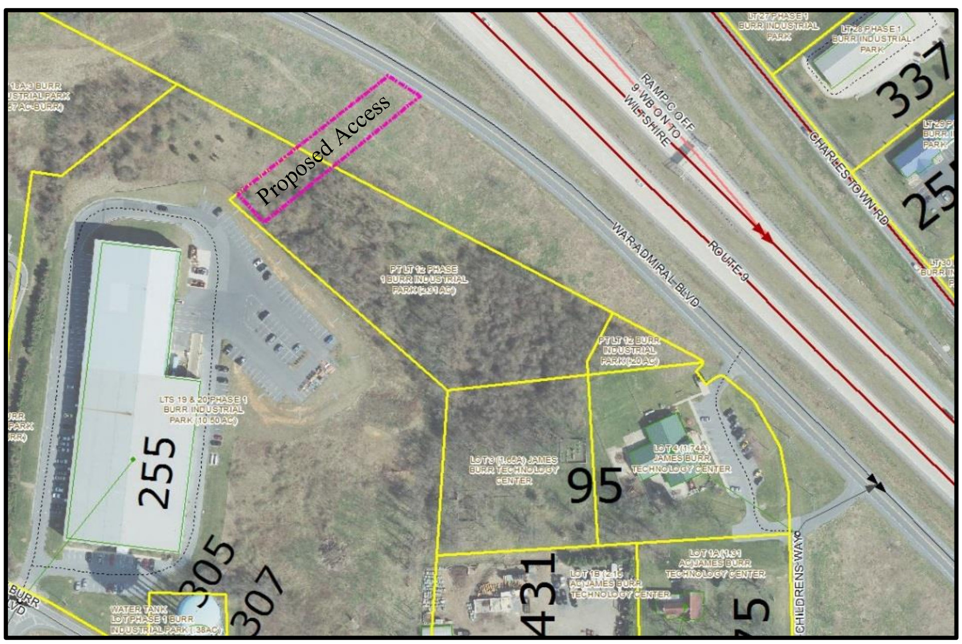
Blossman Gas
Conditional Use Permit Request (#CUP17-05)

Summary of Request and Purpose of Ordinance Requirements

Section 5.6B of the Zoning Ordinance lists several heavy industrial land uses which are required to process a Conditional Use Permit. Item 3 from the list is "Petroleum products refining or storage". The applicant's proposal to install two 30,000 gallon propane storage tanks for distribution requires processing a Conditional Use Permit for review and approval by the Board of Zoning Appeals.

Property Description

The subject parcel is Lot 12 in the Burr Industrial Park, Phase 1 (PC File #88-68). This phase was recorded on March 1, 1990 (Plat Book: 10; Page: 10). A revised plat was subsequently recorded on May 16, 1994 (Plat Book 12; Page 21), which increased the size of the parcel to 6.50 acres. In January of 1995 the parcel's acreage was significantly reduced to the current 2.31 acres through eminent domain by the West Virginia Department of Transportation, Division of Highways. This transfer inadvertently left the parcel landlocked. While the parcel physically fronts a DOH right-of-way (War Admiral Boulevard) it was not granted an access point. The applicant is working with the Division of Highways to obtain approval for access off War Admiral Boulevard and has provided a graphic depicting the proposed entrance (see below).



Impact on adjacent properties

Section 4.6 of the Zoning Ordinance requires that industrial uses be located at least 200 feet from an institution for human care. Lot 4 (Parcel 16.5) is the Children First Child Development Center; therefore, the 200 foot setback applies to Lot 12.

The impact on adjacent properties is expected to be minimal. The most significant impact Staff has recognized is the access. The lot is currently landlocked and depending upon where the access is approved, there could be an impact on adjacent parcels in the Park. However, the impact is not anticipated to be greater than another use that could locate to the park.

Staff Report
Jefferson County Board of Zoning Appeals Meeting
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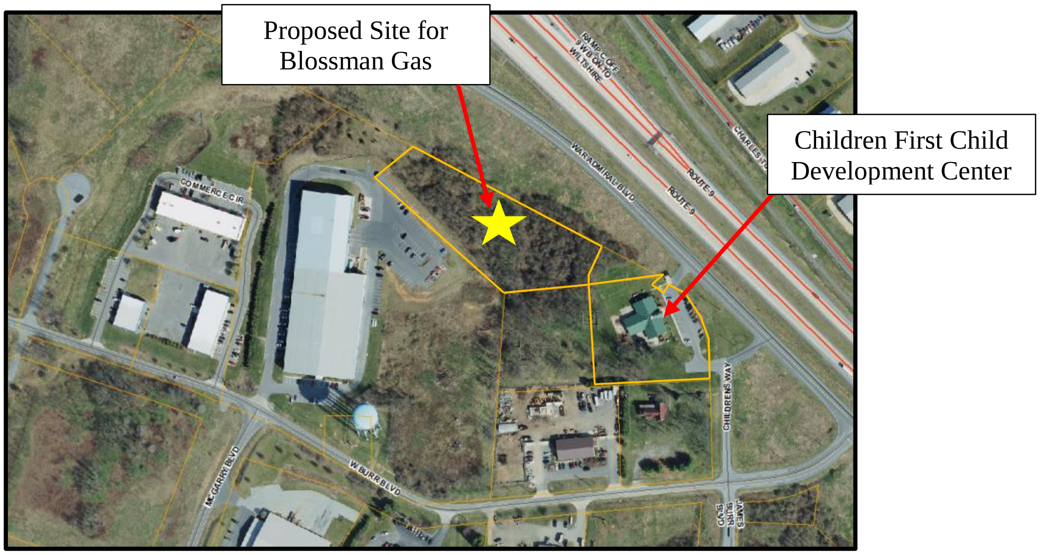
Blossman Gas
Conditional Use Permit Request (#CUP17-05)



Conditional Use Permit Process

On March 16, 2017 the County Commission adopted a text amendment which eliminated the LESA/ CUP process and replaced with a new CUP Process which requires a public hearing before the Board of Zoning Appeals. Below are the general standards from Section 6.3 of the Zoning Ordinance which the BZA shall consider when reviewing a CUP Application.

"The Board of Zoning Appeals shall have the authority over the issuance or denial of a conditional use permit for uses listed as "Conditional Uses (CU)" in each zoning district. The Board shall have the authority to impose such reasonable conditions and restrictions as are directly related to and incidental to the proposed conditional use permit:"

The following General Standards shall be considered in approving or denying the CUP:

1. **The proposed use is compatible with the goals of the adopted Comprehensive Plan.**

   The applicant has addressed this criteria in their application.

   The referenced parcel is shown as industrial on the Envision Jefferson 2035 Comprehensive Plan's Future Land Use Guide and is located outside of the County's Preferred Growth Area. Staff concurs that the proposed use is compatible with the goals of the adopted Comprehensive Plan.

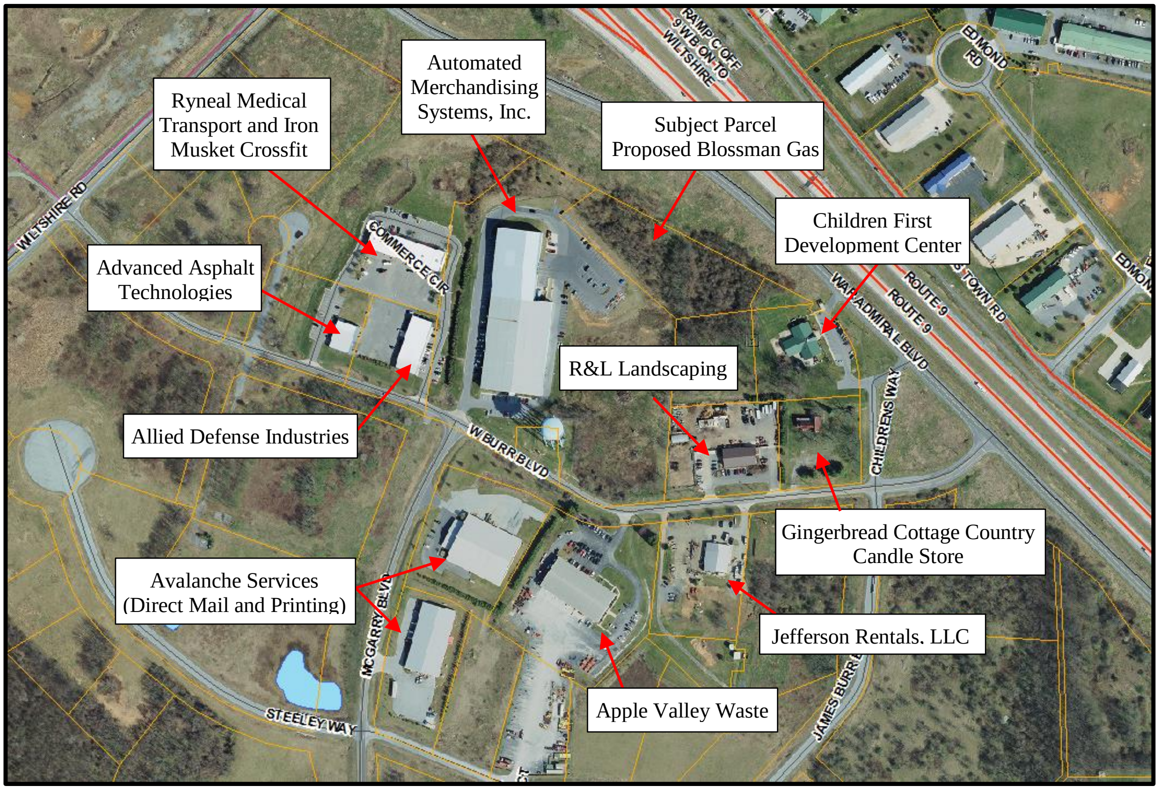
2. **The proposed use is compatible in intensity and scale with the existing and potential land uses on the adjoining and confronting properties, and poses no threat to public health, safety and welfare.**

   The applicant has addressed this criteria in their application.

   The proposed Heavy Industrial use is listed as a conditional use in both Section 5.6 and Appendix C of the Zoning Ordinance. Currently, the existing uses surrounding the proposed use are outright permitted uses and primarily commercial in nature; however, based on the description provided to our Office, the proposed use will be compatible in intensity and scale in that it will be an office and distribution center and there is no refining or extraction component to the proposed use.

Staff Report
Jefferson County Board of Zoning Appeals Meeting
October 26, 2017

Blossman Gas
Conditional Use Permit Request (#CUP17-05)



3. **The proposed site development shall be such that the use will not hinder nor discourage the appropriate development and use of adjacent land and buildings.**

   The applicant has addressed this criteria in their application.

   Based on the information provided, the proposed site development will not hinder nor discourage the appropriate development and use of adjacent land and buildings. Typically the only time additional, more restrictive site development standards are triggered is when an industrial use is proposed adjacent to a residential use, a historic structure, or, as in the instance of this proposal, an institution for human care or school.

4. **Neighborhood character and surrounding property values shall be safeguarded by requiring implementation of the landscaping buffer requirements found in Appendix B and Section 4.11 of this Ordinance.**

   The applicant has addressed this criteria in their application.

   The subject parcel was part of a blanket variance request in July of 2016 which reduced the required side and rear landscaping standards from 20’ to 10’ and to allow a modified planting standard; and to allow existing vegetation in lieu of the aforementioned modified planting standard.

   Landscaping is required and will be subject to review and approval by the Office of Planning and Zoning.

5. **Commercial and Industrial Uses shall be in conformance with Section 8.9 of this Ordinance.**

   As part of the Conditional Use Permit application, the applicant was informed of this criteria and shall comply with this standard.

JEFFERSON COUNTY, WEST VIRGINIA
Department of Engineering, Planning and Zoning
Office of Planning and Zoning
116 East Washington Street, 2nd Floor
P.O. Box 716
Charles Town, West Virginia 25414

File #: CUP 17-05
Mtg. Date: 10/26/17
Fee Paid: $ 400.00
Staff Int.: gH

Email: zoning@jeffersoncountywv.org

Phone: (304) 728-3228
Fax: (304) 728-8126

Application for a Conditional Use Permit

Conditional Use Permit process is outlined in Article 6 of the Zoning Ordinance

Project Name

Blossman Gas

Property Owner Information

Name: **Jefferson County Development Authority**
Business Name: **for Blossman Gas**
Mailing Address: **P. O. Box 237, Charles Town, WV 25414**
Phone Number: **304-728-3255** Email Response: **john@jcda.net/janejones@jcda.net**
Mail Response: ☐ Yes No

Applicant Information

Name: **Jefferson County Development Authority**
Business Name: **for Blossman Gas**
Mailing Address: **P. O. Box 237, Charles Town, WV 25414**
Phone Number: **304-728-3255** Email Response: **john@jcda.net/janejones@jcda.net**
Mail Response: ☐ Yes No

Engineer(s), Surveyor(s), or Consultant(s) Information

Name: **n/a**
Business Name:
Mailing Address:
Phone Number: Email Response:
Mail Response: ☐ Yes No

Physical Property Details

Physical Address: **PT LT 12 PHASE 1 BURR INDUSTRIAL PARK**
Tax District: Charles Town (02) Map No: 1 Parcel No. 65
Parcel Size: 2.31 ac Deed Book: 1036 Page No: 607

Zoning District (please check one)

Residential Growth (RG)	Industrial Commercial (I-C)	Rural* (R)	Residential-Light Industrial-Commercial (R-LI-C)	Village (V)	Neighborhood Commercial (NC)
☐	☑ gH	☒ gH	☐	☒ gH	☐
General Commercial (GC)	**Highway Commercial (HC)**	**Light Industrial (LI)**	**Major Industrial (MI)**	**Planned Neighborhood Development (PND)**	**Office/ Commercial Mixed-Use (OC)**
☐	☐	☐	☐	☐	☐

* For properties in the Rural Zoning District:
Is property located on a primary or secondary road? ☐ Yes ☐ No

Name of Road and/or Route Number:

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Sketch Plan (see cover sheet for description)

☐ Attached

A list of all adjacent and confronting property owners (see cover sheet for description)

☑ Attached

State the proposed land use as listed in Appendix C and provide a description of the proposed use.

Petroleum products refining or storage. Blossman Gas is proprosing to build a propane distribution facility.

Please provide any information or known history regarding this property.

Property is located in the Burr Business Park, Phase I

Please respond (in detail) to the following statements located in Section 6.3 of the Zoning Ordinance:

1. The proposed use is compatible with the goals of the adopted Comprehensive Plan. *Section 6.3A.1*

The property is located in the Burr Business Park which is designated for commercial/industrial uses.

2. The proposed use is compatible in intensity and scale with the existing and potential land uses on the adjoining and confronting properties, and poses no threat to public health, safety, and welfare. *Section 6.3A.2*

The property is located in the Burr Business Park which is designated for commercial/industrial uses and will be surrounded by similar uses.

3. The proposed site development shall be such that the use will not hinder nor discourage the appropriate development and use of adjacent land and buildings. *Section 6.3A.3*

The property is located in the Burr Business Park which is designated for commercial/industrial uses and will be surrounded by similar uses.

4. Neighborhood character and surrounding property values shall be safeguarded by requiring implementation of the landscaping buffer requirements found in Appendix B and Section 4.11 of this Ordinance. *Section 6.3A.4*

☐ I am aware of the landscaping buffer requirements and will adhere to them.

☐ I am aware of the landscaping buffer requirements; however, I may be seeking a variance to modify them.

5. For properties in the Rural zoning district, roadway adequacy shall be assessed by the Comprehensive Plan's Highway Road Classification Map. If a rural parcel is not shown as commercial on the Future Land Use Guide or does not front on a Principal Arterial, Minor Arterial, or Major Collector road (as identified in the Comprehensive Plan), the applicant shall submit trip generation data, including Average Daily and Peak Hour trips, for the Board of Zoning Appeals to review in conjunction with the Highway Problem Areas Map when determining roadway adequacy for the proposed use. *Section 6.3A.6*

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☐ Applicable (Trip Generation Data attached) ☑ Not Applicable

The information given is correct to the best of my knowledge. **Original Signature Required.**

10/2/17

Property Owner Date

Property Owner Date

CUP17-05

Narrative

Blossman Gas proposes to purchase lot 12 (Phase 1) the Burr Business Park to construct a building of approximately 2500 sq ft. The facility will house an office, warehouse, and retail space. In addition, Blossman Gas will also have 2 propane storage tanks of approximately 30,000 gallons each on site. They will distribute propane to the residential, commercial, and industrial marketplace. Blossman Gas intends to employ approximately 20 people which will include office personnel, retail sales staff and CDL drivers.

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Alexandra Beaulieu

From: John Reisenweber <john@jcda.net>
Sent: Friday, October 06, 2017 4:04 PM
To: Alexandra Beaulieu
Subject: ***BULK*** Fwd: Burr Ind Park Lot 12 Access Entrance

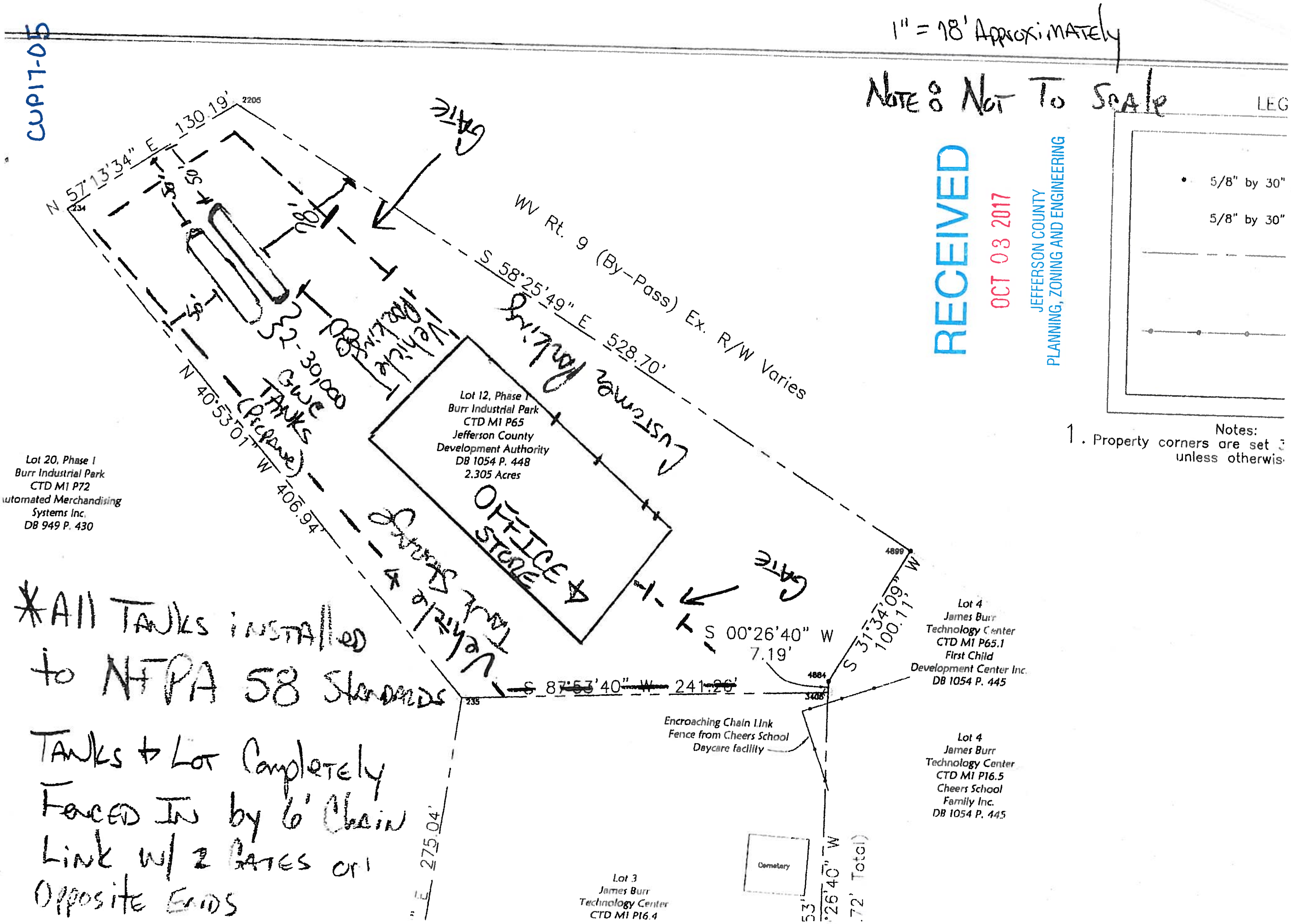
Alex
Here is an exhibit the GIS office did to show where the entrance would go.
Obviously this would push the tanks a little east.
Thanks
John

Sent from my iPhone

Begin forwarded message:

> **From:** "Jessica Gormont" <jgormont@jeffersoncountywv.org>
> **To:** "John Reisenweber" <john@jcda.net>
> **Subject: Burr Ind Park Lot 12 Access Entrance**
>
> Hey John,
>
> Here is the photo you requested.
>
> Jessica Gormont, GISP
> GIS Analyst
> Jefferson County GIS/Addressing Office
> Phone: 304-724-8986

CUP17-05



1" = 18' Approximately
Note: Not To Scale
LEG
5/8" by 30"
5/8" by 30"
Notes:
1. Property corners are set
unless otherwis
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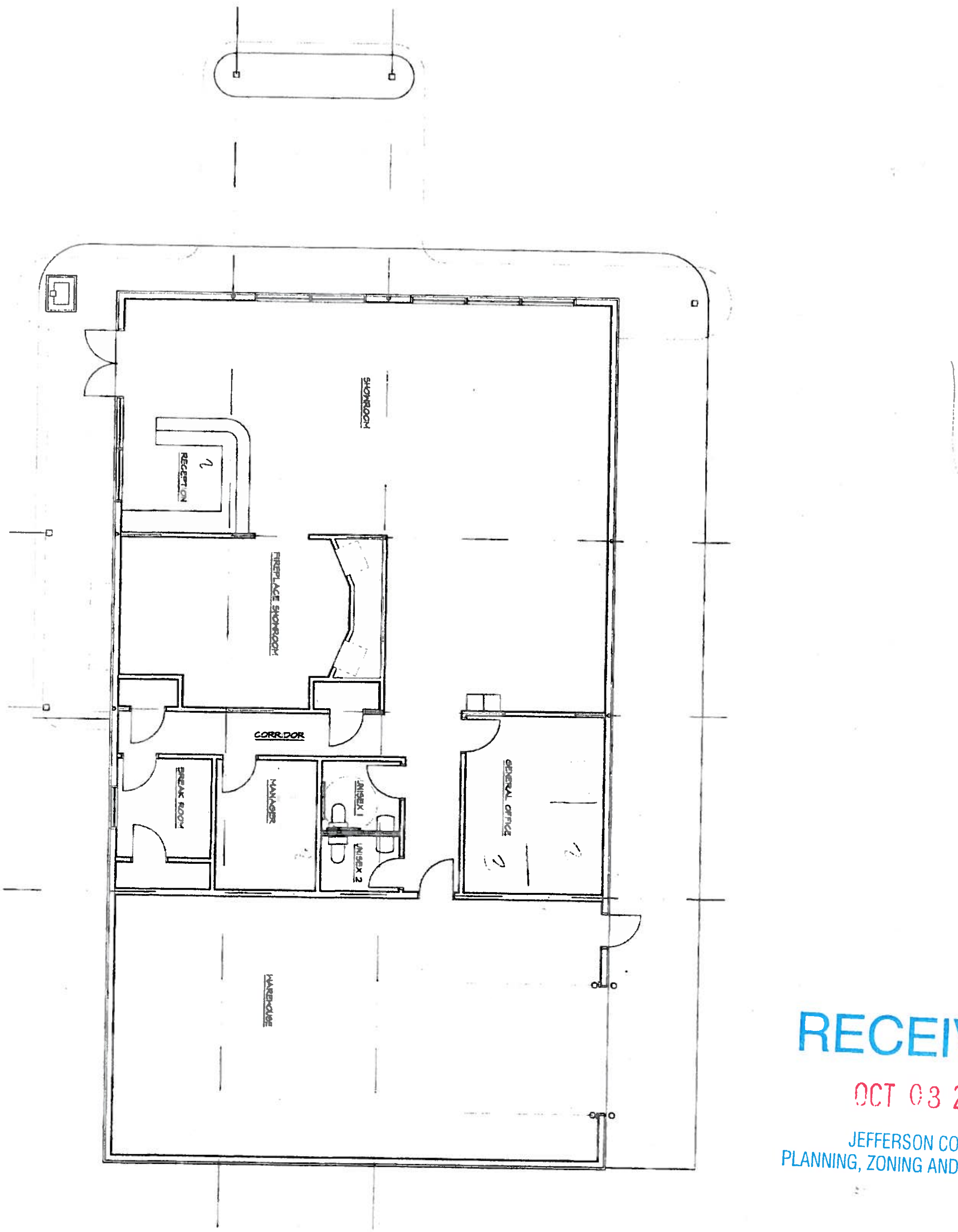
WV Rt. 9 (By-Pass) Ex. R/W Varies
N 57°13'34" E 130.19'
S 58°25'49" E 528.70'
N 40°53'01" W 406.94'
S 00°26'40" W 7.19'
S 31°34'09" W 100.11'
S 87°53'40" W 241.26'
275.04'
Gate
Gate
2-30,000 GWC Tanks (Propane)
Vehicle Parking
Customer Parking
Vehicle & Trailer Storage
Office Store
Lot 12, Phase I
Burr Industrial Park
CTD MI P65
Jefferson County
Development Authority
DB 1054 P. 448
2.305 Acres
Lot 20, Phase I
Burr Industrial Park
CTD MI P72
Automated Merchandising
Systems Inc.
DB 949 P. 430
Lot 4
James Burr
Technology Center
CTD MI P65.1
First Child
Development Center Inc.
DB 1054 P. 445
Encroaching Chain Link
Fence from Cheers School
Daycare facility
Lot 4
James Burr
Technology Center
CTD MI P16.5
Cheers School
Family Inc.
DB 1054 P. 445
Cemetery
Lot 3
James Burr
Technology Center
CTD MI P16.4
*All Tanks installed to NFPA 58 Standards
Tanks & Lot Completely Fenced In by 6' Chain Link w/ 2 Gates on Opposite Ends

CUP17-05



FLOOR PLAN

SCALE 1/4" = 1'-0"

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1

28 APRIL 17

blossman gas

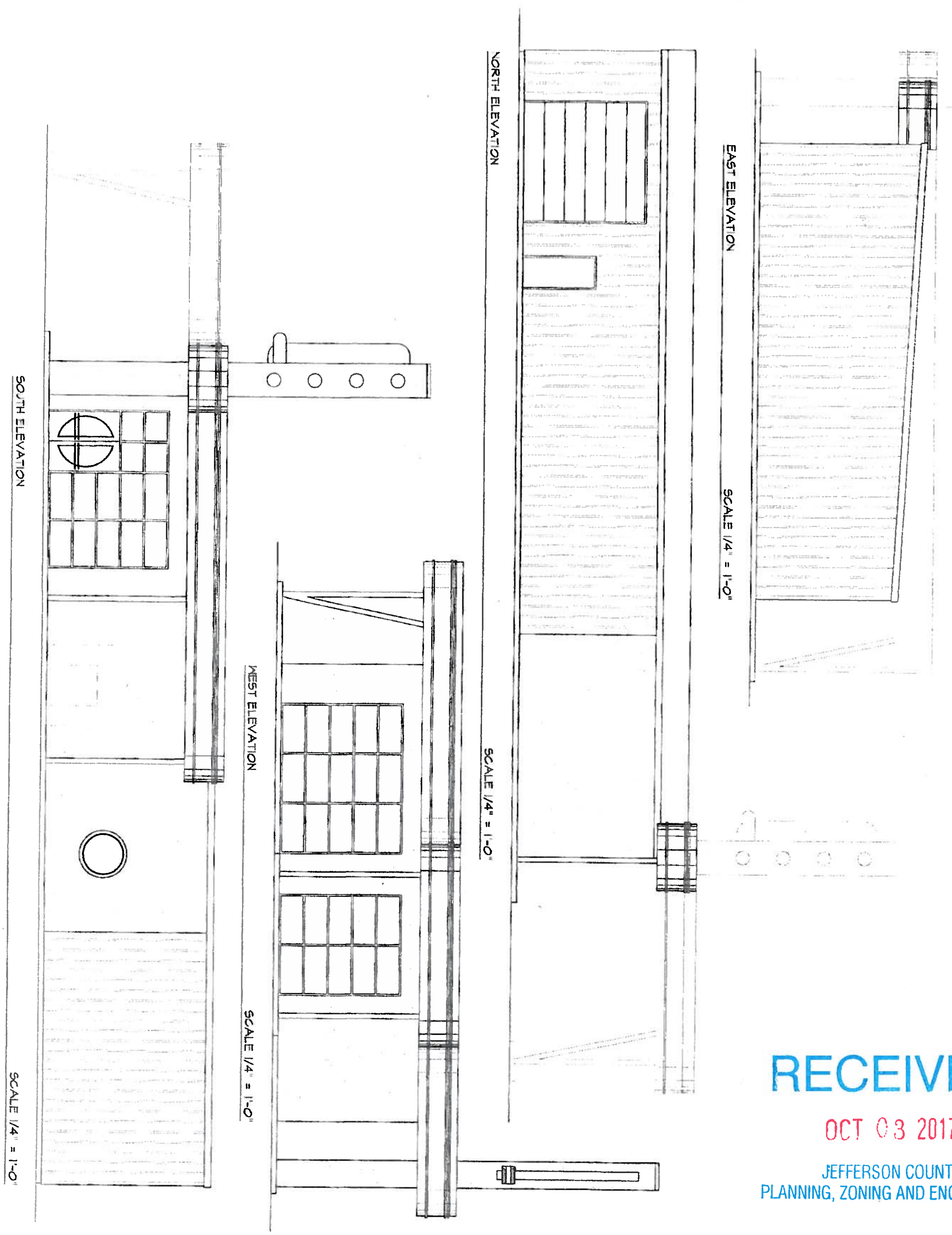
DISPLAY STORAGE BUILDING FOR BLOSSMAN GAS COMPANY

SPARTANBURG HIGHWAY - HENDERSONVILLE - NORTH CAROLINA

CAROLINA SPECIALTIES CONSTRUCTION, LLC

Design Group
ARCHITECTURE & INTERIOR DESIGN
Member American Institute of Architects
118 Fifth Avenue West
Hendersonville, NC 28792
828-692-4891

CUP17-05



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2

28 APR 17

blossman gas

DISPLAY STORAGE BUILDING FOR BLOSSMAN GAS COMPANY
SPARTANBURG HIGHWAY - HENDERSONVILLE - NORTH CAROLINA
CAROLINA SPECIALTIES CONSTRUCTION, LLC

e'cain Design Group
ARCHITECTURE & INTERIOR DESIGN
Member American Institute of Architects
118 Fifth Avenue West
Hendersonville, NC 28792
828-692-4891

CUP17-05

Property is not within 200 Feet of any Historic Structure

Adjoining Property Owners to Lot 12, Burr Industrial Park

Automated Merchandising Systems, Inc. (02 1007200000000)
255 W. Burr Boulevard, Kearneysville, WV 25430

Jefferson County Development Authority (02 1001600040000)
P. O. Bo 237, Charles Town, WV 25414

Cheers School Family, Inc. (02 1001600050000)
Children First Child Development Center
95 Childrens Way, Kearneysville, WV 25430

The following properties are across War Admiral & Route 9

RAI Properties LLC (02 1001600150000)
P. O. Box 790, Charles Town, WV 25414

James Young, Sr. (02 1007900000000)
410 Deep Wood Trail, Shepherdstown, WV 25443

S&G Plumbing Inc. (02 1008000000000)
P. O. Box 407, Kearneysville, WV 25430

Kubic Enterprises (02 1008100000000)
241 Edmond Road, Kearneysville, WV 25430

RECEIVED
OCT 03 2017
JEFFERSON COUNTY
PLANNING, ZONING AND ENGINEERING

Jefferson County, West Virginia

Department of Engineering, Planning, and Zoning
Office of Planning and Zoning
116 East Washington Street, 2nd Floor
P.O. Box 716
Charles Town, WV 25414

Email: zoning@jeffersoncountywv.org **Phone: (304) 728-3228**

MEMORANDUM

TO: Jefferson County Board of Zoning Appeals Members

FROM: Alexandra Beaulieu

DATE: November 3, 2017

SUBJECT: November 9, 2017 Board of Zoning Appeals Meeting

At the October 26, 2017 Board of Zoning Appeals Meeting the Board voted to postpone action on Item #6,

Request for a Conditional Use Permit to allow for a propane distribution facility to consist of two (2) 30,000 gallon propane storage tanks for distribution to residential, commercial, and industrial properties; a 2,500 square foot structure to house an office, a warehouse and retail sales area; vehicle tank storage area; and associated customer/employee parking. Blossman Gas intends to employ approximately 20 people. Owner: Jefferson County Development Authority. Applicant: Blossman Gas, LLC. Location: Burr Industrial Park, Lot 12, fronts along War Admiral Blvd., Kearneysville, WV 25430. District: Charles Town (02); Map: 1; Parcel: 65; Size: 2.31 acres; Zone: Industrial-Commercial. File: CUP17-05.

and requested that the applicant provide the attached documentation addressing question number 2 on their application regarding public health, safety and welfare. Specifically, the Board requested documentation addressing the following:

1) Documentation of any State and Federal Regulations regarding propane storage tanks and how the proposed use would meet said regulations; and,
2) Information on what the blast radius is for propane storage tanks.

Zoning

From: Alexandra Beaulieu
Sent: Friday, November 03, 2017 12:48 PM
To: Zoning
Subject: Fw: Blossman Gas CUP
Attachments: Blossman Shipping Paper.pdf; ATT00001.htm; PERC Operations & Maintenance Handbook.pdf; ATT00002.htm; 2015_FSA_05.16.pdf; ATT00003.htm

---

From: John Reisenweber [redacted]
Sent: Friday, November 3, 2017 12:42:01 PM
To: Alexandra Beaulieu
Subject: Fwd: Blossman Gas CUP

Sent from my iPhone

Begin forwarded message:

> **From:** "Ellis Chapman" [redacted]>
> **To:** "Diehl, Nicolas H" <[redacted]>, "John Reisenweber" <[redacted]>
> **Subject: FW: Blossman Gas CUP**
>
> Gentlemen,
>
> Here is our response.
>
> Thank you,
>
> Ellis
>
> ---
>
> **From:** Scott Weatherford
> **Sent:** Thursday, November 2, 2017 5:35 PM
> **To:** [redacted]
> **Cc:** Steve McCoy <[redacted]>; Ellis Chapman <[redacted]>
> **Subject:** Blossman Gas CUP
>
> Ms. Beaulieu,
>
> On October 31, 2017, we were asked to provide information relating to Bulk Plant Facility Safety Standards as outlined in NFPA 58 and our compliance to the standard. Additionally, the question was raised about the blast radius of a fully engulfed Bulk Storage Tank if it were to explode. Please consider this our response to both questions.
>
> 1. NFPA 58/*LP-Gas Code Handbook* is the recognized national fire safety standard for Liquefied Petroleum Gas. The Code, along with its commentary, describes the best and safest ways to transport, store, handle and utilize propane fuel. Specifically, within Chapter 6 of the Code, we are given the requirements for the installation of the most commonly encountered LP-Gas systems and individual components. Section 6.21 of the chapter addresses Bulk Plants and Industrial LP-Gas systems (including requirements for gas distribution facilities, security and tampering protection, and

electrical equipment requirements.) Failure to follow these requirements would circumvent our primary value -- *SAFETY*. Furthermore, it would contradict Blossman's recognition as an industry leader in Safety and Innovation.

2. The *Emergency Response Guidebook*- is a guidebook used by first responders during the Initial Phase of a Dangerous Goods/Hazardous Materials Transportation Incident. In the unlikely hood of an explosive situation, Guide 115 (Gases – Flammable/Propane) advices an evacuation radius of 1 Mile in all directions for a tank fully engulfed in fire. This Guide is included on our Shipping Paper which is attached for reference.

For additional reference, included as an attachment is Fire Safety Analysis Manual. This manual was created through the cooperation of The National Fire Protection Association, the National Propane Gas Association and the Propane Education and Research Council. The manual serves as a guide for complying with Section 6.29.3.1 of NFPA 58, "Fire protection shall be provided for installations with an aggregate water capacity of more than 4000 gal. Lastly, we have included the *PERC Operations and Maintenance Handbook*, which is designed to satisfy Code requirements for Operation Procedures for large bulk facilities.

I look forward to our meeting on the 9th and addressing any additional safety concerns the Board might have.

P. Scott Weatherford
Director, Safety and Compliance
Cell: 228-369-0534
Voice: 228-875-7604
sweatherford@blossmangas.com

OPERATIONS & MAINTENANCE HANDBOOK

for

LP-GAS BULK STORAGE FACILITIES

PROPANE education & research COUNCIL

PROPANE EXCEPTIONAL ENERGY®

NPGA National PROPANE GAS Association

www.propanesafety.com

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PERC is governed by a twenty-one member Board of Directors appointed by the National Propane Gas Association (NPGA) and the Gas Processors Association (GPA). PERC program beneficiaries include propane retail marketers, producers, transporters' and agricultural cooperatives, as well as representatives of allied service and supply industries (industry members).

The recommendations, standards, or recommended practices, as reflected in this document, were developed by independent consultants retained by PERC. While PERC administers the process of obtaining the information, it does not independently test or verify the accuracy of the information or methods used to collect the data that supports the conclusions or recommendations reflected in this document.

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The procedures and information in this document are intended to implement the standards set forth in the documents referenced with capabilities of the personnel and equipment available. It does not create new standards or criteria for compliance. The order of steps in any procedure may or may not be of importance. This material is not sold nor is it a product of any consulting or engineering activity.

Users of this document should consult the law of their individual jurisdictions for codes, standards and legal requirements applicable to them. This document is not intended nor should it be construed to (1) set forth policies or procedures which are the general custom or practice in the propane industry; (2) to establish the legal standards of care owed by propane distributors to their customers; or (3) to prevent the user from using different methods to implement applicable codes, standards or legal requirements.

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ACKNOWLEDGMENTS

This project to develop an *Operations and Maintenance Handbook for LP-Gas Bulk Storage Facilities* was undertaken to help marketers comply with new requirements for bulk plant and industrial plant LP-Gas systems that were added in the 2001 edition of NFPA 58 (The LP-Gas Code) and remain in the 2004 edition. These new requirements include mandating written procedures for safely conducting activities associated with operations and maintenance, as well as a provision that equipment owners and operators ensure that the procedures are updated, if necessary, whenever a major change occurs and prior to startup of a changed system.

The project was funded by the Propane Education & Research Council (PERC), with the National Propane Gas Association (NPGA) providing technical and regulatory oversight for the duration of the project. Wolf Safety Group, LLC (Chesterbrook, PA) was the principal contractor. As with any project, open communications, a team approach with clear definition of roles and responsibilities, and individual accountability were critical to successfully achieving the objectives.

Much of the reference materials for this handbook are from the Certified Employee Training Program (CETP), originally developed by NPGA.   Materials, schematics and photographs from CETP Books 1.0 – 4.2 have been incorporated into the handbook where appropriate.

Gary Wolf, founder and owner of Wolf Safety Group, was the principal author of the handbook. Christian Branchi and Gordon Eldridge of Trans-Tech Energy (Rocky Mount, NC) provided significant technical input and support, and played key roles in the development of the handbook's format and content. Stuart Flatow, Vice President of Safety and Training for PERC, provided overall project management oversight. Sue Spear, Manager of Education and Training at NPGA, served as technical and regulatory manager for the project. Bruce Swiecicki, NPGA's Senior Technical Advisor, was the primary reviewer for regulatory requirements.

NPGA and PERC both provided valuable input and content review through their safety-related advisory committees, namely NPGA's Education, Training and Safety Committee (ETS) and PERC's Safety and Training Advisory Committee (STAC). The input and contributions from many of these committee members added significant value to the handbook. ETS formed an "O&M Subcommittee" to provide a forum for review and comment during the development of the handbook. Members of this subcommittee included Ed Anderson (ETS Associates), Gary Bourne (CHS), Ken Christensen (Crystal Flash Energy), David Hyslop (Hydratane of Athens), Ray Kazakewich (RegO Products ECII), Ken Kraft (Missouri Valley Propane), Larry Miller (Sharp Energy) and Elbert Stillwagon (HR Weaver). STAC members who significantly contributed to handbook's development included Cliff Slisz (Ferrellgas), Mike Walters (AmeriGas), Walter Cressman (Cress Gas), Thomas Petru (RR Commission of Texas), and Russ Rupp (Suburban Propane). All these gentlemen offered their time to thoroughly review each section of the handbook and provide valuable input.

A special note of appreciation from the author goes to Mike Merrill of Suburban Propane. Mike was the Chairman of the ETS O&M Subcommittee and a driving force on this project, leading consensus building with industry personnel and keeping the project team focused on maximizing the value of the handbook for the end users. He continually offered constructive comments throughout the project and contributed a significant amount of his personal time in reviewing the revisions of the handbook sections.

Last but certainly not least, we offer a special "thank you" to all the employers in the propane industry who have supported this project by providing encouragement to and time for the aforementioned volunteers to contribute to this handbook.

USER FEEDBACK RESPONSE FORM

GIVE US YOUR OPINIONS REGARDING THIS HANDBOOK

Mail to: Propane Education & Research Council
1140 Connecticut Avenue, NW
Suite 1075
Washington, DC 20036

Attention: Courtney Gendron

Email to: Courtney.Gendron@propanecouncil.org

Internet: www.PropaneSafety.com

We would like to know what you think about this Handbook. Please provide feedback using this form. If you find an error in the text, make a copy of the page(s), circle the error, write in your suggested revision and submit the copy with this form.

You can also complete the form on line at www.PropaneSafety.com. The web site will include up-to-date information on user feedback and corrections to the text.

INSTRUCTIONS:

Please read the following statements and check the appropriate response. If you disagree with the statement, please provide comments.

The material included in the *Handbook* will be useful in assisting my organization to meet the requirements of Chapter 14 of NFPA 58 – 2004.

❑ Agree ❑ Disagree

____

____

My organization plans to use the material in this *Handbook* to develop our Operations and Maintenance Manual.

❑ Agree ❑ Disagree

____

____

The information in this *Handbook* is understandable and easy to use.

❑ Agree ❑ Disagree

____

____

NAME: ______________________ **POSITION:** ______________

ADDRESS: ______________________________________

____

EMAIL: ______________________ **PHONE #:** ______________

PROPANE EDUCATION & RESEARCH COUNCIL

INDUSTRY FEEDBACK FORM

PERC Program Operations & Maintenance Manual

Print date February 2007 **Page Number** **Item Number**

Action Requested

☐ **New Text** ☐ **Revised Text** ☐ **Graphic** ☐ **Other**

Action and Reason for Proposed Action

Include proposed updated text or graphic, and supporting information.

Subject ______________________

Note: The subject should clearly and accurately express the main idea of your suggestion.
For Example: Updated Distance Requirements.

Reference or similar piece ______________________

Note: Type in details that reference and support your suggestion.
For Example: A document or book information (title, pages number, publication date and publisher), a website address, or a federal organization name and regulation number.

Method of submitting reference material

☐ **Fax** ☐ **E-mail** ☐ **Regular Mail** ☐ **Other**

Note: If you are unable to type or print your reference details that reference and support your suggestion, please choose a method. You may support your suggestion with additional documents and materials. Propane Education & Research Council encourages you to fax, mail or e-mail additional supporting materials.

Contact Information:

Name: ______________________

Company:

Address: ______________________________

City, State, Zip: ______________________________

Phone: ______________________________

Email: ______________________________

You will receive a response, once the Industry Feedback Form is received. If you do not receive a response within an appropriate time, please contact PERC at (202) 452-8975.

Operations & Maintenance Handbook for LP-Gas Bulk Storage Facilities

Table of Contents

Background and Purpose

New requirements related to the operations and maintenance of bulk plant and industrial plant LP-Gas systems were introduced in the 2001 Edition of NFPA 58, *Liquefied Petroleum Gas Code* (Code) and expanded in the 2004 Edition. Specifically, in Chapter 14 of the 2004 Edition, the requirements summarily include:

- Operating procedure manuals for all such facilities.
- Written procedures describing actions for operating personnel to take in the event of a release of LP-Gas in the facility.
- Maintenance manuals for all equipment at these facilities.
- Maintenance programs, including record keeping, for plant fire protection equipment.

These requirements also include a provision that equipment owners and operators must ensure that the procedures are updated "… whenever a major change occurs that affects the operation of a system and prior to its startup."

It is anticipated that each LP-Gas retailer will eventually be required to meet these NFPA 58 requirements at each bulk plant. Refer to the definition of "Bulk Plant " in Chapter 3 of NFPA 58 and to Annex A of the Code for further explanatory material. In addition, customer industrial plants that meet the definition of "Bulk Plant" will need to prepare these procedures and manuals. Therefore, PERC provided project funds and Wolf Safety Group was retained to develop a "tool" that contains a standardized approach and format for LP-Gas retailers and large industrial (commercial) customers to readily use in order to meet these requirements.

This *Operations and Maintenance Handbook for LP-Gas Bulk Storage Facilities* is both a template and foundation document that allows owners and operators of LP-Gas bulk plants to easily establish and have available in a common location the necessary site information, procedures, manuals and charts used by and for:

- Plant personnel (employees and contractors) as ready reference for support and guidance in emergency situations, plant operations (including startup and shutdown), and maintenance activities.
- Record keeping associated with the required inspection and maintenance activities.
- The authority having jurisdiction to verify the continuing safety of the LP-Gas facility.

In summary, this handbook is intended to provide owners and operators of these facilities the guidance and basic information to meet the intent and the requirements of Chapter 14 of NFPA 58-2004.

LP-Gas terminal operations (i.e., refrigerated storage, marine, pipeline and rail) are typically mandated to meet the requirements of the OSHA Process Safety Management (PSM) regulation under 29 CFR 1910.119. Therefore, this handbook does **not** address the details of those requirements.

Also, LP-Gas distribution systems that operate under the jurisdiction of the Office of Pipeline Safety (OPS) are **not** addressed in detail within this handbook.

While this handbook is not intended to be a training manual, every effort has been made to be consistent with the procedural, technical and instructional information provided in the 2nd Edition of the *Certified Employee Training Program* (CETP). Additionally, this handbook does not intend to introduce, by reference or suggested best practice, new practices that should be considered additions to the regulatory agenda.

Scope of Handbook

Following this first introductory section, the handbook is divided into eight other sections.

Section 2, "*General Facility Information,*" provides the template for itemizing critical emergency contact information for use by facility personnel, and with emergency responders and any authority having jurisdiction. **The information in this section should be completed by the owner or operator of the facility and updated when relevant changes occur.**

Section 3, "*Emergency Procedures Plan,*" gives owners and operators assistance regarding actions, procedures and documentation required by the Code in dealing with an unintentional release of LP-Gas in the facility.

Section 4, "*General Operations & Safety Requirements,*" provides guidance, procedures and charts for achieving compliance related to the **general** bulk plant/facility operating and safety requirements in NFPA 58-2004.

Section 5, "*Plant Operations Procedures,*" gives owners, operators and plant personnel a "menu" of detailed operating procedures for bulk plant facilities and large volume vapor distribution systems, including startup, normal operations and shutdown.

Section 6, "*General Maintenance and Inspection Requirements,*" offers the information necessary to comply with the general requirements for maintaining the mechanical integrity of the facility. Sample charts are provided to meet the record keeping requirements.

Section 7, "*Maintenance and Checklist Procedure,*" provides a bulk storage facility maintenance and inspection checklist detailing many maintenance and inspection steps that must be conducted in typical bulk storage and large volume vapor distribution systems. This checklist is generally organized by LP-Gas system components. Additionally, an appendix is included in this section that provides technical assistance for completing the checklist reviews.

Section 8, "*Maintenance of Fire Protection Equipment,*" gives guidance for complying with requirements associated with maintaining fire protection equipment, and charts for recording the necessary information related to maintenance and inspection activities.

Section 9, "*Manufacturers' Equipment Information*," has been intentionally left blank in the original copy of the handbook provided to you. It is intended to be a "bookmark" location for retaining/filing manufacturer's literature related to the detailed maintenance, inspection and repair information (including instructions and procedures) specific to your LP-Gas bulk plant or industrial/commercial system.

Additionally, Appendix A, "*References,*" has been provided which lists the documents that are referenced throughout this handbook. These references provide further detailed information or work procedure instructions, reference data or training information in order to meet the intent and requirements of the Code.

Using This Handbook

The ultimate purpose of this handbook is to be a functional document for each LP-Gas storage facility and serve (in a combined role) as your facility's operations, maintenance and emergency procedures manuals, consistent with the requirements of Chapter 14 of NFPA 58-2004.

Not all the information and materials contained in this handbook apply to each facility. Also, it is possible that special situations or operations not encountered in a typical LP-Gas storage facility might arise at any given site. Every effort has been made to address the numerous scenarios that can occur in a bulk plant or large storage facility. However, unique situations might not be included in this handbook. Therefore, each section should be thoroughly reviewed by the owners and operators to include all applicable data, information and procedural steps. Materials that are not applicable to your particular facility can be removed.

At the beginning of each handbook section, the purpose and objective(s) of that section are provided so that the readers, whether owners/operators or field personnel, can understand the intent of the section and the scope of the regulatory subject that is being addressed. Each section then has specific instructions regarding how to use its content in order to achieve compliance with that regulatory requirement.

By nature of the subject matter, the sections differ in their respective approaches in addressing each specific regulatory topic. For example, Section 5 on *Plant Operations Procedures* should be considered as a "template" for the operations conducted at your facility. Additions or deletions to these procedures might be necessary in order to accurately reflect local operations and conditions. Section 7 provides a checklist and guidance information for performing and documenting maintenance and inspection activities required by the Code. Again, not all subparts will necessarily be applicable; so those portions of the checklist can be removed; other items might need to be added under special circumstances.

Again, it is important to read the information at the beginning of each section so that the information contained can be used most efficiently and effectively, especially for use by plant/field personnel.

Accessibility and Review

When the information and procedures are developed into your facility's operating, maintenance and emergency procedures manual(s), these procedures and manual(s) **must all be available at the facility to which they apply and accessible to all employees and users**, including any authority having jurisdiction. Per NFPA 58-2004, maintenance manuals for normally unattended facilities are allowed to be stored at a location where they are accessible for maintenance personnel serving the unattended location.

The procedures should be reviewed with all appropriate employees and users who are expected to carry out the relevant job functions at the time when the procedures are initially developed and again when changes to the procedures occur.

Keep in mind that NFPA 58-2004 requires that all applicable **procedures must be updated whenever a change occurs** that effects the operations, maintenance or emergency response activities of the facility.

Type of Facility: ***LP-Gas Bulk Storage Plant***

Company Name:

Facility Name (if different):

Street Address:

City, State, Zip Code:

Facility Telephone Number:

Company Headquarters (city, state):

Original Date of Manual:

Revision Number and Date:

MANAGEMENT CONTACT INFORMATION

Authorized/Responsible Facility Representative:

Title/Position of Representative:

Representative's Emergency Contact Telephone Number(s):

-
-

LOCAL EMERGENCY RESPONDER CONTACT INFORMATION

Fire Department (name):

- **Telephone Number**:

Emergency Medical Responders (name):

- **Telephone Number**:

Hospital/ Emergency Medical Facility (name):

- **Telephone Number**:

Police Telephone Numbers

- **State**:
- **Local**:

LP-Gas Inspection Agency (name):

- **Telephone Number**:

Coast Guard Telephone Number (if applicable):

Section Purpose and Objectives

This section of the Operations & Maintenance Handbook is intended to assist owners or operators of bulk plants and industrial plants in meeting the emergency procedures requirements of NFPA 58-2004 for an unintentional LP-Gas release. Emergency procedures in the broader sense of employee exposure or the reasonable possibility for employee exposure to safety or health hazards is an OSHA jurisdictional requirement which may or may not apply to a specific LP-Gas system.

General Fire Protection Requirements

Fire protection must be provided for bulk plants and industrial plants. Fire protection can include fire prevention, fire detection and/or fire suppression.

General fire protection and response requirements for LP-Gas facilities are detailed in NFPA 58-2004 (§6.23), and include the following considerations:

Planning

- Must be coordinated with local emergency response agencies.
- Must consider the safety of emergency personnel, workers and the public.

Protection of Containers

- A written Fire Safety Analysis (FSA)* must be developed to evaluate the total product control system and to specify the modes of fire protection installed.
- This FSA must be submitted to the authority having jurisdiction and local emergency responders.
- The FSA must be updated when there are changes in the storage capacity or the transfer system.

** The FSA is a self-conducted audit of the safety features of a propane installation and an assessment of the means to minimize the potential for inadvertent propane releases from storage containers and during transfer operations. The assessment also includes an evaluation of the capabilities of local emergency response agencies as well an analysis of potential hazard exposures from the installation to the neighborhood and from the surrounding to the LP-gas facility.*

For guidance on conducting a FSA, go to www.NPGA.org and click on the "Fire Safety Analysis Manual" link where, at no cost, you can obtain the necessary forms and a step-by-step method for completing a written fire safety analysis, as explained in the 2001 and 2004 editions of NFPA 58. A FAQ sheet and other useful information about the manual are also available via the link. FSA materials may also be downloaded from PERC's Safety and Training Website at www.propanesafety.com by registering at no cost and clicking on "Regulatory Compliance." If desired, a bound paper copy of the FSA manual can be purchased online through the Propane Education & Research Council at www.propanecatalog.com.

Emergency procedures based on equipment at the facility will be described further in this section and within the system operating procedures in Sections 4 and 5.

Each owner or operator should check for other emergency planning requirements established by various regulatory agencies such as OSHA (Emergency Action Plan) and USDOT (Security Plan).

When is it an Emergency?

It is an emergency when:

- An occurrence results in or is likely to result in an unintentional or uncontrolled release of a hazardous material.
- There is a potential safety or health hazard, such as a fire, explosion or chemical exposure hazard.

Employees must be immediately evacuated from the danger area when an emergency occurs, and employees are not permitted to assist in handling the emergency, unless they have received specialized training as detailed in the company's Emergency Response Plan (ERP).

When is it *NOT* an Emergency?

Even though there may have been an incidental release of a hazardous material, it is not considered an emergency when:

- An intentional release is produced during normal operations.
- There is no potential safety or health hazard (no potential fire, explosion or chemical exposure hazard). Because this determination may be difficult to make, companies may choose a policy of evacuation any time there is a spill or leak, regardless of the size of the spill or leak

Contact Information

By completing Section 2 of this handbook, basic facility data and contact information is documented and available for emergency response and support agencies. If there are special circumstances that require additional information about the facility or require contact information specific to or necessary for other first responders in an emergency, also include that information in Section 2.

Material Safety Data Sheet (MSDS)

A Material Safety Data Sheet (MSDS) is defined as "written or printed material concerning a hazardous chemical that is prepared in accordance with OSHA's Hazard Communication Standard." The purpose of the MSDS is to provide information about chemical hazards. Each MSDS may look a bit different, but they must all provide the following information:

1) Product and Company Identification (product information)
2) Composition/Information on Ingredients (hazardous ingredients)
3) Hazards Identification (toxicology and health information)
4) First Aid and Emergency Procedures
5) Fire-fighting Measures
6) Accidental Release Measures (leak response procedures)
7) Handling and Storage
8) Exposure Controls and Personal Protection
9) Physical and Chemical Properties (characteristics)
10) Stability and Reactivity

Additional sections that can apply (as appropriate) include:

11) Toxicological Information
12) Ecological Information
13) Disposal Considerations
14) Transport Information
15) Regulatory Information
16) Other Information

Know the location of the MSDS for LP-Gas used at your company. A sample MSDS for propane is included in Appendix 3.1 at the end of this section.

Emergency Equipment Location

A site map (or site plan) that identifies the location of fire protection systems and emergency equipment should be developed, and include the following information:

- Indication of direction "north"
- Off-site references (e.g., adjacent roads)
- Property lines
- Fence lines
- Gates for vehicles and personnel
- Buildings and structures, identified by name and general function
- Bulk storage tanks
  - Identification of each tank on site

- Capacity designation for each tank (maximum capacity in water gallons)
- Identification of tanks equipped with internal valves

- Loading and unloading facilities (including rail car, if applicable)
- Site electrical system controls (i.e., switch gear, main panel, breaker box)
- Emergency Shutoff Valves (location of valve and remote control device)
- Fire monitoring, detection and suppression equipment, such as
  - Monitors and hydrants
  - Sprinkler Systems
  - Extinguishers
  - Other sources of water for emergency response

For reference, see Appendix 3.2 at the end of this section for a sample site map.

Emergency Equipment Description

All individual components and each type of fire protection and emergency equipment that exist on site should be identified on the Site Map and listed in the following table for reference.

Equipment Description	Available (Yes/No)	Total # on Site
Emergency Shutoff Valve		
Remote Emergency Shutoff Valve Device		
Container Internal Valve		
Fire Extinguisher		
Fire Hydrant/Monitor		
Fire Water Sprinkler Systems		
Main Electrical Panel		
Emergency Site Egress (Gates) Points		
Other (describe):		

Emergency Equipment Availability

While it is important that an emergency procedures plan is documented, is clear and understandable, and is accessible for use in emergency situations, the plan can only be executed successfully if emergency equipment and controls are available and functional at all times. Particularly, emergency equipment and controls must be conspicuously marked and installed in locations specified by the Code for accessibility in emergency situations.

Specific requirements regarding inspection and maintenance of emergency equipment are discussed in Sections 7 and 8.

Emergency Escape Procedures and Routes

The site map and plan clearly defines emergency escape routes, assembly points and shelter areas to be used. An employee(s) must also be designated to take a head count of all workers after evacuation and inform emergency responders of any missing personnel.

Always plan two ways out!

Fire Extinguishers

Each bulk plant must have at least one approved portable fire extinguisher that has a minimum capacity of **18 pounds** (8.2 kg) of dry chemical with a B:C rating. NFPA codes do not specify a placement point (e.g., distance from the point of transfer or path of egress).

However, for bulk plants that have storage locations where the aggregate quantity of LP-Gas stored in cylinders awaiting use, resale or exchange is in excess of 720 lb (327 kg), the required fire extinguisher must be located no more than **50 feet** (15 m) from the storage location.

Fire extinguisher training must be provided upon hiring and annually thereafter for any employee who will be expected to use portable fire extinguishers to respond to small stage fires. Only these trained employees are authorized to use the portable fire extinguishers in an emergency.

All other employees in the fire area must immediately evacuate the affected work area when they hear the fire alarm. Employees who are trained to evacuate do not need to be trained on fire extinguisher use.

Emergency Shutoff Devices

NFPA 58 requires that emergency shutoff valves be installed at transfer points such that the temperature-sensitive element for the valve is no more than **5 feet** from the nearest end of the hose or swivel-type piping connection to the line in which the valve is installed.

Container openings meeting the retrofit requirements for thermal activation of the emergency shutdown system (effective July 1, 2011) must have the temperature sensitive element located as follows:

- For internal valves, no more than **5 feet** from the internal valve.
- For emergency shutoff valves, as close as practical to the positive shutoff valve/excess flow valve combination on the container.

Refer to §5.7.7.2 of NFPA 58-2004 for more detailed information and requirements.

Specifically for thermally activated remote emergency shutoff devices and/or for redundant fail-safe product control systems associated with underground and mounded ASME containers, they must be:

- Identified by a sign that is readable from the point of transfer and incorporates the words "Propane – Container Liquid Valve Emergency Shutoff" in block letters of not less than 2 inches in height and on a background that contrasts in color to the letters; and
- Located not less than **25 feet** or more than **100 feet** in the path of egress from the emergency shutoff valve.

If an LP-Gas dispensing device or station is on the site, a labeled and accessible electrical switch or circuit breaker must be installed to shut off the electrical power in case of an emergency and located within **20 – 100 feet** from the dispenser itself.

Emergency Equipment Access

NFPA 58 requires that bulk plants have roadways and other appropriate means of access for emergency response equipment (e.g., fire fighting vehicles and equipment) for the situation where outside emergency response assistance is required.

Medical First Aid

For those facilities transferring LP-Gas between marine vessels and shore facilities, medical first aid equipment must be available at the shore facility.

APPENDIX 3.1

MATERIAL SAFETY DATA SHEET (MSDS)
FOR
ODORIZED PROPANE
(SAMPLE ONLY)

1. Chemical Product and Company Identification

Product Name: Odorized Propane

Chemical Name: Propane

Chemical Family: Paraffinic Hydrocarbon

Formula: C3H8

Synonyms: Dimethylmethane, LP-Gas, Liquefied Pertoleum Gas (LPG), Propane, Propyl Hydride

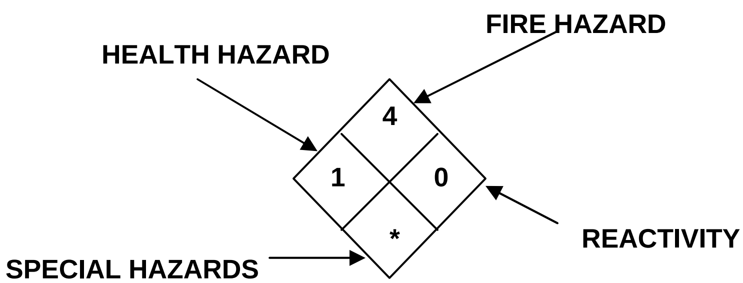
Name & Address:	Transportation Emergency Number:	Emergency Number: For Routine Info, Call:

2. Composition/Information on Ingredients

Ingredient Name /CAS Number	Percentage	OSHA PEL	ACGIH TLV
Propane/74-98-6	87.5-100	1,000 ppm	Simple asphyxiant
Ethane/74-84-0	0-5.0	1,000 ppm	Simple asphyxiant
Propylene/115-07-1	0-10.0	1,000 ppm	Simple asphyxiant
Butanes/various	0-2.5	1,000 ppm	Simple asphyxiant
Ethyl Mercaptan/75-08-1	16-25ppm	0.5 ppm	0.5 ppm

3. Hazards Identification

A. *EMERGENCY OVERVIEW*



4-- Severe
3-- Serious
2-- Moderate
1-- Slight
0-- Minimal
*** -- Ref. NFPA 704**

DANGER! Flammable liquefied gas under pressure. Keep away from heat, sparks, flame, and other ignition sources. Vapor replaces oxygen available for breathing and may cause suffocation in confined spaces. Use only with adequate ventilation. Odor may not provide adequate warning of potentially hazardous concentrations. Vapor is heavier than air. Liquid can cause freeze burn similar to frostbite. Do not get liquid in eyes, on skin, or on clothing. Avoid breathing of vapor. Keep container valve closed when not in use.

B. *POTENTIAL HEALTH EFFECTS INFORMATION*

ROUTES OF EXPOSURE:

Inhalation: Asphyxiant. It should be noted that before suffocation could occur, the lower flammability limit of propane in air would be exceeded, possibly causing both an oxygen-deficient and explosive atmosphere. Exposure to concentrations >10% may cause dizziness. Exposure to atmospheres containing 8%-10% or less oxygen will bring about unconsciousness without warning, and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.

Eye Contact: Contact with liquid can cause freezing of tissue.

Skin Contact: Contact with liquid can cause frostbite.

Skin Absorption: None.

Ingestion: Liquid can cause freeze burn similar to frostbite. Ingestion not expected to occur in normal use.

CHRONIC EFFECTS: None

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: None

OTHER EFFECTS OF OVEREXPOSURE: None

CARCINOGENICITY: Propane is not listed by NTP, OSHA or IARC.

4. First Aid Measures

INHALATION: Persons suffering from lack of oxygen should be removed to fresh air. If victim is not breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.

EYE CONTACT: Contact with liquid can cause freezing of tissue. Gently flush eyes with lukewarm water. Obtain medical attention immediately.

SKIN CONTACT: Contact with liquid can cause frostbite. Remove saturated clothes, shoes and jewelry. Immerse affected
area in lukewarm water not exceeding 105. F. Keep immersed. Get prompt medical attention.

INGESTION: If swallowed, get immediate medical attention.

NOTES TO PHYSICIAN: None.

5. Fire-Fighting Measures

FLASH POINT: -156° F (-104° C) **AUTOIGNITION:** 842° F (432° C)

IGNITION TEMPERATURE IN AIR: 920-1120° F

FLAMMABLE LIMITS IN AIR BY VOLUME: Lower: 2.15% Upper: 9.6%

EXTINGUISHING MEDIA: Dry chemical, CO_2, water spray or fog for surrounding area. Do not extinguish fire until propane source is shut off.

SPECIAL FIRE-FIGHTING INSTRUCTIONS: Evacuate personnel from danger area. Immediately cool container with water spray from maximum distance, taking care not to extinguish flames. If flames are accidentally extinguished, explosive re-ignition may occur. Where water is abundant and immediate, the fire should be allowed to burn while the container and area are cooled and the flow of propane is shut off. Where water is scarce, compare the risk of allowing the area to continue to heat from the fire and the alternative of extinguishing the fire without shutting off the propane flow, which may allow for the propane to accumulate and re-ignite explosively.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Propane is easily ignited. It is heavier than air; therefore, it can collect in low areas where an ignition source can be present. Pressure in a container can build up due to heat and container may rupture if pressure relief devices should fail to function. Propane released from a properly functioning relief valve on an overheated container can also become ignited.

HAZARDOUS COMBUSTION PRODUCTS: None.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Evacuate the immediate area. Eliminate any possible sources of ignition and provide maximum ventilation. Shut off source of propane, if possible. If leaking from container, or valve, contact your supplier.

7. Handling and Storage

HANDLING PRECAUTIONS: Propane vapor is heavier than air and can collect in low areas that are without sufficient ventilation. Leak-check system with a leak detector or solution, never with flame. Make certain the container service valve is shut off prior to connecting or disconnecting. If container valve does not operate properly, discontinue use and contact supplier. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into pressure relief valve or cylinder valve cap openings. Do not drop or abuse cylinders. Never strike an arc on a gas container or make a container part of an electrical circuit. See “OTHER INFORMATION” for additional precautions.

STORAGE PRECAUTIONS: Store in a safe, authorized location (outside, detached storage is preferred) with adequate ventilation. Specific requirements are listed in NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.* Isolate from heat and ignition sources. Containers should never be allowed to reach temperature exceeding 125° F (52° C). Isolate from combustible materials. Provide separate storage locations for other compressed and flammable gases. Propane containers should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 feet, or by a barrier of non-combustible material at least 5 feet high having a fire rating of at least 1/2 hour. Full and empty cylinders should be segregated. Store cylinders in upright position, or with pressure relief valve in vapor space. Do not drop or abuse cylinders. Keep container valve closed and plugged or capped when not in use. Install protective caps when cylinders are not connected for use. Empty containers retain some residue and should be treated as if they were full.

8. Exposure Controls/Personal Protection

ENGINEERING CONTROLS

Ventilation: Provide ventilation adequate to ensure propane does not reach a flammable mixture.

RESPIRATORY PROTECTION (SPECIFY TYPE)

General Use: None.

Emergency Use: If concentrations are high enough to warrant supplied-air or self-contained breathing apparatus, then the atmosphere may be flammable (see Section 5). Appropriate precautions must be taken regarding flammability.

PROTECTIVE CLOTHING: Avoid skin contact with liquid propane because of possibility of freeze burn. Wear gloves and protective clothing which are impervious to the product for the duration of the anticipated exposure.

EYE PROTECTION: Safety glasses are recommended when handling cylinders.

OTHER PROTECTIVE EQUIPMENT: Safety shoes are recommended when handling cylinders.

9. Physical and Chemical Properties

BOILING POINT: @ 14.7 psia = -44° F

SPECIFIC GRAVITY OF VAPOR (Air = 1) at 60° F: 1.50

SPECIFIC GRAVITY OF LIQUID (Water = 1) at 60° F: 0.504

VAPOR PRESSURE: @ 70° F = 127 psig
@ 105° F = 210 psig

EXPANSION RATIO (From liquid to gas @ 14.7 psia): 1 to 270

SOLUBILITY IN WATER: Slight, 0.1 to 1.0%

APPEARANCE AND ODOR: A colorless and tasteless gas at normal temperature and pressure. An odorant (ethyl mercaptan) has been added to provide a strong unpleasant odor. Should a propane-air mixture reach the lower limits of flammability, the ethyl mercaptan concentration will be approximately 0.5 ppm in air.

ODORANT WARNING: Odorant is added to aid in the detection of leaks. One common odorant is ethyl mercaptan, CASNo.75-08-01. Odorant has a foul smell. The ability of people to detect odors varies widely. Also, certain chemical reactions with material in the propane system, or fugitive propane gas from underground leaks passing through certain soils, can reduce the odor level. No odorant will be 100% effective in all circumstances. If odorant appears to be weak, notify propane supplier immediately.

10. Stability and Reactivity

STABILITY: Stable.
Conditions to Avoid: Keep away from high heat, strong oxidizing agents and sources of ignition.

REACTIVITY:
Hazardous Decomposition Products: Under fire conditions, fumes, smoke, carbon monoxide, aldehydes and other decomposition products. When used as an engine fuel, incomplete combustion can cause carbon monoxide, a toxic gas.
Hazardous polymerization: Will not occur.

11. Toxicological Information

Propane is non-toxic and is a simple asphyxiant, however, it does have slight anesthetic properties and higher concentrations may cause dizziness.

IRRITANCY OF MATERIAL: None

REPRODUCTIVE EFFECTS: None

TERATOGENICITY: None

SENSITIZATION TO MATERIAL: None

SYNERGISTIC MATERIALS: None

MUTAGENICITY: None

12. Ecological Information

No adverse ecological effects are expected. Propane does not contain any Class I or Class II ozone-depleting chemicals (40 CFR Part 82). Propane is not listed as a marine pollutant by DOT (49 CFR Part 171).

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused product in the container. Return to supplier for safe disposal. Residual product within process system may be burned at a controlled rate, if a suitable burning unit (flare stack) is available on site. This shall be done in accordance with federal, state and local regulations.

14. Transport Information

DOT SHIPPING NAME: Liquefied Petroleum Gas

HAZARD CLASS: 2.1 (Flammable Gas)

IDENTIFICATION NUMBER: UN 1075

PRODUCT RQ: None

SHIPPING LABEL(S): Flammable gas

IMO SHIPPING NAME: Propane

PLACARD (WHEN REQUIRED): Flammable gas

IMO IDENTIFICATION NUMBER: UN 1978

SPECIAL SHIPPING INFORMATION: Container should be transported in a secure, upright position in a well-ventilated vehicle.

15. Regulatory Information

The following information concerns selected regulatory requirements potentially applicable to this product. Not all such requirements are identified. Users of this product are responsible for their own regulatory compliance on a federal, state [provincial] and local level.

U.S. FEDERAL REGULATIONS

EPA Environmental Protection Agency

CERCLA Comprehensive Environmental Response, Compensation and Liability Act of 1980
(40 CFR Parts 117 and 302)
Reportable Quantity (RQ): None

SARA Superfund Amendment and Reauthorization Act
*SECTION 302/304: Requires emergency planning on threshold planning quantities (TPQ) and release reporting based on reportable quantities (RQ) of EPA's extremely hazardous substances. (40 CFR Part 355).

Extremely Hazardous Substances: None

Threshold Planning Quantity (TPQ): None

*SECTIONS 311/312: Require submission of material safety data sheets (MSDSs) and chemical inventory reporting with identification of EPA-defined hazard classes (40 CFR Part 370). The hazard classes for this product are:

IMMEDIATE: No **PRESSURE**: Yes

DELAYED: No **REACTIVITY**: No **FLAMMABLE**: Yes

*SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372. Propane does not require reporting under Section 313.

40 CFR PART 68 Risk Management for Chemical Accidental Release

TSCA Toxic Substance Control Act
Propane is listed on the TSCA inventory.

OSHA Occupational Safety and Health Administration

29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals.

FDA Food and Drug Administration

21 CFR 184.1655: Generally recognized as safe (GRAS) as a direct human food ingredient when used as a propellant, aerating agent and gas.

16. Other Information

SPECIAL PRECAUTIONS: Use piping and equipment adequately designed to withstand pressure to be encountered.

NFPA 58 *Standard for the Storage and Handling of Liquefied Petroleum Gases* and OSHA 29 CFR 1910.10 require that all persons employed in handling LP-gases be trained in proper handling and operating procedures, which the employer shall document. Contact your propane supplier to arrange for the required training. Allow only trained and qualified persons to install and service propane containers and systems.

WARNING: Be aware that with odorized propane the intensity of ethyl mercaptan stench (its odor) may fade due to chemical oxidation (in the presence of rust, air or moisture), adsorption or absorption. Some people have nasal perception problems and may not be able to smell the ethyl mercaptan stench. Leaking propane from underground gas lines may lose its odor as it passes through certain soils. While ethyl mercaptan may not impart the warning of the presence of propane in every instance, it is generally effective in a majority of situations. Familiarize yourself, your employees and customers with this warning, and other facts associated with the so-called "odor-fade" phenomenon. If you do not already know all the facts, contact your propane supplier for more information about odor, electronic gas alarms and other safety considerations associated with the handling, storage and use of propane.

ISSUE INFORMATION

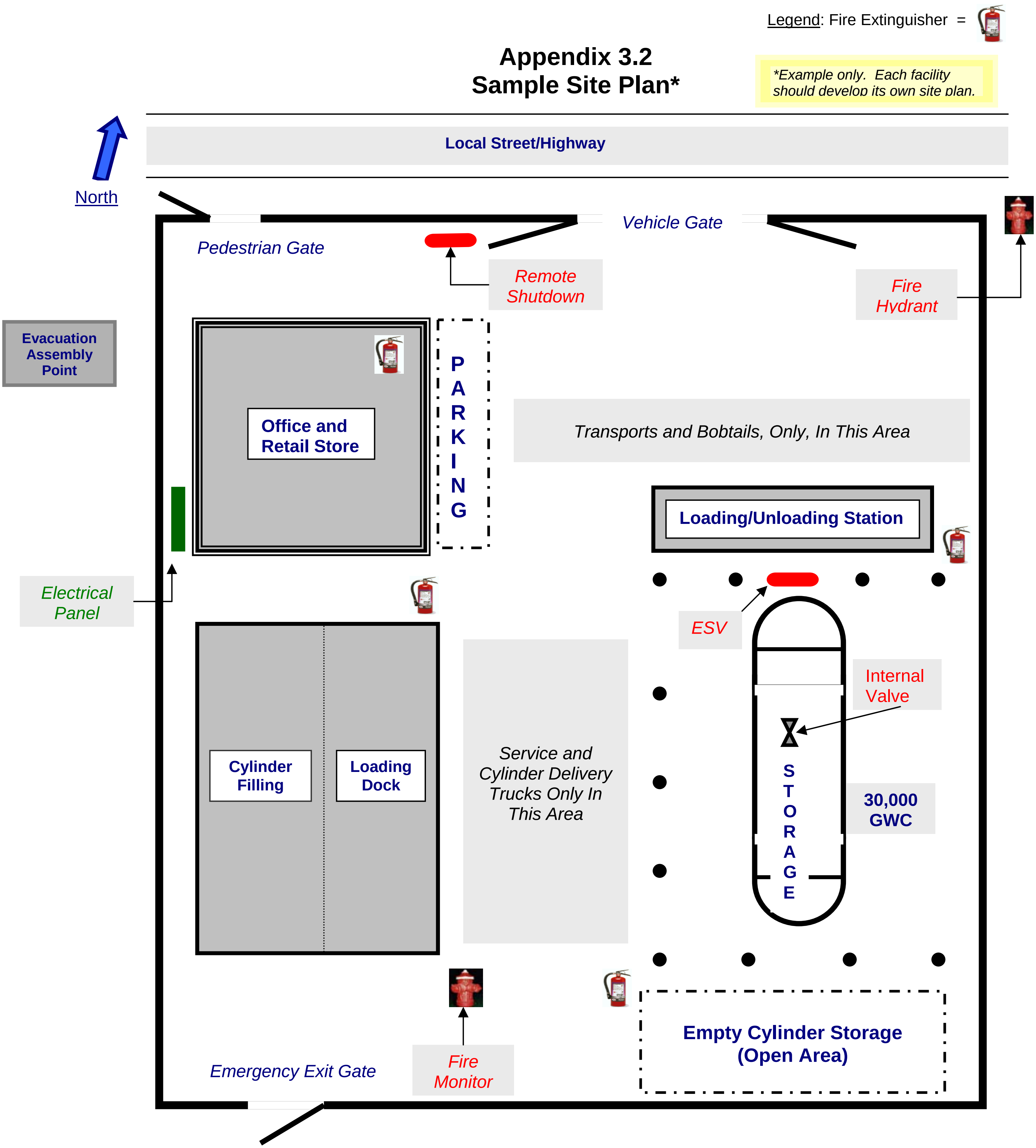
Issue Date:_________________

This material safety data sheet and the information it contains is offered to you in good faith as accurate. This Supplier does not manufacture this product but is a supplier of the product independently manufactured by others. Much of the information contained in this data sheet was received from sources outside our Company. To the best of our knowledge this information is accurate, but this Supplier does not guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely, comply with all applicable laws and regulations and to assume the risks involved in the use of this product.

NO WARRANTY OR MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSES, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OF COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE.

Appendix 3.2
Sample Site Plan*

Example only. Each facility should develop its own site plan.



Section Purpose and Objectives

NFPA 58-2004 requires that general operating procedures be prepared and maintained for each facility in a common location or locations (§14.2.1.5, 14.2.2.2, and their sub-referenced paragraphs). Owners and managers of LP-Gas bulk or industrial plant systems must ensure that the operating procedures are updated, as appropriate, whenever a major change occurs and prior to the startup of a changed system.

This section provides guidance for achieving compliance with those referenced requirements related to general bulk plant/facility operating procedures and safety requirements, exclusive of emergency procedures that have already been addressed in Section 3 of this handbook. Guidance specific to startup, operation and shutdown of the transfer system and equipment are addressed in Section 5.

Site Accessibility

Except where business activities dictate, customers and the general public must be restricted from areas where LP-Gas is stored, transferred and handled.

Site Signage and Markings

Signs and other forms of markings within the site or on the equipment should provide appropriate warnings and sufficient information for personnel onsite to work safely and perform duties consistent with procedures and work practices.

Control of Combustible Materials and Ignition Sources

Referring to Figure 4.1, basic fire prevention concepts demonstrate that the elimination of any leg of the "fire triangle" will eliminate the possibility of combustion occurring.

Figure 4.1

Therefore, the control of combustible materials and ignition sources is critical to the operating safety of any LP-Gas facility.

Combustible Materials

Weeds, long dry grass, wooden materials (e.g., limbs, planks, pallets) and paper products are all examples of combustible materials (i.e., "fuel") that need to be controlled and kept at a sufficient distance from LP-Gas storage containers in order to reduce the potential of a fire that could occur adjacent to the equipment. All these and similar combustible materials must be maintained or stored such that they are no closer than **10 feet** to the container. Additionally, where single containers (constructed as portable containers) are used for temporary storage, they must not only be placed on level and firm surfaces but they also must be kept clear of combustible materials (as defined in this paragraph) for a minimum distance of **10 feet**.

Ignition Sources

Smoking

Another significant fire prevention measure is the control of ignition sources. First and foremost, smoking prohibitions for each site must be established. As minimum requirements, no person, whether that person is an employee, contractor or site visitor, can be allowed to use or carry lighted smoking materials under the following situations:

- When he or she is on or within **25 feet** of a vehicle that contains LP-Gas, liquid or vapor.
- When he or she is at any point of liquid transfer.
- When delivering to or connecting to containers.

Further smoking restrictions or prohibitions may be established by the owner or operator of the site.

Open Flames & Other Ignition Sources – Continuous Control

Open flames and other ignition sources (such as non-explosion proof electrical equipment and vehicles) must be controlled on an on-going basis for general fire prevention purposes. Specific control measures that must be implemented include:

- Prohibiting open flames and all other sources of ignition in pump houses, cylinder filling rooms and other locations where the presence of LP-Gas vapors is likely.
- Prohibiting the installation in pump houses or cylinder filling rooms of:
  (a) Direct-fired vaporizers, or
  (b) Indirect-fired vaporizers that are attached or installed adjacent to gas-fired heat sources.

- Prohibiting open flames, cutting or welding tools, sparking hand tools, portable electric tools (including two-way radios and cell phones) and non-explosion proof electrical equipment within the classified electrical areas per Table 6.20.2.2 in NFPA 58-2004.

- Installing all fixed electrical equipment and wiring within a classified area specified in Table 6.20.2.2 to be consistent with the requirements of NFPA 70, *National Electric Code*.

While open flames and other ignition sources are not prohibited in site locations where LP-Gas equipment has been purged of all liquid and vapor, appropriate measures should be taken to ensure that these locations remain gas-free.

Open Flames and Other Ignition Sources – Transfer Operations

Sources of ignition must be eliminated during all LP-Gas transfer operations, including the periods when connections and disconnections are being made and while LP-Gas is being vented to the atmosphere. During transfer operations the following specific precautions must be taken:

- Internal combustion engines that are within **15 feet** of the point of transfer must be shut down, except for:

  (a) Engines of LP-Gas cargo tank vehicles constructed and operated in compliance with Chapter 9 of NFPA 58-2004, when these engines are being used to operate transfer pumps or compressors on the vehicles themselves in order to load containers that are not located at a stationary installation (*Note: This is not a typical bulk plant scenario.*); or

  (b) Engines in buildings as covered by Section 11.12 of NFPA 58-2004 (i.e., Industrial and Forklift Trucks Powered by LP-Gas).

- Smoking or the use of open flames, sparking hand tools, portable electric tools (including two-way radios and cell phones), non-explosion proof electrical equipment or any other equipment that has the energy to ignite LP-Gas must be prohibited within **25 feet** of the point of transfer.

- Metal cutting, grinding, oxygen-fuel gas cutting, brazing, welding, soldering or welding (i.e., any “hot work” procedures) must be prohibited within **35 feet** of the point of transfer. Furthermore, if any of these procedures have been performed within this zone of 35 feet prior to the transfer operation, the affected materials must be cooled to a temperature below the ignition temperature of LP-Gas (i.e., less than 900ºF) before starting the transfer.

- For those facilities where LP-Gas is dispensed into a vehicle container for the purpose of using the LP-Gas as a fuel source (e.g., a recreational vehicle or a propane-fueled vehicle), all ignition sources associated with the vehicles must be turned off. Control measures include shutting down the engines of the vehicle being fueled and those waiting to be fueled, and also extinguishing pilot lights and shutting off other ignition sources within recreational vehicles, for example.

Facility Ignition Sources

Survey your facility and list the ignition sources in the data box, below. Insert an additional sheet, if necessary.

Table 4.1 – Ignition Sources

TYPE/NATURE OF IGNITION SOURCE	***LOCATION OF IGNITION SOURCE***	***CONTROLS OR CORRECTIVE ACTION***

Containers – General Requirements

ASME Containers (Pressure Vessels)

In general, stationary containers used for LP-Gas bulk plant storage must be designed, fabricated, tested and marked in accordance with the requirements of the ASME *Boiler and Pressure Vessel Code*, Section VIII or the API –ASME code if constructed prior to July 1, 1961. The agency having jurisdictional authority (usually, that associated with "boilers") should be contacted for specific requirements related to compliance and continued service use. The NFPA *LP-Gas Code Handbook* (2004 Edition) provides additional background information, guidance and reference material.

ASME Container Data

For your record keeping, insert information from the data plates (nameplates) on the ASME storage containers at your facility into Table 4.2. For additional ASME storage containers, add another table and insert the appropriate information.

Table 4.2 – ASME Container Data

	CONTAINER #1	CONTAINER #2	CONTAINER #3	CONTAINER #4
Service (UG, AG)				
Manufacturer's Name & Address				
Manufacturer's Serial Number				
National Board Number				
Water Capacity (lbs. or gal.)				
MAWP (psi)				
Surface Area (sq. ft.)				
Year Built				
Shell Thickness (in.)				
Head Thickness (in.)				
Overall Length (ft.-in.)				
Outside Diameter (ft.-in.)				
Head Design				
Min. Design Metal Temp. @ MAWP				
Type of Construction				
Degree of Radiography				

Liquid and Vapor Openings

The requirements for internal valves and other valve/line closure components for liquid and vapor openings (both inlet and withdrawal) on ASME containers over 4,000 gallons are defined in §5.7.7.2 of NFPA 58. Alternate provisions for underground and mounded tanks of 2,001 gallon through 30,000 gallon water capacity are further provided in §6.24 of NFPA 58.

Portable Cylinders

These containers are designed, fabricated, tested and marked in accordance with the U.S. Department of Transportation (DOT). This handbook is not intended to reiterate the DOT requirements with respect to these aspects of the regulations. For details, refer to Title 49, *Code of Federal Regulations*, “Transportation”. Again, the NFPA *LP-Gas Code Handbook* (2004 Edition) provides additional background information, guidance and reference material on these containers, also.

Site Storage

A number of considerations must be taken into account when storing portable cylinders in a bulk plant. These include:

- Locating them in a place that minimizes their exposure to excessive temperatures, physical or mechanical damage and tampering.
- Positioning any cylinder that has a nominal LP-Gas capacity greater than 1 lb. (0.45 kg) such that the pressure relief valve is in direct contact with the vapor space of the cylinder.
- When storing LP-Gas cylinders inside buildings (in accordance with Section 8.3 of NFPA 58-2004), they cannot be located near any areas of egress (e.g., exits, entrances, and walkways). Also, when determining the maximum quantity of LP-Gas that can be stored indoors, each cylinder stored indoors must be considered to be a full cylinder.
- Cylinders cannot be stored on the roof of any building or structure.

Temporary Stationary Storage

In situations where a portable container is being used for temporary stationary storage in a bulk plant, it must be placed on a firm flat surface (e.g., concrete pad, pavement or firm earth) while in use as such.

Labeling

ASME Containers (> 2000 gallon water capacity)

The representative inlet and outlet lines for both the liquid and vapor spaces must be labeled as such. While not required, color coding of the associated piping and valves can be used as an identification aid in addition to labeling.

Connections for gauges and pressure relief devices are not required to be labeled.

Portable Cylinders

When LP-Gas cylinders are to be stored or used at the same sites with other compressed gases, each cylinder must be labeled to identify their individual and respective contents. The labeling should be consistent with the requirements of ANSI/CGA C-7, *Guide to the Preparation of Precautionary Labeling and Marking of Compressed Gas Containers*.

Container Filling

Overfilling Prevention Devices (OPD)

NFPA 58 requires that cylinders with LP-Gas capacities of 4# through 40# be equipped with an OPD and a fixed maximum liquid level gauge, and that no cylinder in this capacity range can be filled if it is not equipped with both of these devices unless specifically exempted from the requirement.

Those cylinders in the 4 - 40# capacity range that are exempt from having a listed OPD installed include:

- Cylinders used in industrial truck service.
- Cylinders identified and used for industrial welding and cutting gases.
- Cylinders manufactured prior to October 1, 1998, and designed for use in the horizontal position and where an overfilling prevention device is not available.

Liquid Level Gauges

Every container that is designed to be filled on a volumetric basis must be equipped with a **fixed maximum liquid level gauge** in order to indicate the maximum fill level for the service in which the container is to be filled or used.

For bulk plants or specific points of transfer that are designated as a "low emission transfer" locations (i.e., to meet environmental regulatory requirements or to take advantage of reduced installation distances), fixed maximum liquid level gauges cannot be used to determine the maximum filling limit. Therefore, the maximum permitted filling limit must be determined by weight or other approved means.

Where **variable liquid level gauges** are also used for filling containers (usually large capacity storage vessels), these devices must meet the following requirements to facilitate reading the gauges:

- The gauges must show the maximum liquid level (in metric units or percent capacity of the container) when installed in containers greater than 2000 gallon water capacity; and
- Markings must indicate the maximum liquid level at liquid temperatures from 20ºF to 130ºF and in increments not greater than 20ºF; and
- The system nameplate and/or the gauge must have markings indicating the various liquid levels from empty to full; and
- Dials of rotary gauges or magnetic float gauges must indicate whether they are for cylindrical containers or spheres, and if the service is aboveground or underground; and
- Dials of gauges for aboveground (only) containers that have a water capacity of more than 1200 gallons must be marked to note this fact.

General Requirements for LP-Gas Transfer Operations

Personnel

The individual(s) performing the LP-Gas transfer operations, filling or evacuating, must be properly trained (qualified) in LP-Gas handling procedures, procedures relevant and specific to the transfer operations, and emergency response procedures. Additionally, NFPA 58 requires that refresher training be provided **every three (3) years**, and that the training be documented.

During the transfer operation, from the time of original connection through the final disconnect, at least one qualified person must be in attendance. "In attendance" means that the individual must have line of sight of the transfer operation and be in a position to physically take action if required during the operation.

These persons are also responsible to ensure that the equipment and containers used in the transfer operations are designed for the type of LP-Gas that is being filled into the receiving container.

Furthermore, when these individuals observe non-compliant situations or conditions with respect to containers and their appurtenances, the container owner and user must be notified **in writing**.

Prohibitions

Compressed air, oxygen or any oxidizing gases cannot be injected into containers for the purpose of transferring LP-Gas liquid. These gases can create a flammable gas mixture within the container.

Similarly, when evacuating containers, no liquids or gases other than LP-Gas may be injected into the containers.

Ammonia Contamination

Brass fittings are commonly used in LP-Gas service. Ammonia will damage these brass system components by a corrosion phenomenon commonly called “season cracking” (a form of stress corrosion cracking), potentially resulting in unanticipated and premature failure.

Therefore, it is important that stored LP-Gas is essentially free of ammonia. The gas must be tested for ammonia and must contain quantities less than what will turn red litmus paper to blue. Furthermore, when a transportation or storage system is being converted from ammonia service to LP-Gas, it must be tested for ammonia contamination at the time of the initial fill.

Section Purpose and Objectives

NFPA 58-2004 requires that bulk plants and industrial plants have operating procedures that are documented and readily available (§14.2.1, 14.2.2 and 13.4.4). This section provides guideline operating procedures for bulk plant facilities and large volume storage systems, including startup, normal operation and shutdown.

Scope and Application of Section

While operating procedures are typically similar at LP-Gas bulk storage facilities, the equipment can vary in size (e.g., storage capacity), design, layout, equipment complexity or function (e.g., rail unloading facilities, cylinder filling operations, on-site commercial dispensers).

This handbook section should be considered to be a “template” for the operations conducted at any specific LP-Gas bulk storage facility, and additions or deletions to these procedures could be necessary. Therefore, owners or site management and supervisors should consider site-specific features and conditions that need to be included, modified or deleted in the information in this section in order to accurately reflect local operations and conditions. With these changes, operators, technicians, drivers and other site personnel can use this document as the operating procedures required by NFPA 58-2004.

Operating procedures for large-volume storage and vapor distribution systems at customer locations are also addressed in this section.

Although NFPA 58-2004 references the need for documented operating requirements with respect to refrigerated storage, marine and pipeline LP-Gas systems, these systems (which can vary significantly in design and complexity) come under the authority of other jurisdictions which have very specific and detailed requirements within EPA’s Risk Management Plan, OSHA’s Process Safety Management and US DOT’s Office of Pipeline Safety. Therefore, these systems are not addressed in this handbook.

Content of Section

The chart below is a guide for operators to easily identify which sections are appropriate for their specific applications. Applicable CETP modules are included in the table for easy reference to further instructional information and materials.

Topic	CETP Ref.	Handbook Sect. 5 Pages	Check, If Applicable
5.1 - Basic Bulk Plant			
5.1.1 - Bulk Storage Container	3.4.1	2 - 3	
5.1.2 - Loading a CTMV (Bobtail/Transport) Using a Plant Pump	2.2.4 & 2.3.3	3 - 7	
5.1.3 - Loading a CTMV (Bobtail/Transport) Using a Plant Vapor Compressor	2.2.5 & 2.3.4	7 - 11	
5.1.4 - Unloading a CTMV (Bobtail/Transport)	3.5.11	12 - 15	
5.1.5 - Unloading a Railcar	3.6	16 - 25	
5.1.6 - Preparing & Transporting DOT Cylinders	2.4	26 - 33	
5.1.7 - Preparing & Transporting ASME Containers	2.5	34 - 42	
5.1.8 - Evacuating LP-Gas from Containers	3.1.5 & 3.2.2	42 - 57	
5.1.9 - Purging Containers	3.2.3	57 - 60	
5.1.10 - Dispensing LP-Gas in a Bulk Plant	3.3	61 - 69	
5.2 - Vapor Distribution Systems	-	70 - 71	

5.1 Bulk Plant Operating Procedures

5.1.1 Bulk Storage Containers

Startup

1. Before beginning any operation ensure the transfer equipment is in good condition, the bulk storage container is safe to be filled, and the surrounding area is free from hazards that may constitute a source of ignition.

2. Ensure that all the appropriate manual valves (i.e., globe, angle, or ball) are open on the bulk storage containers.

3. If the container has manually operated internal valves, ensure that the emergency shutdown system is operational and that internal valves are opened.

    a. Pneumatically operated systems – ensure that there is adequate pressure (typically, 30-70 psig) and that the system is leak free.

    b. Cable operated systems – ensure that all cables are operational

Operation

1. Now the system is operational and is ready to:

   a. Fill a Cargo Tank Motor Vehicle (CTMV), more commonly referred to as a "**bobtail**" or "**transport**" – see subsections 5.1.2 and 5.1.3

   b. Unload a CTMV (bobtail or transport) – see subsection 5.1.4

   c. Unload a Railcar – see subsection 5.1.5

   d. Fill Containers/Cylinders – see subsections 5.1.6 and 5.1.7

   e. Evacuate Cylinders – see subsection 5.1.8

Shutdown

1. Ensure that all the appropriate manual valves (i.e., globe, angle, or ball) are closed on the bulk storage containers.

2. If the container has remotely operated internal valves, ensure that these valves are closed by releasing the pressure in emergency shutdown system or by pulling the cable for the system.

5.1.2 Loading a Cargo Tank Motor Vehicle (CTMV) Using a Plant Pump

Before the filling operation, the person loading the CTMV (bobtail or transport) should review the bulk plant layout and operating procedures.

Startup

1. Before moving the vehicle to the loading bulkhead, check for any obstacles that might create an unsafe condition.

2. Remove the chock blocks from the wheels and store them temporarily on the vehicle.

3. Check the PTO to ensure it is disengaged.

4. After starting the engine, ensure all instrumentation indicates normal operation.

5. Position the CTMV at the loading bulkhead in a way that maximizes the shearing effect of the hoses and piping should a pull-away occur. The fill connection on the cargo tank should be at least 10 feet from the nearest bulk storage container.

6. Engage the parking brake and turn off the engine.

7. Place chock blocks in front and behind a rear wheel to prevent movement.

Operation

1. After positioning the vehicle at the loading bulkhead, set and/or determine the liquid level gauges on the CTMV**.**

   [Note: The specific gravity for propane is assumed to be 0.508 when more accurate information is not available. However, if the temperature is unknown, the float gauge cannot be used to determine the set point. Consequently, the maximum permitted filling level of the cargo tank cannot be determined. Therefore, the fixed maximum liquid level gauge must be used to determine the maximum filling level.]

2. Before making the connection, make sure all sources of ignition within 25 feet of the transfer point are removed, consistent with the requirements in Section 4 of this handbook.

3. Put on Personal Protective Equipment per company policy.

4. Carefully check the liquid and vapor transfer hose assemblies.

5. Observe Emergency Shutoff equipment and pull-a-way protection. If any defect is found, discontinue the loading operation, notify your supervisor and do not resume loading until the defect has been eliminated. If another loading bulkhead is available, move to it after notifying your supervisor and ensuring that a warning notice is placed on the defective hose.

6. Ensure the liquid fill and vapor equalizing valves on the CTMV are closed. Remove the dust covers from the ACME connectors and inspect them for damage and wear. If necessary, replace any defective O-ring or flat gasket.

7. Ensure the liquid and vapor hose-end valves are closed. In accordance with company policy, operate the ESVs at the loading bulkhead to be sure they are functioning properly.

SAFETY	If the ESVs do not operate properly, do not connect the transfer hoses.

8. Connect the liquid plant hose-end valve to the fill valve on the CTMV. Carry it in the palm of your hand, pointed away from your body. Tighten the plant hose-end valve into the filler valve of the CTMV.

9. Once the hose end connector is hand-tight, turn the connector to "wrench tight" using a spanner wrench.

10. Slightly open the liquid hose end valve and check for leakage. If leakage exists, close the hose end valve and disconnect the ACME adapter after the

connection has bled down and is de-pressurized. Examine the condition of the O-ring or flat gasket in the filler adapter and replace as needed.

11. Examine the ACME threads on the hose end adapter and the CTMV filler connection. If either is excessively worn so that the connection leaks with a new O-ring or gasket, replace the worn fitting or adapter before proceeding.

12. Connect the vapor equalizing hose between the storage container and the CTMV. Follow the procedures used when connecting the plant liquid transfer hose.

13. DOT regulations and NFPA 58 require that LP-Gas be odorized when it is delivered to a bulk plant. These requirements also state that the presence of the odorant be determined at the time of delivery by sniff-testing or other means, and that the results be documented. Though it is not a regulatory requirement, propane marketers may also perform sniff tests when filling cargo tanks. Should a sniff test be performed during cargo tank loading, the following procedure can be used:

    - Vent a small quantity of liquid through a #54 vent (or a bleeder valve).
    - Close the vent and sniff immediately after the liquid vaporizes. .
    - If you can smell propane odorant, record your sniff test on your loading ticket, daily routing report, or other company form and proceed with the loading operation.

SAFETY	If you cannot smell propane odorant, do not load the CTMV. Contact your supervisor immediately after disconnecting and securing the transfer hoses in their storage racks. Further loading should be discontinued from the storage tank until the odorization problem is resolved.

14. During the transfer operation, a qualified person must be present at the transfer point to identify emergencies, monitor the condition of the transfer system and remain in attendance during the transfer period.

15. If applicable, insert a ticket in the plant meter and reset the register to zero.

16. Ensure all liquid and vapor valves are fully open in the transfer piping between the plant storage containers and the bulkhead.

17. Verify that all line valves are in their correct open or closed positions for liquid transfer from the bulk storage tank(s) to the CTMV.

18. Start the plant transfer pump. Listen for any unusual pump noise.

19. Check the venting of vapor at the fixed maximum liquid level gauge or correctly set the rotary gauge frequently to ensure that the vent is not blocked

by frozen moisture from the air.

20. Be alert for signs of erratic pump operation. If a leak or fire develops, perform emergency shutdown actions consistent with the emergency plans in Section 3 of this handbook.

SAFETY

If for any reason the transfer operation is interrupted, or the attendant must leave the area, the pump must be shutdown and transfer hoses disconnected. Do not leave transfer hoses connected to a CTMV if a qualified person is not in attendance.

21. If operations are normal, continue the transfer process until a steady white mist fog is first emitted from the liquid level gauge vent valve, then immediately shut down the pump, close the ESVs, the hose end valves and CTMV liquid and vapor fill valves.

Shutdown

1. Bleed down the gas trapped between the cargo tank filler valve and the transfer hose end valve and disconnect the liquid hose from the truck fill valve.
2. Bleed down the gas trapped between the cargo tank vapor return valve and the vapor equaling hose end valve and disconnect the vapor hose from the vapor equalizing valve on the truck.
3. Replace the dust caps on the truck fill and vapor equalizing valves.
4. Replace the dust caps on the liquid and vapor hose-end valves. Store the hoses as required.
5. If applicable, operate the reset lever on the plant meter so that it stamps the loading ticket.
6. Fill out any company inventory forms and process them as required.
7. Before removing the chock blocks, walk around the CTMV and check for any obstacles that may be in its path. When determined to be clear, remove the chock blocks and store them on the vehicle.
8. Move the vehicle only after it has been determined the path is clear and any discharge of propane has dissipated.

5.1.3 Loading a Cargo Tank Motor Vehicle (CTMV) Using a Plant Compressor

Before the filling operation, the person performing the filling operation should review bulk plant layout and operating procedures.

Startup

1. Position the CTMV at the loading bulkhead with the fill connection on the cargo tank at least 10 feet from the nearest storage container.
2. Set the vehicle parking brake.
3. Shut down the engine.
4. Place chock blocks in front and behind a rear wheel to prevent movement of the vehicle.
5. Examine the plant piping and flow control valves. Determine how vapor will move from the bulk storage tank(s) to the suction side of the compressor and on to the cargo tank. Figure 5.1.3a illustrates typical bulk plant compressor connections, while Figure 5.1.3b illustrates the compressor 4-way valve positions for loading, unloading and vapor recovery. The chart below the illustrations gives the typical operating status of valves for the bulk plant connections illustrated for loading the cargo tank.

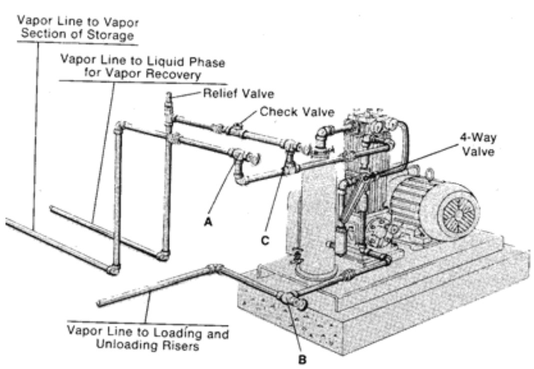


Figure 5.1.3a.
Compressor and Bulk Plant Connections

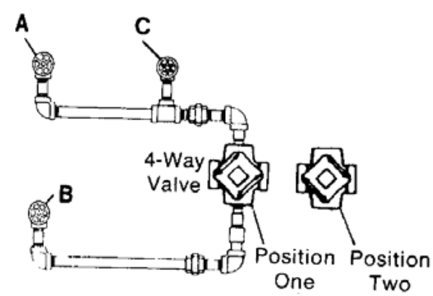


Figure 5.1.3b
4-Way Valve Positions

Operation of Valves for Cargo Tank Loading

4-Way Valve	Valve A	Valve B	Valve C
Position Two	Open	Open	Close

Operation

1. Set and/or determine the liquid level gauges on the CTMV.

   [Note: The specific gravity for propane is assumed to be 0.508 when more accurate information is not available. However, if the temperature is unknown, the float gauge cannot be used to determine the set point. Consequently, the maximum permitted filling level of the cargo tank cannot be determined. Therefore, the fixed maximum liquid level gauge must be used to determine the maximum filling level.]

2. Before making the connection, make sure all sources of ignition within 25 feet are removed, consistent with the requirements in Section 4 of this handbook.

3. Put on Personal Protective Equipment per company policy.

4. Carefully inspect the liquid and vapor transfer hose assemblies.

5. Observe Emergency Shutoff valves and Pull-a-way protection. If any defect is found, discontinue the loading operation, notify your supervisor and do not resume loading until the defect has been eliminated. If another loading bulkhead is available, move to it after notifying your supervisor and ensuring that a warning notice is placed on the defective hose.

6. Ensure the fill and vapor equalizing valves on the cargo tank are closed. Remove the dust covers from the valve connectors. Inspect the valve connectors for damage and wear; and if necessary, replace any defective O-ring or flat gasket.

7. Ensure the liquid and vapor hose-end valves are closed. Operate the emergency shutdown valves (ESVs) at the loading bulkhead to be sure they are functioning properly.

SAFETY	If the ESVs do not operate properly, do not connect the transfer hoses.

8. Connect the liquid plant hose-end valve to the fill valve on the cargo tank. Carry it in the palm of your hand pointed away from your body. Tighten the plant hose-end valve into the filler valve of the transport by gently moving the hose-end valve up and down while turning the ACME connector.
9. Once the connector is hand-tight, turn the connector to being “wrench tight” using a spanner wrench.
10. Slightly open the liquid hose end valve and check for leakage. If leakage exists, close the hose end valve and disconnect the ACME adapter after the connection has bled down and is de-pressurized. Examine the condition of the O-ring or flat gasket in the cargo tank filler adapter and replace as needed.

11. Examine the ACME threads on the hose end adapter and the transport filler connection. If either is excessively worn so the connection leaks with a new O-ring or gasket, replace the worn fitting or adapter before proceeding with the loading operation.

12. Connect the vapor equalizing hose between the storage container and the CTMV. Follow the procedures used when connecting the plant liquid transfer hose with the exception of the use of the spanner wrench.

13. DOT regulations and NFPA 58 require that LP-Gas be odorized when it is delivered to a bulk plant. These requirements also state that the presence of the odorant be determined at the time of delivery by sniff-testing or other means, and that the results be documented. Though it is not a regulatory requirement, propane marketers may also perform sniff tests when filling cargo tanks. Should a sniff test be performed during cargo tank loading, the following procedure can be used:

    - Vent a small quantity of liquid through a #54 vent (or a bleeder valve).
    - Close the vent and sniff immediately after the liquid vaporizes.
    - If you can smell propane odorant, record your sniff test on your loading ticket, daily routing report, or other company form and proceed with the loading operation.

SAFETY	If you cannot smell propane odorant, do not load the CTMV. Contact your supervisor immediately after disconnecting and securing the transfer hoses in their storage racks. Further loading should be discontinued from the storage tank until the odorization problem is resolved.

14. Inspect the compressor and check the crankcase oil level in the sight glass or by using the dipstick.

15. Open the vent on the compressor's liquid trap to verify that liquid is not present in the vapor hose and suction line. Liquid may severely damage the compressor and ultimately produce leaks at the head gasket or oil sump.

16. Verify the 4-way valve is in the proper position for loading the CTMV and check all in-line valves and bulk tank valves for their proper open or closed position.

17. Ensure that all shutoff valves are open in the liquid transfer, vapor suction and vapor discharge hoses.

18. Start the compressor in accordance with manufacturer's instructions. Check the pressure gauges for excessively high exhaust or excessively low intake pressure. If either occurs, stop the compressor and correct the problem

before continuing. Check the sight glass or flow indicator to make sure liquid is flowing through the system.

19. During the transfer operation, a qualified person must be present at the transfer point to identify emergencies, monitor the condition of the transfer system and remain in attendance during the transfer period.

20. Verify the proper filling set for the cargo tank, using the thermometer reading and the liquid level gauge index.

21. Monitor the cargo tank filling and stop the compressor when the proper liquid level is reached, or if any abnormal operating condition is noticed.

Shutdown

1. Close all valves in the transfer hoses.

2. Close all valves in both the suction and discharge vapor piping circuits. Close the ESV(s) at the transfer bulkhead and the appropriate liquid and vapor valves in the bulk storage tank(s), if applicable.

3. Bleed down the gas trapped between the cargo tank filler valve and the liquid transfer hose end valve.

4. Disconnect the liquid hose from the CTMV fill valve.

5. Bleed down the gas trapped between the vapor return valve and the vapor equalizing hose end valve.

6. Disconnect the vapor hose from the vapor equalizing valve on the transport.

7. Replace the dust caps on the fill and vapor equalizing valves.

8. Replace the dust caps on the liquid and vapor hose-end valves.

9. Store the hoses as required.

10. If applicable, operate the reset lever on the plant meter so that it stamps the loading ticket.

11. Fill out any company inventory forms and process them as required.

12. Before removing the chock blocks, walk around the CTMV and check for any obstacles that may be in its path. When determined to be clear, remove the chock blocks and store them on the vehicle.

13. Move the truck only after it has been determined the path is clear and any discharge of propane has dissipated.

SAFETY	If for any reason the transfer operation is interrupted, or the attendant must leave the area, the compressor must be shutdown and transfer hoses disconnected as noted in the above steps. Do not leave transfer hoses connected to a CTMV if a qualified person is not in attendance.

5.1.4 Unloading a Cargo Tank Motor Vehicle

Procedures for liquid transfer operations at LP-Gas bulk storage tanks from transports are based on common industry practices, manufacturer's instructions, and provisions listed in NFPA 58-2004 and U.S. DOT cargo tank unloading regulations. Furthermore, the major steps in the unloading procedures will vary according to the emergency discharge system used on the CTMV.

These procedures are designed to be as universal as possible and are to be used as a guide only and do not replace company policies or federal, state or local codes. Be sure to check company policy and state and local codes before beginning the unloading operation. Before the unloading operation, you should review bulk plant layout and operating procedures. Make sure you are familiar with the bulk plant equipment, piping functions, and company operating procedures.

US Department of Transportation Requirements

U.S. Department of Transportation requirements for drivers and operators unloading cargo tank motor vehicles (CTMV) are set out in several sections of the Code of Federal Regulations. The principal requirements can be found in the following references:

- Unloading Attendance Requirements – 49 CFR 177.834
- CTMV Safety Check – 49 CFR 177.840(m)
- Unloading Procedures* – 49 CFR 177.840 (q)
- Emergency Discharge Control – 49 CFR 178.337-11, 173.315(n)

** for cargo tanks with capacities larger than 3500 water gallons, and cargo tanks in other than metered delivery service*

US DOT unloading rules include:

1. A qualified person must be in attendance at all times during unloading.

2. A person is "qualified" if he or she has been made aware of the nature of the hazardous material which is to be loaded or unloaded, has been instructed on the procedures to be followed in emergencies, is authorized to move the cargo tank, and has the means to do so.

3. The qualified person attending the unloading operation must be awake and remain within **25 feet** of the cargo tank when the CTMV internal self-closing stop valve is open.

4. The qualified person attending the unloading operation must have an unobstructed view of the cargo tank and delivery hose to the maximum

extent practicable, except during short periods when it is necessary to activate controls or monitor the receiving container.

New transport cargo tanks placed into service after July 1, 2001, must be equipped with either a passive emergency shutdown system or, if the transport is used in metered delivery service, a remote (radio frequency) shutdown system with a query feature for unloading operations lasting more than 5 minutes. Cargo tanks that are used in **both** metered **and** non-metered service must have **both** types of emergency shutdown systems.

Startup

1. Inspect the transfer area, before giving the driver the signal to enter the plant area.

2. Spot the CTMV (most commonly, a “transport”) and guide it into position at the unloading bulkhead. To prevent unnecessary wear on the PTO (power take-off) drive shaft and the pump during unloading, the centerlines of the tractor and trailer should coincide.

3. Set the brakes and turn off all electrical devices.

4. Set the chock blocks at the front and back of one of the tractor drive wheels.

5. If applicable, check with company policy for procedures to follow if a water or ammonia test is required.

Operation

1. Determine the maximum amount of LP-Gas to be transferred to the plant storage tanks. In most cases, a transport will arrive only when there is enough room in the plant storage tank(s) for the entire load of LP-Gas. To avoid accidentally overfilling the storage tank(s), calculate the maximum amount of LP-Gas that can be added safely.

2. Review and follow company procedures for checking the operation of the ESVs and pull-a-way protection installed in the plant. If the ESVs will not operate properly, do not continue the transfer operation. Notify the bulk plant’s manager or supervisor.

3. Check the manual shutoff valves on the transport liquid and vapor connections to be sure they are fully closed. Slowly remove the dust caps.

4. Remove the dust caps from the connectors on the transfer hoses. Check the connectors to be sure they are clean. Check the O-rings on the valve connectors to be sure they are in good condition. If necessary, clean the connectors with a rag and replace worn, flattened, or damaged O-rings before making connections to be transport.

5. Conduct a visual inspection of delivery hose deployed during each unloading operation. Rejection criteria include exposed reinforcement, permanently deformed wire braid reinforcement, soft spots, bulging, loose outer covering, damaged couplings, and loose/missing/corroded bolts.

6. Connect hoses between the transport and the bulkhead. When using ACME connectors, spin on the connectors until they are hand-tight. While tightening the connectors, move the hose or hose end valve up and down slightly to prevent the threads from seizing. When each connection is hand-tight, tighten it to “wrench tight” with a hook spanner. Never bang on the connector with the dust cap, a hammer, or other device.

7. Check each connection for leaks by isolating it from the system and charging it with LP-Gas. If any connection leaks, close all valves and retighten the connection. If the leak persists, examine the condition of connection o-rings or gaskets, and replace them if they are defective.

SAFETY	Do not transfer liquid if leaking LP-Gas is present.

8. Verify that the LP-Gas being delivered to the bulk plant is odorized by conducting a sniff test or other means, and document the results.

9. When all valves are fully open, start the pump by engaging the PTO. Listen carefully for sounds of erratic pump behavior and check the sight gauge or flow indicator to be sure liquid is flowing through the system.
   [Note: If an excess-flow valve slugs shut, stop the pump; then, reopen the excess-flow valve by equalizing pressure across the valve before continuing.]

10. Unload the transport tank. Remember that a qualified person must be present during the entire transfer operation to handle emergencies and monitor the condition of the transfer system. Monitor the liquid level gauges in the plant storage tanks carefully during the operation. If possible, equalize pressure between the transport and the plant storage tank.

11. When a tank reaches its maximum permitted filling level, stop the pump and adjust the valves in the plant piping to route the remainder of the load to another tank.

Shutdown

1. When the plant storage tank reaches its maximum permitted filling level or the transport tank is empty, stop the pump and immediately close all liquid and vapor lines involved in the transfer operation.

2. Bleed down and disconnect the hoses. Store them away as necessary.

SAFETY

Caution: Never disconnect any hose until the LP-Gas trapped in the connection has been safely bled off. This should be done through either the bleeder valve on the hose-end valve or a pipe-away adaptor in the transport or bulkhead connections.

3. Replace all caps on hose-end valves and on transport and plant liquid and vapor connections.

4. Complete the plant unloading form, any necessary accounting forms, and the return bill of lading.

5. Check to be sure that all bulkhead or transport hoses have been disconnected and securely stored and that all valves are tightly closed and capped.

6. Before removing the chock blocks, walk around the CTMV and check for any obstacles that may be in its path. When determined to be clear, remove the chock blocks and store them on the vehicle.

7. Move the truck only after it has been determined the path is clear and any discharge of LP-Gas has dissipated.

5.1.5 Unloading a LP-Gas Railcar Using the Plant Compressor

Procedures for liquid transfer operations at LP-Gas bulk storage tanks from a railcar are based on common industry practices, manufacturer's instructions, and provisions listed in NFPA 58-2004 and U.S. DOT regulations. These procedures are designed to be as universal as possible and are to be used as a guide only and do not replace company, federal, state or local codes. Check company policy and state and local codes before beginning the unloading operation.

Before the unloading operation, you should review bulk plant layout and operating procedures. Make sure you are familiar with the bulk plant equipment, piping functions, and company operating procedures.

US Department of Transportation Requirements

DOT regulations require employers to train and test every employee directly involved in the transportation of hazardous materials, including personnel who inspect, load or unload pressurized railcars used in LP-gas transportation.

Some specific regulations that are relevant include:

- Qualifications, Maintenance, and Use of Railcars - 49 CFR 173.31
- Training and Security Plans - 49 CFR 172, Subparts H and I
- Carriage By Rail - 49 CFR Part 174, Subparts A, B and C
- Specifications for Railcars - 49 CFR 179.7
- Quality Assurance Program - 49 CFR 179.7
- Requirements for Inspection and Test of Specification - 49 CFR 180.509

Other regulations or standards adopted by reference that may apply include:

- Association of American Railroads, *Manual of Standards and Recommended Practices, Section C, Part III, Specifications for Tank Cars (M-1002)*
- Association of American Railroads, *Field Manual of the Interchange Rules, (#70, 88, 89, and 90)*
- Canadian General Standards Board, CAN/CGSB 43.147-2005, *Construction, Modification, Qualification, Maintenance and Selection and Use of Means of Containment for the Handling, Offering for Transport, or Transporting of Dangerous Goods by Rail*

Startup

1. Check to ensure that the following conditions exist:

    - Railcar wheels are chocked.
    - Railcar brakes are set.
    - Derailer is set to the derailing position.
    - Railcar and spur entrance(s) are flagged (including Blue and White "**STOP - TANK CAR CONNECTED**" sign).

2. Climb the unloading riser and lower the platform to gain access to the dome and tank car openings.

3. Be sure the platform is properly seated and secured before crossing over to the tank car. Exercise caution when climbing or working on the riser, especially in wet or icy weather.

4. Before opening the dome, be sure that all sources of ignition have been removed from the area as outlined in Section 4. Also, avoid creating sparks when opening or working in the dome.

SAFETY

Caution: If one of the fittings is leaking, the dome might be filled with LP-Gas vapor.

5. Put on Personal Protective Equipment.

6. Inspect the rail car for:
    - Shipping name of product -2 sides
    - Reporting markings – 4 sides
    - Tank Car Classification – 2 sides
    - Safety valves and tank test information – 2 sides
    - Placarding – 4 sides
    - All valves closed
    - All valves plugged and wrench tight
    - Valves free of corrosion
    - Bolts and nuts present and secure
    - Protective valve housing secure
    - No corrosion or damage on relief valve.

7. If the inspection reveals an unsafe condition that cannot be corrected, notify the bulk plant manager or supervisor. In most cases, a “bad order” tag must be filled out to notify the shipper of the problem.

8. Rail Car contents must be verified with Shipping Paper before making hose connections.

9. Gauge the contents of the railcar by using the slip tube gauge. First, open the bleeder valve at the top of the gauge and raise or lower the tube until a white plume of mist vents out of the bleeder orifice indicating that the slip tube is in contact with liquid LP-Gas. A series of graduated markings on the slip tube indicates the distance in inches and feet from the top of the tank to the surface of the liquid, also known as the "outage" of the railcar.

SAFETY	The slip tube is always under high pressure and can cause serious injuries if it springs up quickly or unexpectedly. Therefore, always exercise caution when working around the slip tube gauge by standing to the side of the slip tube gauge before releasing the brake or safety catch.

10. Once the outage of the railcar is read, convert the outage to gallons by using the outage table (sometimes called a “strapping chart”) furnished by the shipper or railcar manufacturer.

WARNING	Even a relatively small error in reading the slip tube gauge can make a large difference in calculating the number of gallons in the tank. Therefore, it is important to measure the railcar outage at least twice to be sure of getting an accurate reading.

11. Determine the maximum amount of LP-Gas that can be transferred to the plant bulk storage tanks. To avoid accidentally overfilling the tank, calculate the maximum amount of LP-Gas that can be safely added.
    Even if the plant has more than one storage tank, determine how much LP-Gas can be safely added to each tank. If a single tank will not hold the entire load, use calculations to distribute the load and notify the bulk plant manager or supervisor.

    Gauge the contents of the plant storage tank with the rotary or float gauge installed in the tank head. Record the reading on the company form or on a worksheet.

    If there is more LP-Gas in the railcar than the plant tank(s) will hold safely, notify the bulk plant manager or supervisor.

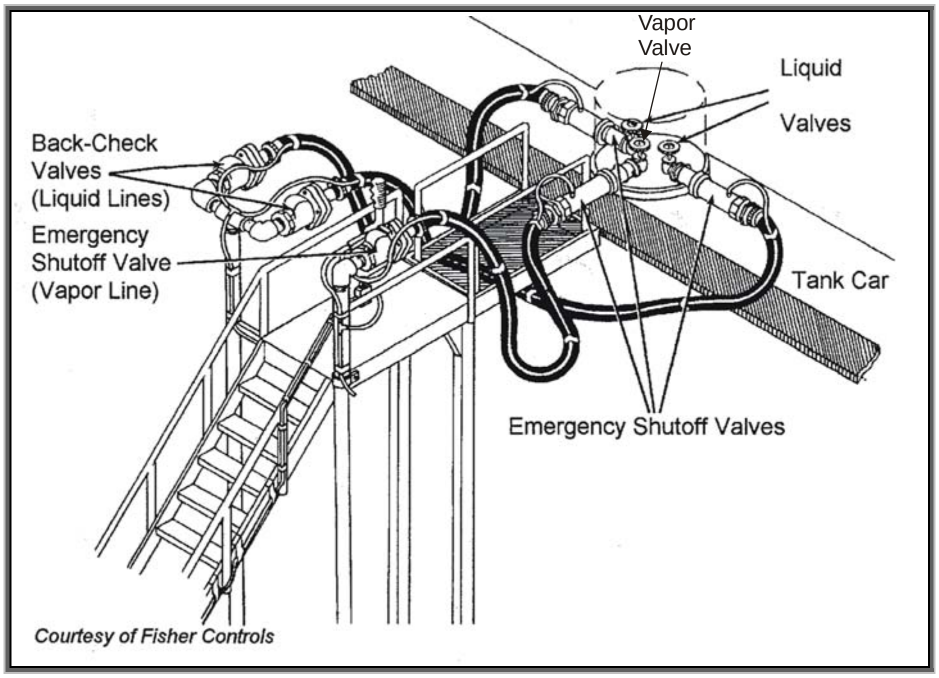


Figure 5.1.5a – Typical Railcar Riser with ESVs

12. Before connecting the liquid and vapor transfer hoses between the railcar and the unloading riser, check the manual shutoff valves on the railcar liquid and vapor connections to make sure they are fully closed. Then, carefully remove the plugs.

SAFETY	LP-Gas may vent around the plug threads for a short time. Wear heavy vinyl safety gloves throughout the operation. Keep face and other parts of the body away from the valve opening. If LP-Gas continues to vent around the plug threads, the manual shutoff valve may be faulty. Retighten the plug and notify the bulk plant manager or supervisor.

13. Install the ESVs in the liquid and vapor valves. It may be necessary to install stubs (schedule 80 pipe nipples) before installing the ESVs. Thread the ESVs into the valve opening until they are hand tight. Then, tighten them with the appropriate wrench until they are securely seated. Once installed, open the ESVs in accordance with company procedures.

14. Remove the dust caps from the connectors on the riser hoses. Check the connectors to be sure they are clean. Check the O-rings on the ESV or unloading stub to be sure they are in good condition. If necessary, clean the connectors with a rag and replace worn, flattened, or damaged O-rings.

15. Connect the hoses to the railcar stubs or ESVs (whichever is applicable) by spinning on the ACME connectors until they are hand tight. As the

connectors are tightened, move the hose or hose-end valve up and down slightly to prevent the thread from seizing. When each connection is hand tight, tighten it an additional 1/8 turn with a hook spanner.

16. Check the ESVs at the riser by opening and closing them according to plant test procedures. Be sure the remote operators are working properly and that all fusible links are intact. If the ESVs will not operate properly, do not continue the transfer operation. If possible, correct the problem. Otherwise, notify the bulk plant manager or supervisor.

17. Check each connection for leaks by opening and closing the manual shutoff valve at the railcar to charge the connection with LP-Gas.

18. If using ESVs instead of unloading stubs, open the ESV to charge and test the hose connection. If there are any connection leaks, close all valves and retighten the connection. If the leak continues, notify the bulk plant manager or supervisor.

Operation

A qualified person must be present at all times during the entire transfer operation to monitor the condition of the transfer system and to handle emergencies. Otherwise, the operation must be shut down and hoses disconnected.

If a release or fire develops at any time during the operation, close all ESVs immediately and stop the compressor. Refer to Section 3 of this handbook and company procedures to handle the situation.

Be alert for signs of erratic compressor operation. If a problem develops, shut down the operation and correct it before continuing.

1. Open the vapor valves at the railcar riser. Then, open all valves in the liquid line, starting at the manual shutoff valves on the railcar and working toward the plant storage tank(s). Allow as much liquid as possible to drift between the two tanks. Open the remaining valves in the vapor line. Open all valves slowly to prevent the excess-flow valves from slugging.

2. Check to be sure the four-way valve and the plant valves have been set so that the compressor will remove vapor from the plant storage tank and discharge it into the railcar. Figures 5.1.5b and 5.1.5c illustrate the compressor 4-way valve and piping positions for unloading in a *typical* bulk plant. Plant piping might vary. Verify the proper valve positions and operating procedures for each bulk plant.

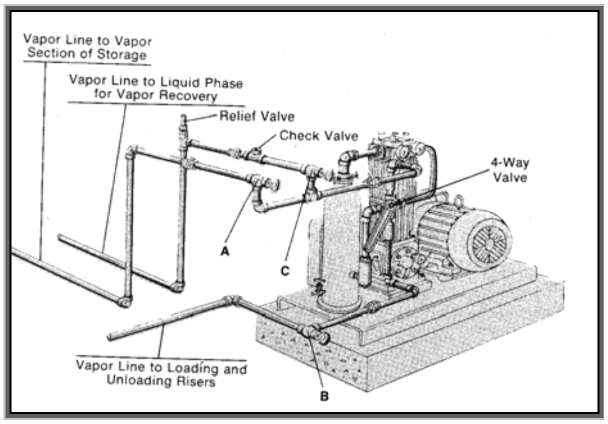


Figure 5.1.5b
Compressor & Bulk Plant Connections and Valves

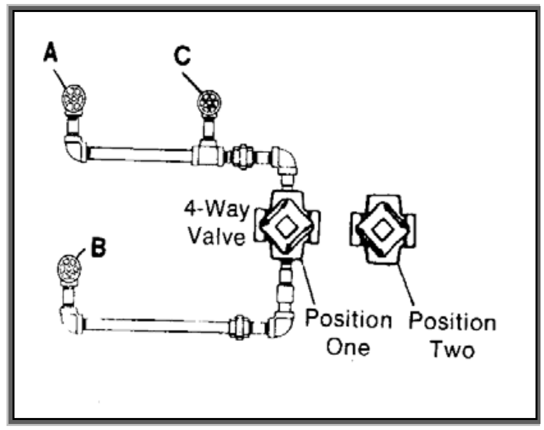


Figure 5.1.5c

4-Way Valve Positions

Operation of Valves for Cargo Tank Unloading

4-Way Valve	Valve A	Valve B	Valve C
Position One	Open	Open	Close

3. Open the vent on the compressor's liquid trap to verify that liquid is not present in the vapor hose and suction line. Liquid may severely damage the compressor and ultimately produce leaks at the head gasket or oil sump.

4. Start the compressor and check the pressure gauges for excessively high exhaust or excessively low intake pressure. If either occurs, stop the compressor and correct the problem before continuing. Check the sight glass or flow indicator to make sure liquid is flowing through the system.

5. When the plant storage tank reaches its maximum permitted filling level or the railcar is empty, close all valves in the liquid line and stop the compressor.

6. Reverse the four-way valve and adjust the plant piping manifold so the compressor will withdraw vapor from the railcar and force it through the liquid space of the plant storage tank (refer to Figures 5.1.5b and 5.1.5c). Restart the compressor and check the pressure gauges for excessively high discharge or excessively low intake pressure. If either occurs, shut down the compressor and correct the problem before continuing.

Operation of Valves for Cargo Tank Vapor Recovery

4-Way Valve	Valve A	Valve B	Valve C
Position Two	Close	Open	Open

Shutdown

1. At the end of the vapor recovery operation, close all valves in the vapor line and shut down the compressor.

   [Note: Some plants shut down the compressor when the discharge pressure rises to four times the intake pressure. Others stop vapor recovery operations when the intake pressure drops to 50 psi in the summer or 30 psi in the winter. Under some conditions plants will also shut down their compressors, if the intake pressure drops less than 10 psi during 15 minutes of operations. Check with your supervisor for the proper guidelines to follow.]

2. To ensure that the railcar is totally unloaded, open the sample valve. If liquid escapes, it might not be fully unloaded. Resume unloading operations until the railcar is totally un-loaded.

3. Close all railcar discharge valves, ESVs, and transfer hose-end valves.

4. Vent the LP-Gas trapped between valves, stubs and hose couplings. When the connections are fully de-pressurized, disconnect the transfer hoses.

5. Remove the railcar unloading nipples (or “stubs”) that are screwed into the railcar valve outlets.

6. Replace all railcar valves openings and tighten as appropriate.

7. Replace and secure all covers over fittings.

8. Check to be sure there is no liquid left in the railcar by partially opening the sampling valve.

9. Bleed down and disconnect the hoses at the riser. Never disconnect any hose until the LP-Gas trapped in the connection has been safely bled off.

10. Replace all dust caps and store the hoses.

11. Remove the unloading stubs or ESVs from the railcar, and replace the plugs in the liquid and vapor valve openings.

12. If any railcar defects were found during the unloading operation, complete a “Bad Order Tag” (see Figure 5.1.5d) and attach it to one of the sampling valves.

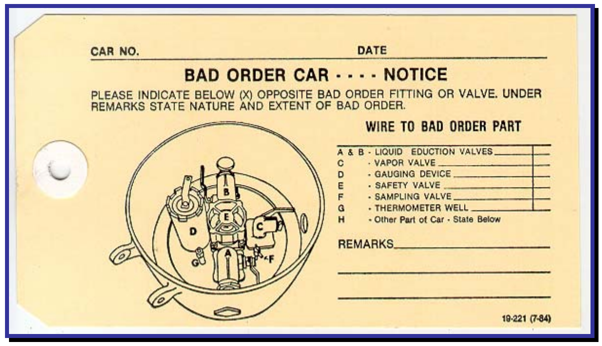


Figure 5.1.5d - "Bad Order Tag"

13. Lower the dome cover and secure it appropriately.

14. Stow all transfer hoses and fittings and raise the unloading riser platform to its stored position.

15. Remove and store the warning signs, chock blocks and reset the derail from the derailing position.

Do not release the hand brake on the railcar. This will be done by railroad personnel when the railcar is picked up.

16. Prior to releasing for return shipment verify the following:
    - Shipping name of product – 2 sides
    - Reporting markings – 4 sides
    - Tank Car Classification – 2 sides
    - Safety valve and tank test information -2 sides
    - Placarding – 4 sides
    - All valves closed
    - All valves plugged and wrench tight
    - Empty Tank Car Return Billing instructions completed
    - Valves free of corrosion
    - Bolts and nuts present and secure
    - Protective valve housing secure
    - No corrosion or damage visible on relief valve.

17. Take an extra look around the railcar and unloading site to make sure everything is safe and secure.

SAFETY

CAUTION: Whether loaded or unloaded, a railcar is hazardous. Unless it has been thoroughly purged and cleaned, all safety and hazardous materials handling regulations must be observed.

18. Complete a Railcar Return Instructions Form and deliver the form to the rail carrier representative (see sample form in Figure 5.1.5e). This form must be prepared, signed and presented to the rail carrier representative for their signature before the railcar is released.

SAFETY

The LP-Gas marketer should use reasonable care to provide a safe and secure environment for the railcar, from the time the railcar return form is used to notify the railroad company agent that the car is ready to be picked up until the time it is actually removed from the siding.

TANK CAR RETURN INSTRUCTIONS

ORIGINAL

DATE 1-15-02

CAR/CARS

INITIAL	NUMBER
MBLOX	93372

Loaded at Gas Producing Company

On 1-15-02

To Consignee Propane Heat, Inc

Railroad Agent NS-ATLA/CSXT

Forward To GAS PRODUCING COMPANY
DESMOND, MS

Routing Via CSXT-ATLA-NS

DATES

Notified of Arrival
Received on Switch
Finished Unloading
Removed from Switch

DESCRIPTION:
RESIDUE, LAST CONTAINED

(FLAMMABLE GAS),
PLACARDED FLAMMABLE GAS
STCC CODE
CONTAINS OIL

For help in chemical Emergencies involving spill, Leak, fire, or exposure, call 800-424-9300 Day or Night

EXEMPTION: DOT - E 7616

INSTRUCTIONS:
WHEN TANK CAR IS UNLOADED, CLOSE DISCHARGE VALVES AND REPLACE PLUGS IN TANK CAR VALVE OPENINGS, LOWER DOME COVER AND SECURE WITH PIN. APPLY PROPER PLACARDS. IMMEDIATELY AFTER UNLOADING THE ABOVE CAR/CARS, SIGN, DATE AND DELIVER (DO NOT MAIL) THESE INSTRUCTIONS TO THE RAILROAD AGENT FOR SIGNATURE. FURNISH ALL INFORMATION WHICH IS IMPORTANT FOR OUR RECORDS. INFORMATION SHOULD BE ACCURATE.

SHIPPER OF CAR

Signed
Per
Date

RAILROAD AGENT'S ACKNOWLEDGEMENT

Signed
Per
Date

REMARKS: If any part of tank or appliances are in bad order, describe the nature of the Defect. State cause if possible.

Figure 5.1.5e - Sample Railcar Return Instructions Form

5.1.6 Preparation and Transportation of DOT Cylinders

This section provides general guidance for the preparation of cylinders being shipped from a bulk plant. For complete details and procedures that fully describe the associated regulatory requirements, refer to 49 CFR 173, the Compressed Gas Association publication CGA-6, *Standard for Visual Inspection of Steel Compressed Gas Cylinders*, 1993, and ANSI/CGA C-6.3, *Guidelines for Visual Inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders*, 1991.

Cylinder Inspection

Prior to filling cylinders at the bulk plant, cylinders that have been in service must be inspected to determine their fitness for continued service. Specifically, DOT regulations stipulate that no individual is allowed to fill a cylinder that is overdue for periodic requalification with a hazardous material and then offer it for transportation.

Before each filling of a cylinder, the individual filling the cylinder must visually inspect the outside of the cylinder. A cylinder that has any of the following characteristics cannot be filled and offered for transportation:

- A crack or leak.
- Bulging.
- A defective valve.
- A leaking or defective pressure relief device.
- Evidence of physical abuse.
- Fire or heat damage.
- Detrimental rusting or corrosion.

Requalification of Cylinders

Any cylinder that is due for requalification cannot be refilled and offered for transportation until it is requalified using methods prescribed by DOT. In jurisdictions that have adopted NFPA 58-2001 (without exceptions or modifications to §2.2.1.5), there is no distinction between cylinders that are transported in commerce and those that are not with respect to the cylinder requalification requirement. Beginning with the 2004 edition, cylinders that are in stationary service and filled on-site are permitted to undergo a visual inspection (§5.2.3.1) instead of requalification.

Specific to requalification requirements, all cylinders received at a bulk plant must be checked for:

- Requalification Due Date

  Three requalification methods are used to verify DOT cylinder fitness for continued service. The method used determines when the cylinder is next due for requalification.

Requalification date markings consist of numbers designating the month and year of the last requalification, followed by a letter or blank to signify the requalification method used (see Table 5.1.6a).

Letter After Year Stamp	**Requalification Method**	**Next Requalification Due** (years)
None	Volumetric Expansion Test	12
S	Proof Pressure Test	7
E	External Visual Inspection (CGA Inspection Method)	5

Table 5.1.6a - DOT Cylinder Requalification Periods

For example, a DOT cylinder marked 10 01E is due for requalification before or during October 2006. The cylinder may require requalification before its due dates if it is damaged or subjected to physical abuse, excessive corrosion or heat. Cylinders that have been exposed to fire must be immediately removed from service.

As of May 31, 2004, a Requalification Identification Number also appears with the Requalification Date. The RIN will be either a 4 character or 7 character RIN consisting of letters and numbers.

- The 4 character RIN will have a letter and a number above the Requalification Date and 2 numbers under the Requalification Date, as shown below.

A1

5 04 x

3 2

<u>Where</u>:
"5" is the month of requalification;
"A123" is the RIN;
"04" is the year of requalification (2004);
"X" represents the symbols described in paragraphs (f)(2) through (f)(7) of 49 CFR 180.213.
{Note: Characters not to scale in size.}

- The 7 character RIN will appear as a letter and 6 numbers all appearing either over, under or before the Requalification Date (see examples below).

V100001
0504 E -or-

0504 E
V100001 -or-

V100001 0504 E

<u>Where</u>:"V10001" is the RIN; "0504" is the month and year of requalification; "E" represents external visual inspection.

- <u>Components to Check for Continued Service</u>
  - Proper cylinder valve protection
  - Filler valves and weather caps
  - Valve hand-wheels
  - Valve stem leaks
  - Relief valves
  - Quick-closing couplings on motor fuel cylinders
  - Fixed maximum liquid level gauge
  - Float gauges
  - Foot rings and welds
  - Evidence of ammonia contamination
  - Any abnormal conditions reported by the customer

If valve or fitting replacement is necessary, or requalification is required, the cylinder should be moved to a designated area for that purpose.

Only facilities with a Requalification Identification Number issued by Federal Motor Carrier Safety Administration are allowed to perform a DOT specification cylinder requalification. Check with your supervisor.

<u>Safety Considerations for Storing and Processing DOT Cylinders</u>

Cylinders should be arranged so that any cylinder can be accessed in the event of a service valve or other leak. Proper valve protection should be maintained at all times. Also, cylinders should be stored so that cylinder relief valve discharges are not directed at the service valves of adjacent cylinders in order to limit the extent of damage and the hazards to persons and property in the event of a relief valve discharge and fire.

<u>Checking for Proper Cylinder Labeling</u>

Cylinders that contain LP-Gas should be labeled to indicate their contents in compliance with DOT hazardous material transportation regulations (see Figure

5.1.6a). Cylinders may be checked for proper labeling as part of the inspection process.

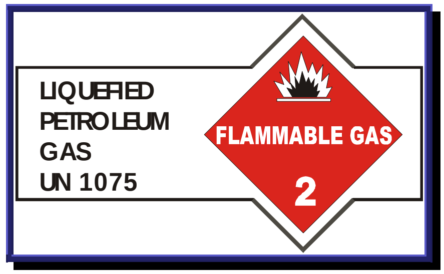


Figure 5.1.6a – DOT Label

New Cylinder Inspection

When new DOT cylinders arrive, they should be inspected to ensure that they are not damaged and are acceptable for LP-Gas service. Important items to check are:

- DOT and NFPA 58 required markings
- Proper DOT Specification and Service Pressure (minimum 240 psig)
- Tare Weight
- Water Capacity
- Manufacturer Name or Mark and Serial Number
- Manufacturer Test Date
- Relief Valve Start-to-Discharge Pressure (375 psig)
- Customer Information Labels
- Proper Valve Protection (neck ring or cap)
- Proper Foot Ring Attachment
- Motor Fuel Cylinders
    - Relief Valve Weather Cap
    - Proper Relief Valve Discharge Orientation (away from the industrial truck operator)
    - Weather Cap on Filler Valve
    - Quick-Closing Coupling on Service Valve
- Stationary Cylinders
    - Relief Valve Weather Cap
    - Weather Cap on Filler Valve

Purging New Cylinders of Air

Before liquid LP-Gas is introduced into new cylinders, it is necessary to purge them of air and moisture. Some cylinder manufacturers pre-purge new cylinders (including vacuum purging) before they are shipped. Refer to subsection 5.1.8 of this handbook for further information.

Preparing and Loading LP-Gas Cylinders on the Delivery Vehicle

When delivering LP-Gas cylinders to residential or industrial customers, the driver is responsible for the delivery vehicle and for transporting cylinders safely and efficiently. Cylinders and their valves and fittings must be leak-free before being loaded onto vehicles. Various kinds of equipment are designed and used to lift the cylinders on and off the delivery vehicle, and to secure them while being transported. Regular inspection and maintenance of the delivery vehicle, its equipment, and the cargo is also required.

Protecting the Cylinder Valves and Fittings

The transportation of cylinders must include protection against physical damage to the cylinder valves and fittings while in transit.

For cylinders manufactured after October 1, 2007, a cylinder must have its valves protected by one of the following methods:

- By equipping the cylinder with securely attached metal caps of sufficient strength to protect valves from damage during transportation; or
- By constructing the cylinder so that the valve is recessed into the cylinder or otherwise protected (e.g., valve collars) to the extent that it will not be subjected to impact damage when the container is dropped onto a flat surface.

Additionally, cylinders of 45-pound LP-Gas capacity or less must have a plug, cap or an approved quick closing coupling in place on or in the service valve (such as the backcheck in valves equipped with a listed overfilling protection device) when the cylinder is not connected for use.

Loading and Securing the Cylinder Cargo

Cylinders must be transported in a suitable rack or frame or on a flat surface, and fastened securely in a position to minimize the possibility of movement, tipping, or physical damage related to each other or to the supporting structure while in transit.

Figure 5.1.6b – Vertically Secured Cylinders

Figure 5.1.6c – Horizontally Secured Cylinders (Relief Valve at Top)

LP-Gas cylinders should be loaded so that an even weight distribution is achieved and maintained. A load distribution that places most of the weight on the front and rear axles with both side-to-side and front to back distribution is ideal. An unbalanced load is extremely dangerous due to the possibility of overturning the truck or causing poor handling due to insufficient ground contact.

Additionally, cylinders of 2½ pound water capacity or more must be positioned so that each cylinder's pressure relief valve is in direct communication with the vapor space at all times. The cylinders must be secured in this position by binders or straps.

Checking the Cylinder Delivery Vehicle for Placarding

The vehicle must be properly placarded before leaving the bulk plant. DOT regulations require any vehicle transporting more than 1,000 pounds of LP-Gas, including the weight of the cylinders, be placarded on the front, rear, and on both sides. Placards must indicate the hazard class name and hazard class number. For LP-Gas (propane), these are:

- **FLAMMABLE GAS** (indicated by red color and flame symbol),
- Hazard Class or Division - 2 or 2.1, and
- 1075 (for LP-Gas).

Verifying Shipping Papers and Emergency Instructions

If permanent shipping papers are used, the date and number of cylinders loaded at the beginning of the delivery route must be recorded on the permanent shipping paper, typically with a wax pencil marker (see Figure 5.1.6d on next page).

If single-trip shipping papers are used, they should be completed according to company procedures.

HAZARDOUS MATERIAL (CYLINDER DELIVERY VEHICLE)

SHIPPING PAPER

LIQUEFIED PETROLEUM GAS

2.1 (Flammable Gas)

UN 1075

Product Propane (Non-Corrosive)

Date: ________________

Number of Cylinders Loaded: _______
EMERGENCY CONTACT: 1-XXX-XXX-XXXX

GUIDE 115 GASES-FLAMMABLE (INCLUDING REFRIGERATED LIQUIDS) NORTH AMERICAN EMERGENCY RESPONSE GUIDE 1996

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- **EXTREMELY FLAMMABLE.**
- Will be easily ignited by heat, sparks, or flames.
- Will form explosive mixtures with air.
- Vapors form liquefied gas are initially heavier than air and spread along ground.
- Vapors may travel to source of ignition and flash back.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

HEALTH

- Vapors may cause dizziness or asphyxiation without warning.
- Some may be irritating if inhaled at high concentrations.
- Contact with gas or liquid may cause burns, severe injury and/or frostbite.
- Fire may produce irritating and /or toxic gases.

PUBLIC SAFETY

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover. (CHEMTREC® 1-800-424-9300)**
- Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Keep out of low areas.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.
- Always wear thermal protective clothing when handling refrigerated/cyrogenic liquids.

EVACUATION

Large Spill

- Consider initial downwind evacuation for at least 800 meters (½ mile).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (l mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

EMERGENCY RESPONSE INSTRUCTIONS ON BACK OF PAGE

Front Side

EMERGENCY RESPONSE

FIRE

- **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

Small Fires

- Dry chemical or CO_2.

Large Fires

- Water Spray or fog.
- Move containers form fire area if you can do so without risk.

Fire involving Tanks

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from the ends of tanks.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area.)
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do so without risk.
- If possible, turn containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift.
- Do not direct waier at spill or source of leak.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

FIRST AID

- Move victim to fresh air.
- Call emergency medical care.
- Apply artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Reverse Side

Figure 5.1.6d - Shipping Paper for Cylinder Delivery Vehicles

5.1.7 Preparation and Transportation of ASME Containers

5.1.7.1 Tank Inspection and Preparation at Bulk Plant

The following items (as a minimum) should be checked on each tank transported from the bulk plant to a customer location:

- Check for leaks at all tank welds and fittings.

  On a typical aboveground (AG), underground (UG), or aboveground/underground (AG/UG) ASME tank there are at least 19 welds. In addition, threaded fittings installed in the tank represent at least 11 additional places where leaks could occur. Each of these welds and threaded connections should be checked for leakage with the tank pressurized, using a suitable leak detection solution or leak detection device.

Figure 5.1.7a - Checking for Leaks on AG/UG Tank

- Verify that any tank over 125 gallons water capacity contains 5% or less LP-Gas in liquid form.

  If more than 5% liquid is present in a tank larger than 125 water gallons capacity, the excess liquid must be evacuated before the tank can be transported on public roadways.

Figure 5.1.7b - Liquid Level < 5%

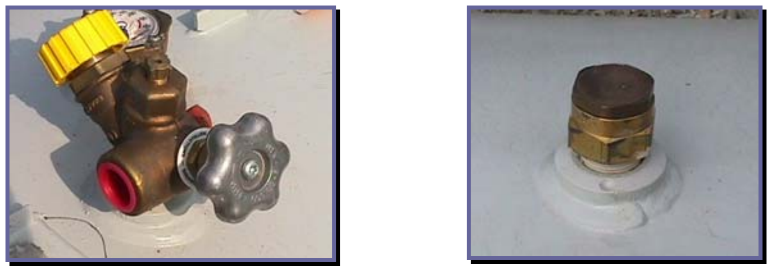
- Check the condition of the tank coating to be sure that it is proper for the tank installation, whether it is for underground or aboveground service.

  The protective coatings used on both types of tank installations are important to maintaining structural integrity and protecting the container from loss of wall thickness due to corrosion. The coating for underground tanks is an integral part of the tank's corrosion protection system. If the protective coating of a tank is damaged, the tank coating should be repaired or another tank selected for installation. Coating touch-up materials should be transported with the tank to make any needed final repairs to tank coatings at the installation site.

- Check the condition of each tank valve and fitting.

  Check to ensure that weather caps are in place on filler valves, relief valves, and the vapor equalizing valve. Verify that the metal plug is in place and sealed on the liquid withdrawal valve. If the tank is a new tank and not vacuum-sealed by the manufacturer, be sure that the container is properly purged of air before it is transported to the customer location. Older tanks that have been open to the atmosphere must be purged as well (see subsection 5.1.9 of this handbook).

Relief Valve | Filler Valve



Vapor Equalizing Valve | Liquid Withdrawal Valve

Figure 5.1.7c – Proper Installation of Weather Caps

- Verify that the tank is properly marked and labeled for transportation.

  ASME data plate markings or ASME certification stampings in the tank head or shell must be legible.

Figure 5.1.7d – Underground Tank Data Plate

- Check the condition of the tank's lifting lugs and supports.

After the condition of the ASME tank has been determined to be satisfactory, the tank and any required installation materials should be readied for loading. Secure installation items, such as masonry foundation blocks, since they are also considered cargo that must be secured as any other cargo transported under DOT regulations.

5.1.7.2 Loading of ASME Containers to be Transported

Coordination of ASME tank loading and unloading is essential to avoid personnel injury or equipment damage.

Planning and Safety Review

When two or more people are involved in any task, efficiency and safety are dependent on planning and clear communications. Handling and setting tanks requires a coordinated effort. Before the tank is lifted, transported, and placed in its new location, pre-job planning that includes everyone who will be involved should be conducted and should address the following:

- A detailed tank loading or unloading plan along with a description for each person's responsibilities in the operation.
- Assignments for equipment operators and the means used for communicating and coordinating each step of the job. Details, such as who will act as spotter for the crane operator and the meaning of hand signals or other means of communication that will be used, should be established.
- The locations of trucks and other equipment being used to ensure that crane lifts, swings, and other movements are completed safely.
- A "Walk-Through" at the installation site by drivers and equipment operating personnel before trucks or cranes are brought onto the site. Special care should be given to ensuring proper support for vehicles, avoiding buried structures and overhangs, and slopes or terrain hazards that could lead to truck or crane overturn.
- Safe working procedures, Personal Protective Equipment and any special tank handling requirements, with emphasis on prohibiting personnel from beneath a tank during lifts, swings, or positioning.

Truck-Mounted Crane Operations

When LP-Gas company employees use company-owned truck-mounted cranes to load, unload, and install tanks, they are responsible for all the phases of these operations. OSHA regulations regarding truck-crane operations are found in 29 CFR 1910.180.

Operating the Truck-Mounted Crane

Truck-crane operators should read and follow the manufacturer's instructions for inspecting, maintaining and operating the crane.

After the pre-job planning session, the crane truck should be located on level ground so that the ASME tank can be lifted and positioned within safe working limits of the crane. The vehicle parking brakes should be set, and chock blocks placed in front of and behind the vehicle's rear wheels. The crane outriggers should be fully extended and locked into position. Outriggers should be adjusted to level the crane structure in accordance with manufacturer's operating instructions. Crane outriggers (where provided by the manufacturer) are used to prevent damage to the truck chassis and maintain stability.

Safety Inspections

Before lifting the tank, the crane should be inspected thoroughly. If the tank contains more than 5% liquid, the tank's lifting lugs or "eyes" should not be used. Instead a "basket lift" should be made using slings or chains with adequate load ratings.

OSHA regulations regarding slings are found in 29 CFR 1910.184. Also OSHA publication 3072, *Sling Safety*, provides additional guidance.

Lifting Operations

After inspecting the sling(s), the crane operator must determine how the tank will be lifted, how the sling(s) will be arranged, and if additional slings or other equipment is needed for the load. The slings being used should have load ratings well in excess of the weight of the tank and its contents.

In summary, consistently applying knowledge of crane and lifting equipment fundamentals, performing thorough inspections, coordinating communications, conducting pre-job planning, verifying that lifting equipment is properly maintained, and observing all necessary precautions will help protect employees from injury while protecting tanks, equipment, and customer property from damage.

5.1.7.3 DOT Regulations Pertaining to Transporting ASME Containers

The primary regulatory requirements for transporting ASME tanks are found in 49 CFR 173.315(j). To highlight these requirements for awareness purposes, ASME containers used for LP-Gas Service and for permanent installation on consumer premises may be shipped by private motor carrier only under the following conditions:

- Each container must be constructed in compliance with the requirements of the ASME Code and must be marked to indicate compliance (data plate or data specification stamping) in the manner specified by the respective code.

- Each container must be equipped with safety devices in compliance with the requirements as specified in the NFPA 58-2004.

  The containers must be braced or otherwise secured on the vehicle as to prevent relative motion while in transit. Valves or other fittings shall be adequately protected against injury during transportation.

WARNING	**Containers can not be shipped when charged with LP-Gas to more than 5 percent of their water capacity.** The only exception is that containers of less than 125 gallons water capacity may be shipped when charged with LP-Gas in compliance with DOT filling density.

Load Inspection Rules for Tanks and Cargo in Transit

The DOT regulatory reference for checking the security of loads on commercial vehicles is found in 49 CFR 392.9. These regulations prohibit a driver from operating a commercial motor vehicle unless the cargo is properly distributed and secured in compliance with DOT requirements. Of most importance, the driver must:

- Inspect the cargo and the devices used to secure the cargo within the first 50 miles after beginning a trip, and make necessary adjustments; and

- Re-examine the cargo and devices that secure the load, making necessary adjustments whenever:

  - The driver has a change of duty status; or
  - The commercial motor vehicle has been driven for 3 hours; or
  - The commercial motor vehicle has been driven for 150 miles.

Requirements for Transporting Bulk Containers

Tanks used to store LP-Gas are called “bulk packagings” or “containers” under U.S. Department of Transportation regulations when they are transported. They can be classified as two primary bulk container types according to their design and function:

- ASME tanks, which are designed for storage of LP-Gas and are permanently installed at bulk plants or customer locations. As mentioned previously, ASME tanks with water capacities over 125 gallons cannot be transported when filled with liquid LP-Gas to more than 5% of their water capacity.

- DOT specification portable tanks and intermodal tanks are designed to be transported filled to their maximum permitted filling density. These tanks have structural protection for valves and fittings not required for ASME storage tanks.

When any of these bulk containers are transported containing LP-Gas, they must be labeled and shipping papers and emergency instructions must be carried in the vehicle. If the gross weight of the tank plus the LP-Gas is greater than 1,001 pounds, the vehicle must be placarded. DOT regulations for securing the load and protection against shifting and falling cargo also apply.

When an ASME tank larger than 120 gallons water capacity containing LP-Gas (gross weight approximately 665 pounds), or two or more 120 gallon ASME tanks are transported, the vehicle must be placarded on the front, back and both sides.

Flammable gas shipping labels must be applied to each side of ASME tanks of less than 1,000 gallons water capacity containing LP-Gas (see Figure 5.1.7e). The use of the flammable gas label is authorized by an exception to container placarding requirements in 49 CFR 172.514. If flammable gas labels are not used, placards must be attached to each side of the tank.

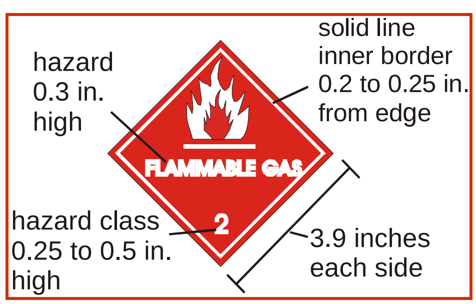


Figure 5.1.7e - Flammable Gas DOT Label

Tanks with 1,000 water gallon capacities or larger must be labeled or placarded on each side and both ends. Placards only should be used on tanks larger than 5,000 gallons because the exception authorizing the use of flammable gas labels does not apply (see Figure 5.1.7.f)

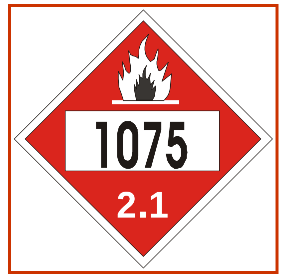


Figure 5.1.7f - LP-Gas Placard

To comply with DOT regulations (per 49 CFR 392 & 393), ASME tanks should be secured with at least 2 cargo straps and binders (or chains and binders) having sufficient working load limit ratings for the tank(s) being transported (see Figure 5.1.7g).

Additional cargo straps or chains should be used for each additional 10-foot length of tanks longer than a typical 1,000 gallon ASME tank or where two restraints do not meet minimum working load requirements for heavier loads.

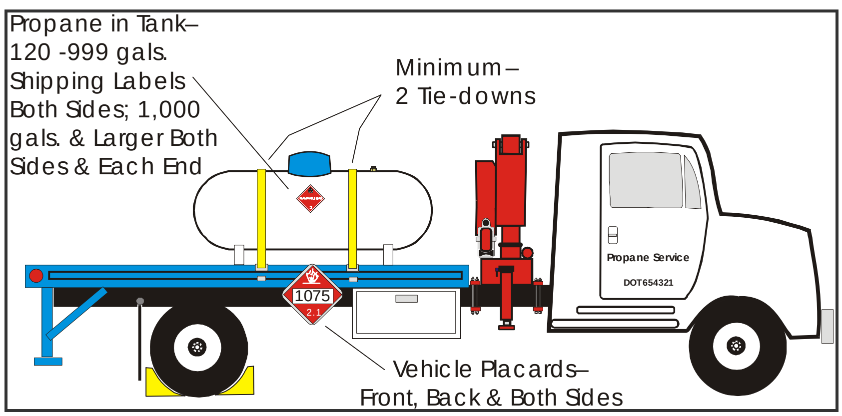


Figure 5.1.7g - Labeling, Placarding, and Cargo Restraints

If an ASME tank has a valve installed in a bottom opening that could be damaged during transit, the tank should be secured on suitable cargo blocking or timbers to provide adequate clearance between the vehicle bed and the valve. Cargo restraints should be arranged to ensure that all valves are protected during transit. If the dome of the tank cannot be adequately secured during transportation, it should be removed and secured in a toolbox or other location, but not carried unsecured in the vehicle cab.

DOT regulations prohibit the display of hazardous material placards if the vehicle is not transporting cargo containing hazardous materials. Therefore, vehicle placards must be removed or covered during the return trip after ASME tanks are delivered.

5.1.8 Evacuation of Containers

A full understanding of the operation of the liquid evacuation process is essential in order to safely remove the liquid propane from containers and reduce the potential for safety incidents associated with the following hazards:

- Exposure to liquid propane can result in freezing of the skin.
- Exposure to flammable gas and other materials at high pressure.
- Potential ignition of flammable gas.
- Utilize Personal Protective Equipment

The area around the evacuation operations must be maintained free of any ignition sources. For example, operating internal combustion engines should be at least 15 feet away from the point of transfer. Additionally, smoking, open flame, portable electric tools and extension lights should not be permitted within 25 feet of the transfer point.

Proper Personal Protective Equipment (PPE) should be worn when evacuating cylinders. Check your company policy for the specific PPE required for the operation.

5.1.8.1 DOT Cylinders

Evacuation by Gravity Transfer

Propane liquid can be removed from portable and exchange DOT cylinders by gravity transfer. Larger cylinders, especially exchange cylinders that do not have neck rings to protect the service valve, should be secured in a cylinder inverter.

To transfer the liquid out of the cylinder:

- Invert the cylinder in an elevated position above a receiving container approved for storage of LP-Gas.
- Connect the two containers with a high-pressure LP-Gas hose assembly.
- Open the service valve on the container to be evacuated and the fill valve on the receiving container to allow the liquid to drain into the receiving container (see Figure 5.1.8a).

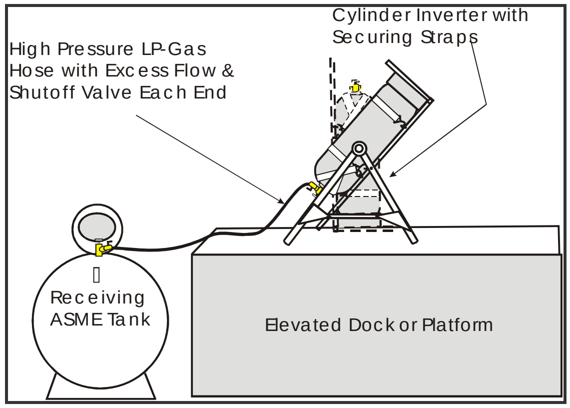


Figure 5.1.8a - Evacuation by Gravity Transfer

When evacuating liquid from stationary DOT cylinders, inverters must be rated for the load of the cylinder and the product within it.

Evacuation Using a Compressor

Bulk plant operators frequently use a compressor system for evacuating cylinders. One of the most common methods used is the scavenging system, which consist of a small scavenging tank, a stationary or portable compressor, and the bulk plant storage tank. See Figure 5.1.8b for a typical scavenging system.

When this system is used to evacuate a container, the following process is typically used:

- The vapor lines that connect the compressor to the two tanks are opened and the liquid line is closed.
- When the compressor is turned on, it pulls vapor out of the scavenging tank into the bulk storage tank.
- As a result, the pressure in the scavenging tank is reduced.
- This creates a difference in pressure between the scavenging tank and the cylinder being evacuated, causing the liquid in the cylinder to flow to the scavenging tank.
- When the scavenging tank is at the maximum permitted filling level, the compressor is turned off and all valves are closed.
- The vapor lines connecting the bulk tank and scavenging tank to the compressor are reversed.
- When the compressor is started again, the compressor pulls vapor from the bulk tank and forces it into the scavenging tank.

- The higher pressure now in the scavenging tank forces the liquid in the scavenger tank into the plant storage tank, emptying the scavenger tank so it can be used again to evacuate other containers.

Cylinders designed for **liquid service** (liquid service valve with dip tube) are very easily emptied using a scavenger tank. The following is a typical procedure:

- A LP-Gas liquid hose, with a shutoff valve on each end, is connected between the cylinder and the scavenger tank.
- When the compressor is turned on, the higher pressure in the cylinder will force liquid to flow up the dip tube in the cylinder and into the scavenger tank.
- When the liquid level in the cylinder reaches the bottom of the dip tube, liquid can no longer be removed.

If the cylinder must be totally evacuated, the remaining contents must be flared or carefully vented.

Cylinders designed for **vapor service** are not as easy to evacuate. Since a vapor service valve does not utilize a dip tube, the cylinder must be inverted (i.e., bottom side up) so liquid can be withdrawn through the vapor service valve (see Figure 5.1.8b).

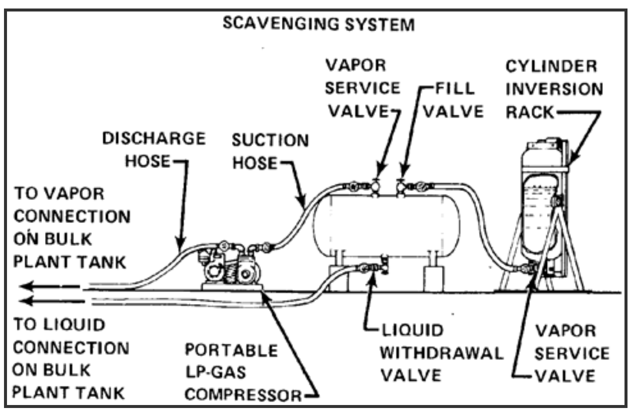


Figure 5.1.8b - Evacuating Vapor Service Cylinders

An inversion rack, also called an evacuation rack, is used to support the cylinder (see Figure 5.1.8c). Once inverted, a liquid transfer hose is connected between the service valve on the cylinder and the scavenger tank, creating liquid flow to the tank.

Figure 5.1.8c – Cylinder Inverter

If the cylinder is evacuated of liquid propane **for the purpose of comparing its weight to the manufacturer's stamped tare weight** as part of requalification, draining the liquid is all that is required. It can remain pressurized with vapor for the purposes of tare weight comparison and requalification.

If the cylinder must be de-pressurized in preparation for valve or fitting replacement, the vapor must be reduced to near atmospheric pressure which might require the flaring of vapor.

Conducting Vapor Flaring Operations

Flaring is the process of burning LP-gas removed from storage containers in a controlled and safe manner. Although venting may be the simplest way to evacuate a container, it is not the safest means and not permitted in some areas. Because of these restrictions, most LP-Gas marketers evacuate tanks and cylinders by flaring or burning off most of the LP-Gas in a burner.

Figure 5.1.8d – Propane Burning from Flare Tower

Many marketers remove most of the LP-Gas liquid by pump or compressor, thus reducing the length of time of the flaring operation. Once the majority of the liquid has been removed, the remaining LP-Gas is usually flared.

The following procedure provides guidance for flaring LP-Gas from cylinders and ASME tanks with water capacity <2,000 gallons. Check company policies and state and local codes for any additional requirements on flaring the container. Training information and instructional details associated with flaring operations are provided in *CETP Module 2.4.4*.

WARNING	In certain areas, local fire codes or company policies require you to contact the local fire department and notify them that the container is to be flared.

1. Evacuate as much LP-Gas from the container as possible.

2. Select the proper site for flaring the LP-Gas. If a designated area for flaring does not exist, select a site with your supervisor that meets the company and code requirements.

3. Select the necessary equipment for flaring the remaining LP-Gas in the container. Again, if equipment has not been designated for flaring operations, check with your supervisor to select and assemble the equipment.

4. Lay out and assemble the flaring equipment, including all the necessary hoses, fittings, supports and burner to flare the remaining LP-Gas in the container.

5. Before opening the container and burner assembly valves and prior to igniting the burner, pressure test the flaring assembly. Do not ignite the flaring burner until you are sure that the supply is gastight.

6. Flare the remaining LP-Gas in the container.

    - Place the fire extinguisher next to the burner support.

    - Inform your supervisor, as well as the other employees at the location, that the container is about to be flared.

    - Following manufacturer's instructions, ignite the burner.

SAFETY	If an accidental fire develops during the flaring operation, immediately close all shutoff valves (including the container service valve) to extinguish the fire.

7. Observe the pressure gauge on the service valve or purging adaptor. When the pressure drops below 15 psig, temporarily shut down the burner and allow the pressures in the tank or cylinder to increase.

WARNING	Because of the high demand of the burner, the container may refrigerate during the flaring operation. If a frost line develops on the cylinder, temporarily shut down the burner and allow the pressure in the container to increase.

8. When the vapor pressure no longer increases (above 15 psig), flare the remaining vapor until the burner extinguishes.

9. While wearing appropriate PPE, bleed down and disconnect the flaring equipment. If applicable, disassemble and store the equipment.

SAFETY	Flaring operations should never be left unattended. Qualified personnel should continuously monitor flaring equipment and conditions. If qualified personnel must leave the flaring operation for any reason, the operation should be shut down and the valve(s) on the container being flared should be closed.

5.1.8.2 <u>ASME Containers</u>

Normally, LP-Gas is evacuated from ASME containers at the customers' locations. However, there are various circumstances where an ASME container must be evacuated in the bulk plant.

When transferring LP-Gas from a stationary ASME LP-Gas storage container to a CTMV cargo tank, the following safety precautions can serve as a guideline:

- All hoses used in the evacuation procedure must be designed, listed and marked for use with liquid propane (1750 psig bursting pressure, and 350 psig working pressure).

- All sources of ignition must be controlled as noted in Section 4 of this handbook.

- At least one recently inspected fire extinguisher, having a minimum capacity of 18-lb. dry chemical with a B:C rating, must be within easy reach during the entire operation.

- A qualified individual must be present at the operation during the entire evacuation procedure.

- Proper PPE should be worn per company policy.

Equipment for Evacuating the ASME Container

CTMV Pump or Portable Compressor

If a CTMV pump is used, the liquid transfer hose must be as short as possible, but no longer than 50 feet. If the CTMV cannot be positioned any closer than 50 feet, a small portable compressor should be used.

WARNING	Because of the limited capacity of the transfer and withdrawal valves, the vehicle pump can "starve" for liquid propane and become damaged.

If a portable compressor is not available, consider moving the ASME tank to a different location on the site, closer to the CTMV.

When an ASME tank containing more than 5% liquid is lifted, the tank's lifting lugs should not be used. Instead, suitable lifting slings that have sufficient weight-bearing capacity ratings should be used to lift the tank.

Liquid Transfer Hose

The liquid transfer hose connected between the two tanks should have the following features (see Figure 5.1.8e):

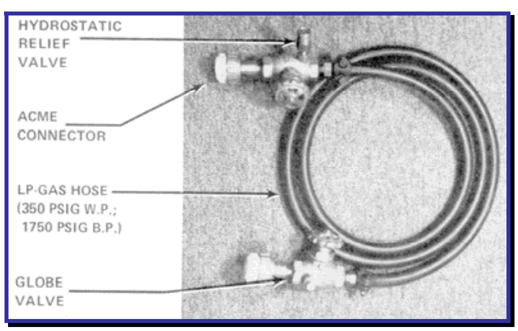


Figure 5.1.8e - Liquid Transfer Hose

- It should be listed and approved for liquid propane gas service (350 psig operating pressure, 1750 psig burst pressure).

- The length should be as short as possible and at least 3/4" (preferably 1") in diameter.
- Manual shutoff valves such as snap-action globe valves, hand wheel-operated globe valves, or ball valves should be installed on both ends of the hose.
- A hydrostatic relief valve should be installed in the liquid assembly to prevent the hose from rupturing if liquid propane is trapped between the two shut-off valves.
- Fittings must be selected that will connect the liquid supply line to the two tanks.
- All threaded connections in the liquid line, except POL and ACME threads, should be sealed with thread sealing compound.

Vapor Hoses

If a CTMV pump is used, a vapor equalizing hose must be connected between the stationary ASME tank and the cargo tank, balancing the vapor pressure between the two. During the evacuation, occasionally check for vapor flow to ensure that the ASME tank's excess flow feature in the vapor equalizing valve does not slug.

If a compressor is used, two vapor hoses are needed. Attach one to the bulk truck (suction line) and the other to the stationary ASME tank (discharge line). Follow the instructions of the compressor manufacturer and your supervisor to locate or assemble vapor lines.

Adapters

If the ASME container being evacuated is not equipped with a vapor equalizing valve, a purging adapter must be installed in the vapor service valve outlet (see example in Figure 5.1.8f).

Figure 5.1.8f - Purging Adapter (POL to Male ACME)

Liquid propane in an ASME container can be removed either through a top or bottom opening. ASME containers built prior to 1961 can be evacuated through the filler valve in the top of the tank since they have dip tubes installed which extend to the bottom of the tank to evacuate liquid through the filler valve. However, a special unloading adapter is needed to operate the filler valve. When the adapter is installed on a filler valve, the moving operator stem pushes open the back checks in the filler valve so the liquid can be removed from the container.

There are several types of unloading adapters available each with its own operating procedure. Read the manufacturer's instructions that accompany the adapter used.

WARNING	Anyone using an unloading adapter to evacuate a container through a filler valve must have a thorough working knowledge of the liquid withdrawal adapter and its effect on the double back check feature of the filler valve. These adapters are not intended to be, nor should they be used as, a permanent means of dispensing liquid for any purpose.

Actuated Liquid Withdrawal Excess Flow Valves

All tanks built after 1963 are spray-filled and should be equipped with a separate actuated liquid withdrawal excess flow valve to evacuate liquid from the tank (Figure 5.1.8g). As long as the valve remains closed, it acts as a back check and prevents any gas from escaping into the atmosphere. Once the valve is opened, the valve disc can move up and down freely on the operator stem, automatically changing it to an excess overflow valve.

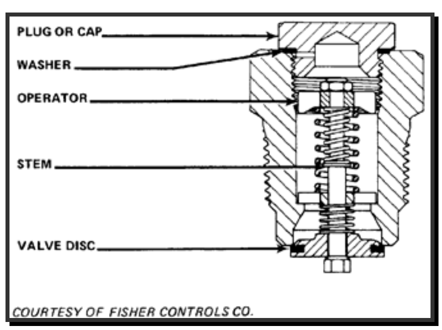


Figure 5.1.8g
Actuated Liquid Withdrawal Excess Flow (Evacuation) Valve

These withdrawal valves may be installed in the bottom, top, or side depending on the internal construction of the tank.

WARNING	In some cases, a damaged seat could allow an excessive amount of liquid to be discharged when the closing cap is loosened. If a significant amount of liquid continues to be blown from under the closing cap for more than 30 seconds, it is unlikely that the internal seat will prevent a dangerous amount of gas from escaping. *If in doubt, do not remove the closing cap, especially in a congested or populated area.*

A transfer valve with a machined adapter (Figure 5.1.8h) must be used to evacuate a tank through a liquid evacuation valve. When the transfer valve and adapter are screwed into the evacuation valve, the machined adapter forces the operator shaft down and moves the valve disc off of its seat.

Install a transfer valve with a 3/4" NPT inlet and a 1 3/4" ACME hose connector in the outlet. Use the machined adapter supplied by the evacuation valve manufacturer.

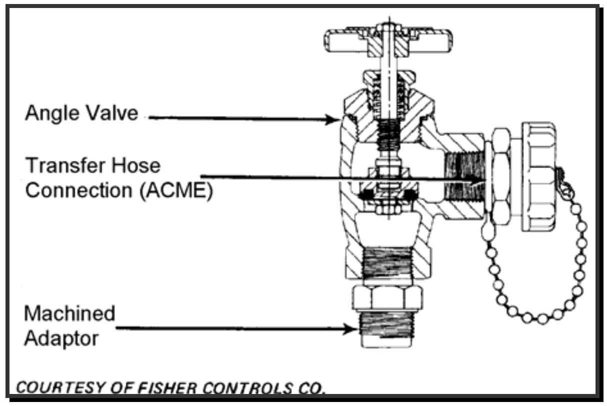


Figure 5.1.8h - Transfer Valve with Machined Adapter

WARNING	Read and strictly follow manufacturer instructions for the installation, use and removal of evacuation transfer valves. Observe all warnings and precautions. If you do not have experience evacuating containers, ask your supervisor for assistance.

Procedure for Evacuating the ASME Container

The following procedures for evacuating LP-Gas from a stationary ASME tank are designed as a guide when using a CTMV or portable compressor. These procedures are based on common industry practice and provisions in NFPA 58-2004. Check your company procedures and state and local codes for any other requirements that apply.

Information outlining features of liquid withdrawal valves, unloading adapters and installation methods is provided in the Supplemental Information Section of *CETP Module 3.1.5*. Always read and follow manufacturers' instructions for use. Use the adapters specified by manufacturers and wear personal protective equipment while evacuating LP-Gas containers.

On most LP-gas containers larger than 125 water gallon capacity and manufactured prior to July 1, 1961, a liquid withdrawal (evacuation) internal dip tube was attached to the bottom of the filler valve by the manufacturer and extended to the bottom of the container. Since 1961, container manufacturers have installed a separate valve, called an actuated liquid withdrawal excess flow valve, for liquid evacuation of domestic containers.

SAFETY	LP-Gas should never be vented into the atmosphere through these valves except as required during installation and removal of the transfer valve.

The LP-Gas evacuated from stationary containers is normally transferred into the bulk delivery vehicle cargo tank. In some cases, an empty LP-Gas storage container of the same capacity is used when a tank change out is done.

The evacuation process may use either a pump or compressor to transfer LP-Gas liquid from one tank to another. Some CTMVs are equipped with an external inlet to the pump called the auxiliary inlet, which may be used for evacuation.

Regardless of the equipment used, since evacuation requires the transfer of both LP-Gas liquid and vapor, all procedures and safety precautions should be fully understood and applied. The procedures described below are limited to the following tanks, equipment and conditions:

- Stationary ASME tanks with water capacities between 125 gallons and 1,000 gallons.
- Liquid being withdrawn through a liquid withdrawal valve with a transfer valve installed.
- The tank being used to receive the liquid from the stationary tank being evacuated is a bulk delivery vehicle cargo tank.
- A portable propane compressor or the bulk delivery vehicle pump is being used to evacuate the liquid in the stationary tank.

1. Determine the quantity of LP-Gas to be transferred. Check to see that the liquid level in the cargo tank is low enough to handle the amount of LP-Gas to be evacuated from the ASME tank without overfilling the cargo tank.

2. Position the bulk delivery vehicle to receive LP-Gas.

    - Position the compressor between the delivery vehicle and the stationary tank being evacuated.

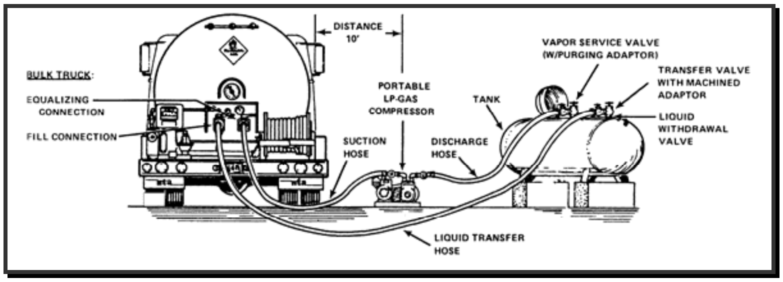


Figure 5.1.8i
Evacuating ASME Tank Using a Portable Compressor

- The delivery vehicle should be approximately 10 feet from the suction side of the compressor. The maximum distance between the compressor and the two tanks will depend on the length of the vapor hose.

3. Connect a transfer valve to the inlet of the withdrawal valve on the stationary tank.

    - Screw a machined unloading adapter into the inlet of the transfer valve.

WARNING	When removing the plug or cap from the liquid withdrawal valve, be sure only the plug is loosened and removed. If an excessive volume of LP-Gas leaks from the valve, reinstall the plug and follow manufacturer's instructions.

    - Install the transfer valve according to manufacturer's instructions.

    - Once installed, close the transfer valve.

4. Close all valves in the liquid transfer line.

5. Lay out the liquid transfer hose between the stationary tank and the cargo tank.

6. Connect one end of the liquid transfer hose to the outlet of the transfer valve and the other end to the fill connection located on the cargo tank of the delivery vehicle.

7. Connect the vapor hoses between the compressor and tanks. Connect the discharge hose between the discharge side of the compressor and the vapor equalizing valve (or purging adapter) on the stationary tank.

- Connect the suction hose between the suction side of the compressor and the equalizing connection on the cargo tank of the delivery vehicle (see Figure 5.1.8i).

8. Pressure test the vapor and liquid hoses.

    - Slowly open one valve at a time, starting with the transfer valve in the stationary tank, to pressure test the liquid supply line.

    - Check all connections downstream to the next closed valve for leakage once a valve is opened.

    - Slowly open each valve downstream one at a time after each section of line is considered tight.

    - Close all valves in the line and make repairs if any leaks are detected.

9. Transfer as much liquid as possible from the stationary ASME LP-Gas tank to the cargo tank. Follow the compressor manufacturer instructions. Typically, portable compressors are run only for short time periods of one or two minutes to create a pressure differential between the two tanks.

10. Bleed down and disconnect all hoses.

    - Bleed down and disconnect the fitting of the liquid transfer hose connected to the closed transfer valve.

    - Bleed down and disconnect the liquid transfer hose connection at the bulk LP-Gas delivery vehicle pump-off adapter or fill connection.

    - Fully open the transfer valve and allow LP-Gas to flow through until the excess-flow check valve "slugs" shut.

WARNING	If the excess flow valve does not “slug shut, immediately close the transfer valve. Do not remove the transfer valve until the pressure in the tank has been reduced to 0 psig.

11. Once the pressure has been reduced, the withdrawal valve must be serviced before the ASME tank is returned to service.

5.1.9 Purging of Containers

The following procedures apply to new containers designed and used for storing LP-Gas (propane) at capacities up to and including 2,000 gallons water capacity, including both ASME and DOT containers. Only personnel who have been properly trained and qualified in the procedures related to container vapor purging and methanol injection should perform the tasks outlined in this section.

SAFETY	All personnel handling LP-Gas and methanol should read and understand the Material Safety Data Sheets (MSDS) for each material prior to handling. Personal Protective Equipment should be used per the MSDS.

Purpose

Because air, moisture and other contaminants might be present in new containers (or in some circumstances used containers), it is essential that these be removed before filling a container and placing it into service. Purging a container with LP-Gas is required because air and moisture can cause corrosion (commonly called "rusting") to occur on the inside surface of the container. When that occurs, the effectiveness of the ethyl mercaptan odorant in the LP-Gas can be significantly reduced and result in "odorant fade", a hazardous situation. Because methanol attaches itself to water molecules and keeps moisture (water) from freezing when the LP-Gas vaporizes, methanol may need to be added to storage containers to act as a drying agent.

Purging LP-Gas Containers with LP-Gas (Propane) Vapor

ASME tanks and DOT cylinders are usually purged of air at the bulk plant using LP-Gas vapor regulated to 15 psig. Note that purging may sometimes be done through an electrically grounded purging stack (see Figure 5.1.9a).

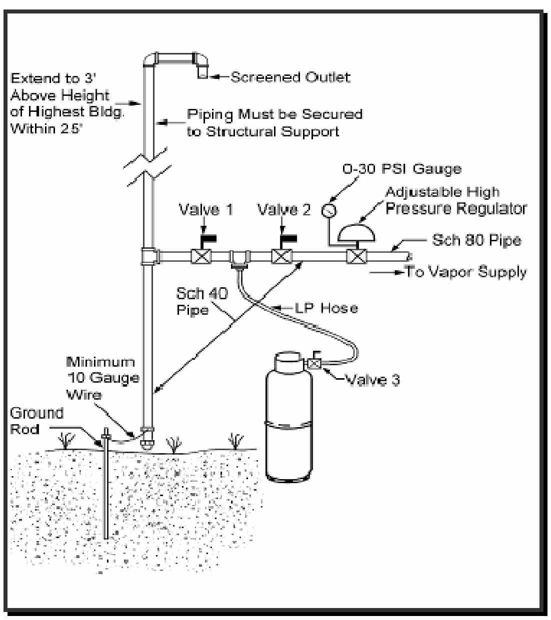


Figure 5.1.9a – Container Purging Stack

To purge a container:

1. Open the service valve to bleed any air from the tank.
2. Attach the vapor hose end valve to the service valve with the appropriate adapter.
3. Pressurize the container with LP-Gas vapor to 15 psig.
4. Close the valve on the vapor hose and bleed off the vapor using the adapter on the filler valve.
5. Repeat this process 5 times.

A final vapor charge of 15 psig should be retained in the container before filling with liquid LP-Gas.

Moisture Removal Using Methanol Injection

Vacuum Purged Containers

Some marketers pre-treat new ASME tanks for moisture by adding a small quantity of methanol. Recently, some tank manufacturers have made this process easier by evacuating air from new tanks and then sealing the tank valves with a vacuum inside (Figure 5.1.9b).

Figure 5.1.9b – New Vacuum Purged Container

The negative pressure (less than atmospheric pressure) shown on the gauge in the above photograph indicates that the tank is leak-free and that methanol can be introduced into the tank by suction.

In order to avoid air entering the tank during the methanol transfer, the hose in the methanol container must extend to the bottom of the container and the service valve on the tank should be closed before the methanol level gets to the level of the hose opening.

After the methanol is transferred into the tank, the tank is pressurized with LP-Gas vapor (see Figure 5.1.9c). All valves should be closed after the tank is pressurized. The manufacturer's applied shrink-wrap plastic should then be removed from the tank valves to indicate that the tank is pressurized with LP-Gas.

Figure 5.1.9c - Pressurizing New Vacuum Purged ASME Tank with Propane Vapor

Injecting Methanol into Pressurized Containers

Methanol can be injected into containers by using a short length of LP-Gas hose with a female ACME connector installed on the container filler valve, while a male ACME connector on the other end is secured to the bulk truck delivery hose end valve adapter. LP-Gas in the delivery hose forces the methanol into the container when the hose end valve is opened

The procedure is as follows:

1. Inspect the short hose that will be used to inject the methanol and be sure it is free of defects that would require it to be removed from service.

2. Pull the CTMV (bobtail/transport) delivery hose end to the receiving tank and place it within arms reach of the filler valve.

3. Attach the female ACME adapter of the short hose to the filler valve of the receiving container and tighten to seal the connection.

4. Fill the short hose section with methanol, holding the hose end up and being careful not to spill or splash the methanol.

5. Attach the male ACME adapter to the delivery hose end valve adapter and seal it to ensure methanol and LP-Gas will not leak out under pressure when the delivery hose end valve is opened.

6. Slowly open the delivery hose end valve. If there is not sufficient LP-Gas pressure in the hose to open the receiving container filler valve, use the CTMV pump to transfer a few gallons of LP-Gas into the receiving container.

7. Close the hose end valve and partially loosen the short hose section from the container filler valve, allowing the LP-Gas to vent until and the hose is de-pressurized.

8. Remove the short hose section from the filler valve and the delivery hose end valve.

9. Inspect the short hose section and the portion of the delivery hose deployed for the transfer.

10. Properly stow and secure the hoses and the methanol container.

5.1.10 Dispensing LP-Gas

While the dispensing equipment at a LP-Gas bulk plant will vary in size and design (e.g., storage capacity, integrated with the bulk storage tank versus stand-alone, manual versus automatic shut-off devices), the basic procedures to follow are typically the same. Prior to any operation, one should review and be familiar with the dispensing equipment, piping functions, and company operating procedures. Detailed information is provided in *CETP Module 3.3 and in PERC's "Dispensing Propane [Safely]" training materials*.

The following procedures apply to dispensing (filling) DOT cylinders and vehicle mounted ASME containers. Only personnel who have been properly trained and qualified in the procedures related to dispensing LP-Gas should perform the tasks outlined in this section. All personnel handling LP-Gas should read and understand the Material Safety Data Sheets (MSDS) for each material prior to handling.

Filling DOT Cylinders

Operating a dispenser to fill DOT cylinders with LP-Gas requires the operator to know the regulations that apply and the characteristics of manual or automatic filling equipment.

Regulatory and Code Requirements for Cylinder Filling

Three of the most critical US DOT regulatory requirements related to cylinder filling are as follows:

- Before filling each cylinder, the person filling the cylinder must visually inspect the outside of the cylinder.
- The weight of LP-Gas filled into the cylinder must be checked, after disconnecting the cylinder from the filling line, by the use of an accurate scale
- No cylinder may be filled and offered for transportation in commerce unless that cylinder has been requalified and marked in accordance with DOT requirements. A cylinder passing requalification by the external visual inspection must be marked in accordance with DOT requirements.

Additionally, NFPA 58-2004 requires that cylinders must be continued in service and transported in compliance with DOT regulations, and that any cylinder that is due for requalification must not be refilled until it is requalified using requalification methods prescribed in the DOT regulations. Some state jurisdictional authorities have not adopted the 2001 edition of NFPA 58 (where this requirement was first adopted), while others may have adopted the Code with exceptions or modifications to this requirement. If you are not sure of state or local jurisdictional requirements for requalification of cylinders not transported in commerce, ask your supervisor to clarify what your company's procedures and policies require.

NFPA 58-2004 also requires that portable cylinders (cylinders of less than 200 pounds water capacity that are subject to DOT jurisdiction) must be filled by weight using a platform scale.

Operating a Dispenser

Startup

1. Inspect all dispenser equipment prior to LP-Gas transfer to ensure that the equipment and supplies needed are in safe and proper working order.

2. Conduct pre-fill inspections on the DOT cylinders, as described in Section 5.1.6 of this handbook. Further details are provided in *CETP Module 3.3.3*.

   Please keep in mind that Overfilling Prevention Devices (OPDs) are required by NFPA 58 (starting with the 1998 Edition) for vertical cylinders with 4# - 40 # LP-Gas capacity. In jurisdictions that have adopted this or more recent editions of NFPA 58 without modification or exceptions to the OPD requirements, these cylinders due for requalification must be equipped with OPDs before they are refilled. OPDs are not required for cylinders used for industrial welding gas service, for motor fuel service, or for horizontally mounted cylinders.

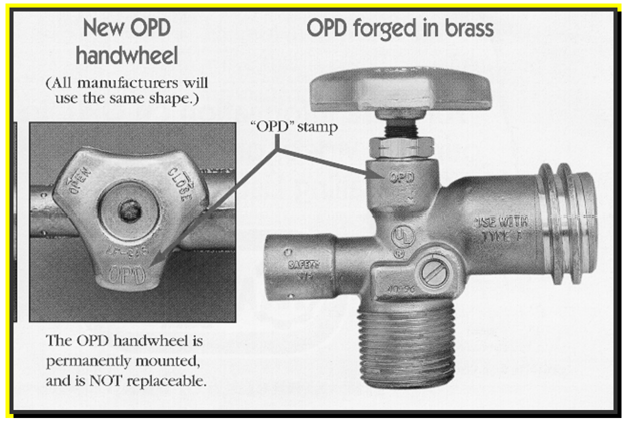


Figure 5.1.10a – Identifying Characteristics of an OPD

OPDs are intended to be a secondary means to protect against overfilling of cylinders. The primary method to prevent overfilling is filling by weight on a scale or using the fixed maximum liquid level gauge.

If you install an OPD as a retrofit to an existing cylinder, be certain it has the proper fixed liquid level gauge and is the correct OPD for the cylinder that is being requalified.

1. Prior to filling any cylinder, ensure that ignition sources are controlled, as described in Section 4 of this handbook.

2. To ensure the cylinder is properly filled, the scales must be "zeroed" periodically.

<u>Operation</u>

<u>*Manual*</u> shutdown dispensers rely on the operator to determine when the maximum permitted filling limit for a cylinder is reached and to stop the flow of liquid into the cylinder by manually closing one or more valves. The operator must be in attendance to

closely observe the platform scale balance beam, close the hose end valve immediately after the balance beam rises, and then shut down the liquid transfer pump.

Automatic shutdown dispensers follow the operating procedures outlined in the previous section covering hydraulic, electric, and pneumatic systems. Be sure to perform each required step listed for manual dispensers that applies, and comply with the manufacturer's operating instructions. Typically where multiple filling stations are operated, the pump by-pass circuit is designed to allow high capacity bypassing so that the pump is not shut down until all cylinders are filled.

Regardless of whether the dispensing equipment is manually operated or if it uses automatic shutdown systems, the operator must set the platform scale for the proper filling weight.

1. Place the empty cylinder on the platform scale and set the balance beam scale to the proper filling weight of the cylinder.

2. Determine and set the proper filling weight by adding:

	Marked Cylinder Tare Weight
+	Marked Cylinder Water Capacity **x** 0.42
+	Weight of dispenser hose, end valve, & adapters
Total **=** Scale Filling Weight Setting	

3. Open the liquid outlet valve on the storage/supply tank and any valves in the by-pass return line.

4. Connect the dispensing hose to the cylinder fill valve. Verify that the proper hose-end valve adapter has been installed

5. Open the service valve on the cylinder as applicable.

6. Start the pump.

7. Slowly open the hose end valve.

8. Close the hose end valve as soon as the scale beam or indicator tips.

9. Close the cylinder valve.

10. Shut off the pump.

11. Disconnect the dispensing hose.

12. Check the weight of filled cylinder after filling connector has been disconnected. If overfilled, bleed off excess LP-Gas in a safe location.

13. Check the cylinder valves, especially the relief valve for leaks.

14. Valve outlets on cylinders of 45-lbs. LP-Gas capacity or less must be either plugged or equipped with a quick closing or quick connect coupling. Plugs are not required and should not be used for OPDs; however, it is recommended to use a dust cap to prevent any debris from entering the valve.

15. If required, apply DOT shipping label or cylinder warning label.

    [Note: *Cylinders that are less than 200 lb water capacity and not subject to DOT jurisdiction, such as non-commercial customers transporting their own cylinders, can be filled volumetrically. Refer to you company's policy and check with your supervisor before filling a cylinder by the volumetric method.*]

Shut-down

1. After the cylinder filling operation is completed, or at any time the dispensing station is unattended, shut off the pump and close the valves at the storage tank.

2. Disconnect and store the hose(s) on a rack inside a fence-protected area, inside a dispenser cabinet, or secured to a supporting structure inside the filling room. At locations that are not weather protected, install a dust cap or plug in the hose-filling adapter.

3. Secure the installation against tampering.

Filling Vehicle-Mounted ASME Tanks

In order to safely and efficiently fill vehicle-mounted ASME tanks, operators must be familiar with each of the basic parts of the dispensing system, the features of ASME tanks, and the filling procedures.

Various types of valves may be used to control the flow of product through a dispenser. It is important to understand how each valve functions and how to open and close them. As a safeguard against overfilling containers, hose end valves must be quick closing types.

Startup

1. In order for the meter to operate and pump propane into an ASME tank, the motor/mobile fuel filling hose end valve must be connected to the ASME tank filler valve and valves V1, V2, V3 and V6 (shown in Figure 5.1.10b) must be in the open position.

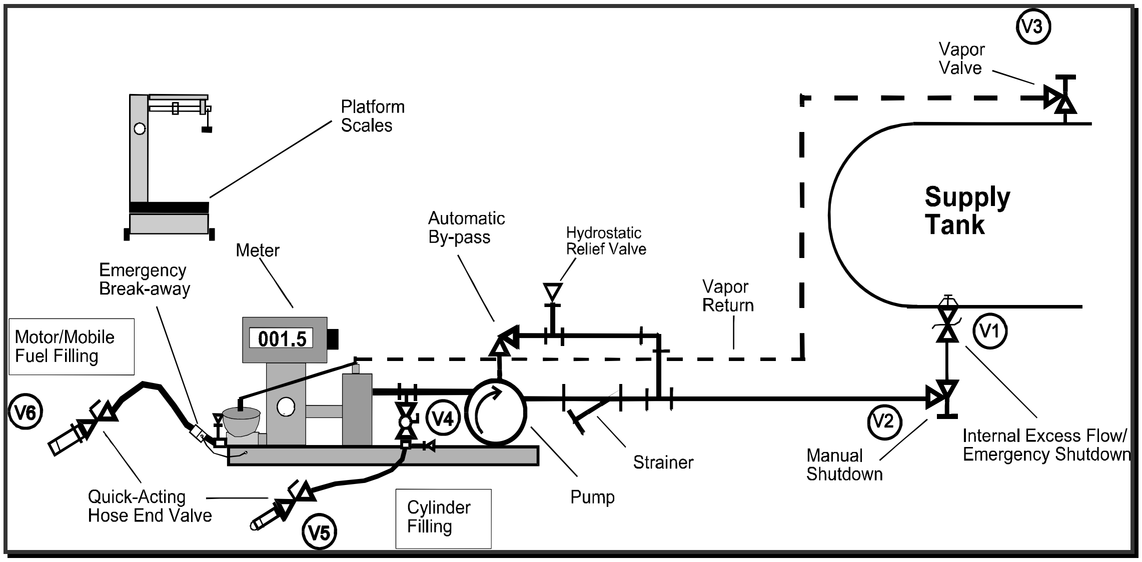


Figure 5.1.10b - Typical Propane Dispenser
(operating valves shown as numbered)

Most dispenser operators will open the vapor valve (V3) during the start up inspection and leave it open as long as they remain in attendance. If you have difficulty filling a motor or mobile fuel tank, always check to be sure the vapor valve is open.

2. Inspect the dispenser prior to propane transfer to ensure that the equipment and supplies needed are in safe and proper working order.

3. Ensure that the propane decal (Figure 5.1.10c) is correctly displayed on vehicles equipped with motor and/or mobile fuel tanks. Location requirements are:

   - For motor fuel tank equipped vehicles, on the rear of the vehicle near the bumper.

   - For vehicles equipped with mobile fuel tanks or concealed DOT cylinders, on or near the access panel door or fender skirt.

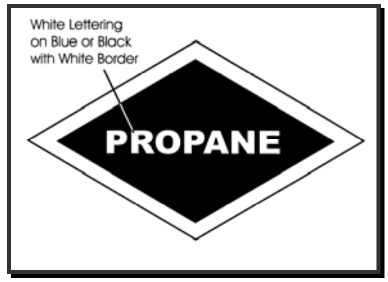


Figure 5.1.10c - Propane Diamond Decal

4. Conduct a pre-fill inspection on the vehicle's ASME tank.

   Unless an ASME tank has a legible ASME data plate, fuel cannot be transferred into the tank. It must contain the following information:

   - The service for which the container is designed
   - *Name and address of the manufacturer
   - *Water capacity of the container in pounds or U.S. gallons
   - *Design pressure in pounds per square inch (psi). The working pressure must be at least 250 psi for propane.
   - The wording "This container shall not contain a product having a vapor pressure in excess of 215 psi at 100°F."
   - Tare weight of container fitted for service
   - Outside surface area in square feet
   - Year of manufacture
   - Shell and head thickness
   - Overall length, outside and head diameter of the tank
   - *Manufacturer's serial number
   - *ASME Code symbol

   ***** These items must appear on the data plate or the tank should not be filled.

WARNING	If the tank does not have a data plate, or if its working pressure is not at least 250 psi, you must not fill it.

Operation

During the filling operation, no one can be inside the vehicle. Additionally, ignition sources must be controlled as described in Section 4 of this handbook.

Most motor fuel tanks are equipped with stop-fill or auto-stop valves. These valves are not the primary means of preventing overfilling. The dispenser operator's responsibility is to close the hose end valve when the fixed maximum liquid level gauge vents liquid LP-Gas.

Filling procedures for **mobile fuel** tanks are similar to those for motor fuel tanks, with one important addition - mobile fuel tanks are used to supply LP-Gas appliances that are possible ignition sources. So, **before the filling procedure is started:**

- Shut off the vapor service valve to eliminate the fuel supply to the pilots of the gas appliances.
- Notify the vehicle operator that you are turning the LP-Gas fuel supply off at the service valve and verify with him or her that appliance pilots are off.
- Allow ample time to ensure pilots are extinguished.
- Verify that pilots and pilot safety systems are off.

Once these steps have been taken, begin the filling process as follows:

1. Set the LP-Gas meter to zero.
2. Connect the motor fuel hose to the tank fill valve.
3. Open the vent valve on the fixed maximum liquid level gauge.
4. Start the pump and slowly open the valve on the hose.
5. When a steady white mist or fog is first emitted from the fixed maximum liquid level gauge vent valve, this indicates the maximum permissible fill has been reached.
6. Immediately close the hose end valve.
7. Close the fixed maximum liquid level gauge.
8. Shut off the pump.
9. Slowly loosen the filler adapter to vent liquid LP-Gas trapped between the filler adapter and the motor fuel tank filler valve.

Wait until LP-Gas stops venting and pressure is relieved between the adapter and the filler valve, before completely disconnecting the adapter.

10. When venting has stopped, disconnect and stow the hose assembly.

11. Check the valve for leaks and replace the dust cap or filler valve cap.

12. For mobile ASME fuel tanks, inform the operator that the service valve will need to be returned to the fully open position and appliance pilots re-lit <u>after</u> the vehicle has been moved from the LP-Gas transfer area. If it is not your company's policy to light customer pilot lights, advise the customer to have a professional service company or gas distributor light the pilot lights, that if the customer does this without professional help he/she must carefully follow the manufacturer's instructions.

<u>Shutdown</u>

When the dispenser is not in use, or at any time that a qualified dispenser operator is not in attendance, the dispenser should be shut down and secured in keeping with company operating procedures. The shut down procedure should ensure that dispenser operating valves are closed, transfer hoses are secured in storage cabinets or their designated locations, and the dispenser cabinet or fence gates are closed and locked.

5.2 <u>Vapor Distribution Systems</u>

The following sections contain guidelines for operating procedures specific to industrial plants using a vapor distribution system. These facilities will have some operating procedures that are similar to those at a Bulk Storage Facility. Therefore, refer to the appropriate subsections under Section 5.1 that apply to the normal operations of a large volume vapor distribution system.

<u>Vapor Distribution Systems – Tank Vaporization Only</u>

While the equipment at a large volume customer operating off of a vapor distribution system will vary in size (i.e., storage capacity, meters, regulators), the basic procedures to follow are usually much the same as for the bulk storage tank. Prior to any operation, one should review and be familiar with its design, layout, equipment, piping functions, and company operating procedures. *CETP Modules 4.1 & 4.2* provide detailed supporting information.

Startup

1. Before beginning any operation ensure the transfer equipment is in satisfactory operating condition, the bulk storage container is safe to be filled, and the surrounding area is free from hazards.

2. The following system checks/tests should be performed during the installation or modification of the vapor distribution system(s). Instructional details are provided in the referenced CETP Modules:

   - Purging of piping systems (per *CETP Module 4.2.21*).
   - Pressure tests and inspection of piping (per *CETP Module 4.2.19*).
   - Regulator operational tests (per *CETP Module 4.2.15*).
   - System leak checks (per *CETP Module 4.2.22*).
   - As required by local jurisdictional authorities, any changes in the system design made during the course of system installation (per *CETP Module 4.2.24*).

3. Ensure that all of the appropriate manual valves (i.e., globe, angle, or ball) are open on the bulk storage containers.

4. If the container has manually operated internal valves, ensure that the Emergency Shutdown system is operational and that internal valves are opened.

   c. For *pneumatically* operated systems, ensure that there is adequate pressure (typically 30-70 psig) and that the system is leak free.

   d. For *cable* operated systems, ensure that all cables are operational

Operation

2. The system is now operational and ready to:

   a. Supply a large volume vapor distribution system.

   b. Supply LP-Gas vapor to a jurisdictional (OPS) vapor distribution system.

   c. Supply liquid LP-Gas to a vaporizer system prior to supplying vapor to the distribution system (i.e., in systems where vaporizers are installed).

Shutdown

3. Ensure that all of the appropriate manual valves (i.e., globe, angle, or ball) are closed on the bulk storage container(s).

4. If the container has manually operated internal valves, ensure that these valves are closed by releasing the pressure in Emergency Shutdown System (pneumatic) or pulling the manual cable for the system.

Vaporizers

The types of vaporizers and their respective startup, operating and shutdown procedures vary considerably. Therefore, it is not possible to provide generic operating procedures or guidelines for this equipment.

SAFETY

Operators of vaporizers should be trained on the specific startup, operating and shutdown procedures prior to use. Follow all safety and operating instructions provided by the manufacturer.

Insert the vaporizer manufacturer's literature in Section 9, Manufacturers' Equipment Information.

Section Purpose and Objectives

This section of the handbook is intended to provide owners or operators of propane systems the information necessary to comply with the general requirements of NFPA 58-2004 for maintaining the mechanical integrity of an LP-Gas bulk plant through maintenance manuals and the incorporated procedures, Chapter 14 (§14.3.1 and §14.3.2).

A checklist approach for the development of procedures specific to the maintenance of the transfer system and plant equipment is provided in Section 7. Also, refer to Section 8 of this handbook for maintenance requirements and guidelines for bulk plant fire protection equipment.

Maintenance Manuals

Written maintenance procedures provided by equipment manufacturers may be used as maintenance manuals for the related equipment.

Maintenance Procedures

- Maintenance procedures are in written form in order to be used as the basis for maintaining the mechanical integrity of bulk plant LP-Gas systems.
- Whenever a change in equipment or the system occurs, the affected procedure(s) must be updated.

Maintenance Record Keeping

Maintenance records provide the tracking and documented verification that the facility is being properly maintained and in a safe condition in accordance with NFPA 58-2004.

- *Record Storage* - Maintenance records for all fixed equipment used to store and transfer LP-Gas must be kept at each facility. For unattended facilities, these records can be maintained at the unattended facility or another designated location.
- *Accessibility* – These records must be available to an authority having jurisdiction at any time during normal business hours.
- *Retention* – Maintenance records must be retained for the life of the equipment.

Sample charts for preventive maintenance record keeping (see Chart 6.1) and for logging equipment repairs (see Chart 6.2) are provided at the end of this section.

Maintenance Personnel - Training

- Individuals performing maintenance on the LP-Gas systems must be trained in the hazards of the system.
- Maintenance personnel also must be trained in the maintenance and testing procedures applicable to the systems or equipment on which they are working.
- In order to perform the maintenance procedures, all maintenance contractors must train the personnel under their supervision as noted in the previous two requirements, or ensure that personnel working on a system or LP-Gas equipment are under the supervision of a properly trained individual.

Physical Protection of Equipment

The following bulk plant equipment must be protected against physical damage due to impact from vehicles:

- LP-Gas containers.
- Aboveground piping, which also must be properly supported.
- Dispensers.

Corrosion Control

Aboveground Containers

- Aboveground containers must be painted to protect against atmospheric corrosion.
- The portion of an ASME container that comes in contact with saddles or foundations (including masonry) must be protected against localized corrosion by coating the affected area or by some other means (e.g., felt, weather stripping).
- Where necessary, non-metallic materials must be provided with protection to prevent deterioration due to atmospheric or chemical exposures. Corrosion protection of non-metallic materials should be in accordance with accepted engineering practice.

Underground and Mounded Containers

- For underground or mounded equipment, all metallic components must be coated or protected by some other means (e.g., cathodic protection) to minimize corrosion. The corrosion protection/control system must be maintained, where applicable, to minimize corrosion.

- For mounded containers, the mounding material (e.g., earth, sand, fillers) must be a non-combustible and non-corrosive material.
- For partially underground, unmounded ASME containers, the corrosion protection must extend for a vertical distance of at least 3 inches above the surface.

<u>Containers and Appurtenances</u>

NFPA 58-2004 provides for a number of general maintenance requirements associated with containers in order to allow their continued used. The important elements required by Chapter 14 of the Code include:

- **Steel containers** that have been involved in a fire <u>and</u> show no signs of distortion must be requalified before being placed back in service.
    - DOT containers must be requalified by either a DOT-approved repair facility or by a cylinder manufacturer of that type cylinder.
    - ASME containers must be retested using the hydrostatic test procedure that was applicable at the time of the original fabrication.
    - For both DOT and ASME containers involved in a fire, the appurtenances must be replaced by qualified personnel.
- **Aluminum DOT cylinders** that have been involved in a fire must be permanently taken out of service.
- All containers that have excessive external corrosion or dents, bulges or gouges must be removed from service.
- **DOT stationary cylinders** that are filled at the customer's location must be:
    - Requalified in accordance with DOT requirements; or
    - Visually inspected within 12 years of the date of manufacture and every 5 years thereafter. Visual inspection requirements are detailed in Paragraph 5.2.3.1 of NFPA 58.

Additional maintenance requirements for container appurtenances are as follows:

- **Gaskets** for container appurtenances and the system piping must be resistant to the action of LP-Gas. Furthermore, gaskets must be replaced whenever a flange is opened. Other detailed gasket requirements are defined in §5.7.1.4 and §12.3.3.4

through §12.3.3.6 of NFPA 58-2004.

- **Pressure Relief valves** and discharge piping must be protected to minimize the entrance of water or extraneous materials through the use of rain caps or any other effective means that do not affect their operability.

Emergency Shutoff Valves

- Emergency shutoff valves (ESVs) and backflow check valves that are required by the Code must be tested annually for their functionality. ESVs must be specifically tested for:

    - Automatic shutoff associated with thermal (fire) actuation.
    - Manual shutoff from a remote location.
    - Manual shutoff at the valve

  The results of these tests must be documented (see sample Chart 6.3 at the end of this section). The Code does not set requirements for the retention and maintenance of these test results. Therefore, you should check with established company policy for the manner in which and the length of time that these records should be kept.

- Temperature-sensitive elements (i.e., thermal links) cannot be painted nor have any ornamental finishes applied after they have been manufactured.

Hose Inspection and Maintenance

Hose assemblies used for liquid transfer must be inspected prior to each use for leakage and any damage that could impair their integrity, and no less than annually.

When inspecting the hose assembly, look for:

- Damage to the outer cover that exposes the reinforcement.
- Kinked or flattened hose.
- Soft spots or bulges in the hose.
- Damaged couplings (including loose bolts, missing parts and slippage).
- Leakage.

Leaking or damaged hose assemblies must be immediately repaired or removed from service.

The Code does not set requirements for the documentation, retention and maintenance of hose inspection results. Therefore, you should check with established company policy.

Chart 6.1 (Sample)
Preventive Maintenance Records

Company: _______________ *Location:* ______________________________ *Year:* ________

Equipment	Procedure	Frequency	Dates Performed
Propane Pump	Inspect coupling; grease pump	Per Mfg. Recommendations	
Propane Compressor	Inspect belts; change oil & filter	Per Mfg. Recommendations	
Hoses	Inspect for cracks, cuts, gouges, wear and other damage	Per company policy	
Others, etc.			

Chart 6.2 (Sample)
Fixed Equipment Log
Repairs, Replacements and Unscheduled Maintenance

Company: _______________ *Location:* ____________________________ *Year:* __________

Equipment	Maintenance/Repair/Replacement Procedure	Date Performed

Chart 6.3 (Sample)
ESV & Back Check Valve Testing Log

Company: ______________ *Location:* ___________________________ *Year:* _______

Plant Location	Liquid Service (✓)	Vapor Service (✓)	Acceptable* (✓)		Corrective Action *(if "no" in previous column)*
			Yes	No	
Bobtail #1					
Bobtail #2					
Bobtail #3					
Transport Unloading					
Transport Loading					
Railcar Unloading					
Railcar Loading					
Bulk Storage #1					
Bulk Storage #2					
Bulk Storage #3					
Other, etc.					

** Based on visual inspection of thermal link (no paint), manual shutoff from remote location, manual shutoff at installed location, and/or positive shutoff by back check valve*

Section Purpose and Objectives

NFPA 58-2004 requires that bulk plants and industrial plants have maintenance procedures that are documented and readily available (§14.3.1 and 14.3.2). This section provides guideline maintenance and inspection procedures that will provide the basis for maintaining the mechanical integrity of LP-Gas Systems.

Scope and Application of Section

While maintenance and inspection procedures are typically similar at LP-Gas bulk storage facilities and large-volume storage/vapor distribution systems, the equipment can vary in size (e.g., storage capacity), design, layout, equipment complexity or function (e.g., rail unloading facilities, cylinder filling operations, on-site commercial dispensers). Similar to the operating procedures in Section 5, this handbook section should be considered to be a “template” for the maintenance and inspection activities conducted at any specific LP-Gas bulk storage facility. Additions, modifications or deletions to these procedures could be necessary. Therefore, owners or site management/supervisors should consider site-specific features and conditions that need to be included, modified or deleted in the information in this section in order to accurately reflect local operations and conditions. With these changes, operators, technicians, drivers and other site personnel can use this document as the maintenance procedures required by NFPA 58-2004.

Although NFPA 58-2004 references the need for documented maintenance and inspection requirements with respect to refrigerated storage, marine and pipeline LP-Gas systems, these systems (which can vary significantly in design and complexity) come under the authority of other jurisdictions which have very specific and detailed requirements.

IMPORTANT: All bulk plant maintenance and inspections performed should conform to equipment manufacturers’ instructions as they apply to specific equipment installation and maintenance procedures.

Manufacturer's literature provides the recommended procedures for maintenance and repair for equipment specific to your facility. Owners and managers/supervisors must obtain that information and include it in Section 9 of this handbook (“Manufacturers’ Equipment Information”) for use by operators, technicians, drivers and other personnel in carrying out their responsibilities. Review this information to determine the appropriate action to take for inspections, maintenance and repairs.

Content of Section

The chart below is a guide to easily identify which equipment in the facility is subject to maintenance and inspection requirements and where these requirements can be found in the checklists that follow. Applicable CETP modules are included in the table for easy reference to further instructional information and materials.

Topic	CETP Ref.	Handbook Sect. 7 Pages	Check, If Applicable
Bulk Storage Containers	3.4.1 & 3.4.2	3 - 6	
Piping	3.4.2	7	
Liquid Pumps	3.4.5	8 - 9	
Bulkheads	3.4.3	10 - 11	
Vapor Compressor	3.4.6	12 - 13	
Tank Car Unloading Tower	3.4.3	14 - 15	
Scales	3.4.8	16	
Meters (Retail Sales Only)	3.4.8	17	
Vaporizers	N/A	18	
Regulators	4.2.15	18	
Electrical Systems	3.4.7	19	

Maintenance and Inspection Procedural Checklist

This section provides a bulk storage facility maintenance and inspection checklist detailing some of the many preventative maintenance and inspection steps that must be conducted in typical bulk storage facility and large volume vapor distribution systems.

This checklist is based on the 2004 Edition of NFPA 58. If your facility is not equipped with an item on this checklist, refer to the edition of NFPA 58 that was applicable at the time of installation. If the edition in effect did not require the item on the checklist, mark the “N/A” (not applicable) box and note the referenced edition in the “Comments” section.

To use this checklist to support and document your maintenance and inspection activities, simply take the actions as directed by the questions and check the appropriate column (i.e., yes, no, not applicable). If the “no” box is checked, comments describing the corrective action steps that have been taken must be documented. If additional space is required, separate sheets can be attached to the checklist. Refer to Appendix 7.1 at the end of this section for additional guidance for completing the checklist.

Inspection / Maintenance Item	Yes	No	N/A	Comments
1. Bulk Storage Containers				
Tank#: **Mfg Serial#:**				
National Board #: **Manufacturer Name:** **Year Built:**				
(A) Construction—Code Compliance				
Is the Manufacturer's Data Plate secured and legible?	☐	☐	☐	
Is the data plate free of corrosion?	☐	☐	☐	
Is the pressure rating proper for the product?	☐	☐	☐	
(B)Container – Condition and Markings				
Are aboveground tanks properly painted?	☐	☐	☐	
Are containers free of excessive corrosion damage, dents, gouges or other damage?	☐	☐	☐	
Are all container markings and decals in accordance with NFPA 58?	☐	☐	☐	
(C) Container Foundations				
Are foundations in good condition?	☐	☐	☐	
Are containers/saddles free of corrosion at masonry contact areas?	☐	☐	☐	
Are saddle pads in good condition?	☐	☐	☐	
(D) Container Fittings				
Are all container openings (except relief valve connections) equipped with proper fixed restriction, back check, or internal valves and shutoff valves?	☐	☐	☐	
Are connections on containers greater than 2,000 gallon water capacity marked "vapor" or "liquid"?	☐	☐	☐	

	Inspection / Maintenance Item	Yes	No	N/A	Comments
(D) Container Fittings (cont'd)					
	Are all fittings that are subject to container pressure rated for at least 250 psig working pressure?	☐	☐	☐	
	Are all unused openings plugged or capped?	☐	☐	☐	
	Are all fittings leak-free?	☐	☐	☐	
(E) Container Gauges					
	Are pressure gauges in good condition and suitable for 250 psig service (such as 0 - 400 psig)?	☐	☐	☐	
	Are thermometers in good condition?	☐	☐	☐	
	Are liquid level gauges arranged and installed so that the liquid level can be accurately determined?	☐	☐	☐	
(F) Container Pressure Relief Valves					
	Is relief valve data legible?	☐	☐	☐	
	Is the relief valve marked for use with LP-Gas and labeled by an independent testing agency?	☐	☐	☐	
	Is the relief capacity sufficient, as determined by NFPA 58?	☐	☐	☐	
	Do relief valves communicate with the container vapor space and discharge upward, unobstructed to the open air?	☐	☐	☐	
	Are relief valves on containers >2000 gallons water capacity equipped with vent stacks of proper diameter and length?	☐	☐	☐	
	Are relief valve vent stacks on containers >2000 gallons water capacity equipped with breakaway couplings?	☐	☐	☐	
	Do relief valves or vent stacks have loose-fitting protective caps or closures to prevent entry of foreign matter?	☐	☐	☐	
	Are weep holes for moisture drainage open and is gas impingement of the container prevented?	☐	☐	☐	

	Inspection / Maintenance Item	Yes	No	N/A	Comments
(G) Container - Internal Valves					
	Are the valve body seams leak-free?	☐	☐	☐	
	Are operating cables working correctly?	☐	☐	☐	
	Is the pneumatic control system in good working condition?	☐	☐	☐	
	Are hydraulic operators in good working condition?	☐	☐	☐	
	Is the thermal link intact and free of paint?	☐	☐	☐	
(H) Container - Emergency Shut-off Valves					
	Are ESVs in good working condition and leak free?	☐	☐	☐	
	Has an annual test been performed and documented as required by NFPA 58?	☐	☐	☐	
	Are operating cables working correctly?	☐	☐	☐	
	Is the pneumatic control system in good working condition?	☐	☐	☐	
	Are remote emergency shutoff devices between 25 and 100 feet from the ESV and within the path of egress?	☐	☐	☐	
	Is the thermal link intact and free of paint?	☐	☐	☐	
(I) Container - Manual Shut-off Valves					
	Are valves located so that they can be easily reached during normal operations and in an emergency?	☐	☐	☐	
	Are valves in good condition and leak-free?	☐	☐	☐	
	Do valves have the proper service pressure rating, equal to or greater than the maximum allowable working pressure of the container?	☐	☐	☐	

Inspection / Maintenance Item		Yes	No	N/A	Comments
(J) Container - Catwalks and Stairways					
	Are stairways well anchored and supported?	☐	☐	☐	
	Are catwalk railings provided and in good condition?	☐	☐	☐	
	Does decking design offer drainage and prevent accumulation?	☐	☐	☐	
(K) Container – Presence of Combustibles					
	Is the area within 10 feet of the containers free of weeds, long grass, rags, paper, wood or other loose or piled combustible debris?	☐	☐	☐	
(L) Underground ASME Storage Tank					
	Is protection against vehicular damage provided for the fitting housing, housing cover, tank connections and piping?	☐	☐	☐	
	Is the container protected against corrosion by at least one of the following means:				
	a.) An external coating on the tank?	☐	☐	☐	
	b.) Cathodic protection?	☐	☐	☐	

Inspection / Maintenance Item	Yes	No	N/A	Comments
2. Piping				
(A) Condition of Pipe and Paint				
Are aboveground pipes properly painted?	☐	☐	☐	
Are pipes free of corrosion damage, dents, gouges or other damage?	☐	☐	☐	
Are pipes adequately supported?	☐	☐	☐	
Are pipes adequately protected against physical damage by vehicles?	☐	☐	☐	
Are pipes properly marked “vapor” or “liquid” or color coded accordingly?	☐	☐	☐	
(B) Pipe Fittings				
Are all flanges and fittings properly sized for the pressure rating, equal to or greater than the maximum allowable working pressure of the system?	☐	☐	☐	
Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?	☐	☐	☐	
Are all flow indicators and sight checks in proper working condition and leak-free?	☐	☐	☐	
Are all fittings and pipes leak-free?	☐	☐	☐	
(C) Hydrostatic Relief Valves				
Are hydrostatic relief valves installed in each section of piping in which liquid can be isolated between shut-off valves?	☐	☐	☐	
Are hydrostatic relief valves approved for use with LP-Gas?	☐	☐	☐	
Do the hydrostatic relief valves have pressure settings between 400 – 500 psig?	☐	☐	☐	
(D) Piping - Manual Shut-off Valves				
Are valves located so that they can be easily reached during normal operations and in an emergency?	☐	☐	☐	
Are valves in good condition and leak-free?	☐	☐	☐	
Do valves have the proper pressure rating, equal to or greater than the maximum allowable working pressure of the system?	☐	☐	☐	
(E) Underground Piping				
Is metallic underground piping protected against corrosion by at least one of the following means:				
a.) An external coating on piping?	☐	☐	☐	
b.) Cathodic protection?	☐	☐	☐	

Inspection / Maintenance Item		Yes	No	N/A	Comments
3. Liquid Pump					
(A) General					
	Are pumps free of corrosion or other damage?	☐	☐	☐	
	Are pump pads and/or foundations in good condition and properly supporting the pumps?	☐	☐	☐	
	Are base plate bolts in place and properly securing the pump to that foundation?	☐	☐	☐	
	Are the pumps properly lubricated?	☐	☐	☐	
	Are strainers in good working condition (i.e., strainer screens free of debris) and leak-free?	☐	☐	☐	
	Are hydrostatic relief valves installed in the appropriate location and in good working condition?	☐	☐	☐	
	Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?	☐	☐	☐	
	Are fittings and piping associated with the pump leak-free?	☐	☐	☐	
(B) Pump Drive Components					
	Are drive belts properly aligned and in good working condition?	☐	☐	☐	
	For shaft coupling-driven pumps, are shaft couplings properly aligned?	☐	☐	☐	
	For shaft coupling-driven pumps, are spacing bushings in good working condition?	☐	☐	☐	
	For gear reduction-driven pumps, are universal joints and couplings properly aligned and in good working condition?	☐	☐	☐	
	Are drive belt guards in place and secure?	☐	☐	☐	
(C) Pump Gauges					
	Are pressure gauges in good condition (i.e., 0 - 400 psig)?	☐	☐	☐	
(D) Automatic Bypass Valves					
	Are bypasses in good working condition and leak-free?	☐	☐	☐	
	Are bypasses set at the appropriate pressure differential?	☐	☐	☐	

	Inspection / Maintenance Item	Yes	No	N/A	Comments
(E) Pump – Manual Shut-off Valves					
	Are valves located so that they can be easily reached during normal operations and in an emergency?	☐	☐	☐	
	Are valves in good condition and leak-free?	☐	☐	☐	
	Do valves have the proper pressure rating, equal to or greater than the maximum allowable working pressure of the system?	☐	☐	☐	

Inspection / Maintenance Item		*Yes*	*No*	*N/A*	*Comments*
4. Bulkheads					
(A) General					
	Are bulkheads properly protected against vehicular damage?	☐	☐	☐	
	Are bulkheads (i.e., structure and foundation) in good condition and properly supporting the bulkhead, especially in the event of an attempted pull-away?	☐	☐	☐	
(B) Bulkheads- Piping and Fittings					
	Are pipe nipples and couplings that are attached to the bulkhead in good working condition and free of excessive wear?	☐	☐	☐	
	Are all flanges and fittings properly sized for the pressure rating, equal to or greater than the maximum allowable working pressure of the system	☐	☐	☐	
	Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?	☐	☐	☐	
	Are all flow indicators and sight checks in proper working condition and leak-free?	☐	☐	☐	
	Are hydrostatic relief valves installed in the appropriate location and in good working condition?	☐	☐	☐	
	Are all fittings and pipes leak-free?	☐	☐	☐	
(C) Bulkheads - Emergency Shut-off Valves (ESVs)					
	Are ESVs in good working condition and leak-free?	☐	☐	☐	
	Has an annual test been performed and documented as required by NFPA 58	☐	☐	☐	
	Are operating cables operating correctly?	☐	☐	☐	
	Is the pneumatic control system in good working condition?	☐	☐	☐	

	Inspection / Maintenance Item	*Yes*	*No*	*N/A*	*Comments*
(C) Bulkheads - Emergency Shut-off Valves (ESVs) (Cont'd)					
	Are remote emergency shutoff devices between 25 and 100 feet from the ESV and within the path of egress?	☐	☐	☐	
(D) Bulkheads - Hoses					
	Are the hose covers free of exposed reinforcement?	☐	☐	☐	
	Is wire braid reinforcement free of kinks and not flattened?	☐	☐	☐	
	Are hoses free of soft spots when not under pressure, show no bulging under pressure, and have no loose outer coverings?	☐	☐	☐	
	Are hose coupling assemblies secure and in good working condition?	☐	☐	☐	
	Are the ACME threads, O-rings, or gaskets in good working condition (i.e., showing little sign of excessive wear)?	☐	☐	☐	
(E) Bulkheads – Manual Shut-off Valves					
	Are valves located so that they may be easily reached during normal operations and in an emergency?	☐	☐	☐	
	Are valves in good condition and leak-free?	☐	☐	☐	
	Do the valves have the proper pressure rating, equal to or greater than the maximum allowable working pressure of the system?	☐	☐	☐	

Inspection / Maintenance Item	Yes	No	N/A	Comments
5. Vapor Compressor				
(A) General				
Are compressors free of corrosion or other damage?	☐	☐	☐	
Are compressor pads and/or foundations in good condition and properly supporting the compressors?	☐	☐	☐	
Are base plate bolts in place and securing the compressor to that foundation?	☐	☐	☐	
Are the compressors properly lubricated?	☐	☐	☐	
Is the crankcase oil properly filled?	☐	☐	☐	
Is the crankcase oil pressure properly set?	☐	☐	☐	
Has the oil filter been changed at the manufacturer's recommended interval?	☐	☐	☐	
Are strainers elements in good working condition (i.e., strainer screens free of debris) and leak-free?	☐	☐	☐	
Are pressure relief valves installed in the appropriate location and in good working condition?	☐	☐	☐	
Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?	☐	☐	☐	
Are all back check valves in proper working condition and leak-free?	☐	☐	☐	
Are fittings and piping associated with the compressor leak-free?	☐	☐	☐	
(B) Compressor Drive Components				
Are drive belts properly aligned, tension properly set, and in good working condition?	☐	☐	☐	
For direct drive compressors, are shaft couplings properly aligned and in good working condition?	☐	☐	☐	
Are drive belt guards in place and secure?	☐	☐	☐	
(C) Compressor Gauges				
Are pressure gauges (suction and discharge) in good condition (i.e., 0 - 400 psig)?	☐	☐	☐	

	Inspection / Maintenance Item	*Yes*	*No*	*N/A*	*Comments*
(D) Compressor – Manual Shut-off Valves					
	Are valves located so that they can be easily reached during normal operations and in an emergency?	☐	☐	☐	
	Are valves in good condition and leak-free?	☐	☐	☐	
	Do valves have the proper pressure rating, equal to or greater than the required working pressure of the system?	☐	☐	☐	

Inspection / Maintenance Item		Yes	No	N/A	Comments
6. Tank Car Unloading Tower					
(A) Tower Foundations					
	Are foundations in good condition?	☐	☐	☐	
(B) Tower- Piping and Fittings					
	Are all flanges and fittings properly sized for the pressure rating equal to or greater than the maximum allowable working pressure of the system?	☐	☐	☐	
	Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?	☐	☐	☐	
	Are all flow indicators and sight checks in proper working condition and leak free?	☐	☐	☐	
	Are hydrostatic relief valves installed in the appropriate location and in good working condition?	☐	☐	☐	
	Are all fittings and pipes leak-free?	☐	☐	☐	
(C) Towers - Emergency Shut-off Valves (ESVs)					
	Are ESVs in good working condition and leak-free?	☐	☐	☐	
	Are ESVs and/or back checks (including thermal release) on riser ends of the liquid hoses in good working condition?	☐	☐	☐	
	Are ESVS on riser ends of the vapor hose (including thermal release) in good working condition?	☐	☐	☐	
	Has an annual test been performed and documented as required by NFPA 58?	☐	☐	☐	
	Is the pneumatic control system in good working condition and free of leaks?	☐	☐	☐	
	Are remote emergency shutoff devices between 25 and 100 feet from the ESV and within the path of egress?	☐	☐	☐	

	Inspection/ Maintenance Item	Yes	No	N/A	Comments
(D) Tower - Hoses and Loading Arms					
	Are the hose covers in good condition to prevent exposure of the reinforcement?	☐	☐	☐	
	Is wire braid reinforcement free of kinks and not flattened?	☐	☐	☐	
	Are hoses free of soft spots when not under pressure, show no bulging under pressure, and have no loose outer coverings?	☐	☐	☐	
	Are hose coupling assemblies secure and in good working condition?	☐	☐	☐	
	Are the ACME threads, O-rings, or gaskets in good working condition (i.e., showing little sign of excessive wear)?	☐	☐	☐	
	Are loading arms leak-free and in good working condition?	☐	☐	☐	
	Are the loading arm swing-joints properly lubricated?	☐	☐	☐	
	Are all factory installed protective guards in place and secure?	☐	☐	☐	
(E) Tower – Manual Shut-off Valves					
	Are valves located so that they can be easily reached during normal operations and in an emergency?	☐	☐	☐	
	Are valves in good condition and leak-free?	☐	☐	☐	
	Do valves have the proper pressure rating, equal to or greater than the required working pressure of the system?	☐	☐	☐	

Inspection/ Maintenance Item		Yes	No	N/A	Comments
7. Scales					
(A) General					
	Has the scale(s) been checked periodically using a certified/standard dead weight?	☐	☐	☐	
	Is the scale(s) properly calibrated and been certified by the proper authority having jurisdiction?	☐	☐	☐	
	Have all loops, pivots, and bearings been periodically lubricated?	☐	☐	☐	
	Are the scale pit(s) and/or platform(s) free of any debris?	☐	☐	☐	
(B) Automatic Shut-off System					
	Are all actuators and control valves leak-free and in good working condition (i.e., proper fluid levels and proper alignment with scale)?	☐	☐	☐	
	Are all sensing lines leak-free and in good working condition (i.e., free of kinks and proper alignment with the scale)?	☐	☐	☐	
(C) Hoses					
	Are the hose covers free of exposed reinforcement?	☐	☐	☐	
	Is wire braid reinforcement free of kinks and not flattened?	☐	☐	☐	
	Are hoses free of soft spots when not under pressure, show no bulging under pressure, and have no loose outer coverings?	☐	☐	☐	
	Are hose coupling assemblies secure and in good working condition?	☐	☐	☐	
	Are the ACME threads, O-rings, or gaskets in good working condition (i.e., showing little sign of excessive wear)?	☐	☐	☐	

	Inspection / Maintenance Item	Yes	No	N/A	Comments
8. Meters (For Retail Sales Only)					
(A) General					
	Is the meter(s) properly calibrated or "proved" at the appropriate time intervals?	☐	☐	☐	
	Is the seal(s) in place by the appropriate authority having jurisdiction?	☐	☐	☐	
	Is the meter in good working condition and free of leaks?	☐	☐	☐	
	Has the strainer been properly cleaned out of any debris?	☐	☐	☐	
(B) Hoses					
	Are the hose covers free of exposed reinforcement?	☐	☐	☐	
	Is wire braid reinforcement free of kinks and not flattened?	☐	☐	☐	
	Are hoses free of soft spots when not under pressure, show no bulging under pressure, and have no loose outer coverings?	☐	☐	☐	
	Are hose coupling assemblies secure and in good working condition?	☐	☐	☐	
	Are the ACME threads, O-rings, or gaskets in good working condition (i.e., showing little sign of excessive wear)?	☐	☐	☐	
	Are pull-away couplings in place and in good working condition?	☐	☐	☐	

Inspection / Maintenance Item		Yes	No	N/A	Comments
9. Vaporizers					
(A) General					
	Is the vaporizer(s) leak-free and in good working condition?	☐	☐	☐	
	Have pilot lights been cleaned on a regular basis?	☐	☐	☐	
	On a periodic basis, have all strainers been cleaned at the inlet side of the vaporizer(s)?	☐	☐	☐	
	Have heavy ends been cleaned from the vaporizer(s) and/or separator tank?	☐	☐	☐	
	Have the burner openings, thermostat, and flue been cleaned?	☐	☐	☐	
	Is the vaporizer(s) located in accordance with NFPA 58?	☐	☐	☐	

Inspection / Maintenance Item		Yes	No	N/A	Comments
10. Regulators					
(A) General					
	Is the first-stage or high-pressure regulator directly attached by flexible connectors to the vaporizer outlet or to the interconnected piping of manifolded vaporizers?	☐	☐	☐	
	Are all first-stage and high-pressure regulators installed outside of buildings?	☐	☐	☐	
	Are all regulators that are outside of buildings installed and protected so that their operation will not be affected by environmental elements (e.g., freezing rain, sleet, snow, ice, mud or debris) or insects?	☐	☐	☐	
	Is the point of discharge on the regulator's relief device at least 3 feet horizontally away from any building opening that is below the level of the discharge?	☐	☐	☐	
	Is the point of discharge on the regulator's relief device located at least 5 feet in any direction from any source of ignition or mechanical ventilation air intakes?	☐	☐	☐	

	Inspection / Maintenance Item	*Yes*	*No*	*N/A*	*Comments*
11. Electrical Systems					
(A) General					
	Are all electrical components and wiring in compliance with Table 6.20.2.2 (Electrical Area Classification) in NFPA 58-2004?	☐	☐	☐	
	Are electrical control switches and wiring in compliance with Class 1, Group D, Division 1 or 2 (where applicable) in compliance with Table 6.20.2.2 (Electrical Area Classification) in NFPA 58-2004?	☐	☐	☐	
	Are pump and/or compressor switches readily accessible to the operator?	☐	☐	☐	
	Are electrical controls for equipment clearly marked or color-coded to indicate the on and off (stop) positions?	☐	☐	☐	
	Is the electrical emergency shutdown located more than 20 ft (but less than 100 ft) from any dispensing devices, and prominently labeled?	☐	☐	☐	
	Is electrical wiring, in Division 1 or 2 areas, installed in rigid conduit? Class 1, Group D in flexible sections?	☐	☐	☐	
	For electric motors, are flexible connectors Class 1, Group D, Division 1 or 2 where applicable?	☐	☐	☐	
	Are all seal-off fixtures filled with suitable putty and installed in the appropriate locations?	☐	☐	☐	

Appendix 7.1

Maintenance and Inspection Procedural Checklist Guidelines

These guidelines are based on the 2004 Edition of NFPA 58. Check with your supervisor if your facility or equipment was constructed or installed under a previous Code edition. If the item on the checklist is not subject to the requirements of the 2004 Edition, refer to the applicable Code edition for guidance.

1. BULK STORAGE CONTAINERS

A. CONSTRUCTION – CODE COMPLIANCE

- ***Is the Manufacturer's Data Plate (i.e., nameplate) secured and legible?***

  - The nameplate should be stainless steel and attached to the container in such a way that minimizes corrosion of the nameplate and does not contribute to corrosion of the container.
.
  - The nameplate should be located so that it is visible after the container is installed.

  - Where the container is buried or otherwise covered so that the nameplate is obscured, the information contained on the nameplate can be duplicated and installed on adjacent piping or on a structure in a clearly visible location.

- ***Is the data plate free of corrosion?***

  - See the guidelines for the above inspection point.

- ***Is the pressure rating proper for the product?***

  For use in propane service, stationary tanks must have a minimum working pressure of 250 psig (200 psig for some specific ASME tanks built before 1950). Check with your supervisor if the minimum working pressure is something other than 250 psig.

B. CONTAINER – CONDITION AND MARKINGS

- ***Are aboveground tanks properly painted?***

  - The container should have a paint/coating system in place that prevents corrosion (rusting).

  - Generally, a light reflecting color paint is preferred unless the system is installed in an extremely cold climate.

- ***Are containers free of excessive corrosion damage, dents, gouges or other damage?***

  - External visual inspection of the shell and heads of the container should indicate that no loss of wall thickness has occurred on the container, either generally or locally. If there is any question regarding the potential loss of wall thickness, a qualified inspector can be employed using appropriate non-destructive testing techniques.

- ***Are all container markings and decals in accordance with NFPA 58?***

  See the first item regarding requirements for the manufacturer's data plate. Additionally, all ASME containers that contain unodorized LP-Gas must be marked "NOT ODORIZED" in letters 4 inches high with a contrasting background, surrounded by a ½ inch rectangular border.

C. CONTAINER FOUNDATIONS

- ***Are foundations in good condition?***

  - The structural supports must be constructed of masonry or another noncombustible material, and located on concrete or masonry foundations. They should be free of excessive cracking and have no significant loss of the structural materials. Footings should be level and stable.

- ***Are containers/saddles free of corrosion at masonry contact areas?***

  - The parts of the ASME container in contact with the saddles or foundations must be coated or protected in some manner to minimize corrosion. No signs of rust bleeding should be apparent.

- ***Are saddle pads in good condition?***

  - The pads should show no signs of excessive deterioration and should have adequate weather sealing to prevent moisture from accumulating and causing corrosion on the container.

D. CONTAINER FITTINGS

- ***Are all container openings (except relief valve connections) equipped with proper fixed restriction, back check, or internal valves and shutoff valves?***

  - Check with your supervisor and refer to the Code edition applicable for your installation for specific requirements.

- ***Are connections on containers greater than 2,000 gallon water capacity marked "vapor" or "liquid"?***

  - Labels or color codes are permitted to be on valves. Connections for pressure relief devices, liquid level gauges and pressure gauges are not required to be labeled.

- ***Are all fittings that are subject to container pressure rated for at least 250 psig working pressure?***

  - Possible exception: The requirement <u>could</u> be 200 psig associated with some specific ASME tanks built before 1950. Check the container nameplate and discuss with your supervisor if other than 250 psig rating.

- ***Are all unused openings plugged or capped?***

  - A blind flange or plugged companion flange is acceptable, also.

- ***Are all fittings leak-free?***

  - Check each fitting using a gas detector calibrated for LP-Gas or an ammonia-free leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should form. Listen and smell for possible leaks.

E. CONTAINER GAUGES

- ***Are pressure gauges in good condition and suitable for 250 psig service (such as 0 – 400 psig)?***

  - ❑ The gauges must be readable, functioning and leak-free. They must be attached directly to the container opening or to a valve or fitting that is directly attached to the container opening.

- ***Are thermometers in good condition?***

  - ❑ Temperature gauges (thermometers) must be readable, functioning and leak-free.

- ***Are liquid level gauges arranged and installed so that the liquid level can be accurately determined?***

  - ❑ The gauging devices must be either fixed maximum liquid level gauges or variable gauges of the slip tube, rotary or float types.

  - ❑ Bulk storage containers must be equipped with a fixed maximum liquid level gauge to indicate the maximum filling level.

  - ❑ ASME containers must have permanently attached markings showing the percentage of capacity that is indicated by that gauge. These markings must be attached to the container, immediately adjacent to the fixed maximum liquid level gauge or on the container nameplate.

F. CONTAINER PRESSURE RELIEF VALVES

- ***Is relief valve data legible?***

  - ❑ Each pressure relief valve must be plainly and permanently marked with the following information:

    + The pressure in psig at which the valve is set to discharge (i.e., start-to-leak).

    + Rated relieving capacity (cubic feet per minute).

    + Manufacturer's name and catalog number.

- ***Is the relief valve marked for use with LP-Gas and labeled by an independent testing agency?***

  - ❑ Underwriters Laboratory (UL) or other testing agency markings must be legible on the valve.

- ***Do relief valves communicate with the container vapor space and discharge upward, unobstructed to the open air?***

  - Self-explanatory.

- ***Are relief valves on containers > 2,000 gallons water capacity equipped with vent stacks of proper diameter and length?***

  - The diameter of the vent stack piping must be large enough so as not to restrict discharge flow.

  - The relief valve discharge must be piped upward to a point at least seven (7) feet above the top of the container.

  - Check with your supervisor if there is any question regarding the installation of vent stacks.

- ***Are relief valve vent stacks on containers > 2,000 gallons water capacity equipped with breakaway couplings?***

  - Inspect the base of the extension stack, immediately above the relief valve, for the presence of a breakaway coupling.

- ***Do relief valves or vent stacks have loose-fitting protective caps or closures to prevent entry of foreign matter?***

  - Rain caps or other protective devices must be provided to minimize the possibility of water or other foreign matter from entering into the relief device or any discharge piping. Where accumulation of water is anticipated, means for drainage must be provided.

  - The rain cap or other protective device must be designed to remain in place, except during discharge, and not restrict discharge flow.

- ***Are weep holes for moisture drainage open and is gas impingement of the container prevented?***

  - Weep holes must remain clear in order to prevent accumulation of moisture/condensation.

  - A deflector or other means must be in place to protect the container against flame impingement resulting from ignited product escaping from the drain opening.

G. CONTAINER – INTERNAL VALVES

- ***Are the valve body seams leak-free?***
  - Check each fitting using a gas detector calibrated for LP-Gas or an ammonia-free leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should appear. Listen and smell for possible leaks.
- ***Are operating cables working correctly?***
  - The cable should be free to move through its entire range without binding.
  - The cable should fully open and completely close the valve.
- ***Is the pneumatic control system in good working order?***
  - Check the operators to ensure proper functioning (typically, through release of air or nitrogen pressure and then repressurizing).
  - The system should be checked for leaks by pressurizing the system and checking all connections with a leak detector solution. No bubbles should appear.
  - The operator should fully open and completely close the valve.
- ***Are hydraulic operators in good working condition?***
  - Check the operators to ensure proper functioning (typically, through release of pressure and then repressurizing).
  - The operator should fully open and completely close the valve.
- ***Is the thermal link intact and free of paint?***
  - Self-explanatory. Additionally, the thermal link should be free of any coating (including foreign matter) that could interfere with the proper functioning of the link.

H. CONTAINER- EMERGENCY SHUT-OFF VALVES

- ***Are ESVs in good working condition and leak-free?***
  - Check for leakage at all body seams, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.
  - Test (operate) the closing feature to ensure that it will close and open the valve.

- ***Has an annual test been performed and documented as required by NFPA 58?***

  - The valves need to be tested for the following functions:
    + Automatic shutoff through thermal (fire) actuation. (Note: Check for the presence of the thermal element.)
    + Manual shutoff from a remote location.
    + Manual shutoff at the installed location.

- ***Are operating cables working correctly?***

  - Check operating cables to make sure they can move through their entire range without binding.

  - Make sure the cable tension is not too tight since that might prevent the valve from latching properly, or vibration or jarring could cause inadvertent closure during normal transfer operations.

- ***Is the pneumatic control system in good working condition?***

  - Check the operators to ensure proper functioning (typically, through release of air or nitrogen pressure and then repressurizing).

  - The system should be checked for leaks by pressurizing the system and checking all connections with a leak detector solution. No bubbles should appear.

  - The operator should fully open and completely close the valve.

- ***Are remote emergency shutoff devices between 25 and 100 feet from the ESV and within the path of egress?***

  - Self-explanatory.

- ***Is the thermal link intact and free of paint?***

  - Self-explanatory. Additionally, the thermal link should be free of any coating (including foreign matter) that could interfere with the proper functioning of the link.

I. CONTAINER – MANUAL SHUT-OFF VALVES

- ***Are valves located so that they can be easily reached during normal operations and in an emergency?***

  - Check that valves are located so that they can be accessed and operated without the use of additional tools or equipment.

- ***Are valves in good condition and leak-free?***

  - Check for any excessive corrosion or damage to the body.

  - Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

  - Check for loose or missing hand-wheels or levers.

  - Some manual shut-off valves have a small hydrostatic relief valve installed in them. If a relief valve is present, be sure the outlet is clear and unrestricted. Be sure the rain cap is in place.

- ***Do valves have the proper service pressure rating, equal to or greater than the maximum allowable working pressure of the container?***

  - Check to make sure that the pressure rating stamped on the valve is no less than 250 psig. Again the possible exception is that the requirement <u>could</u> be 200 psig associated with some specific ASME tanks built before 1950. Check the container nameplate and discuss with your supervisor if other than 250 psig rating.

J. CONTAINER – CATWALKS AND STAIRWAYS

- ***Are stairways well anchored and supported?***

  - Check anchor bolts to make sure they are firmly attached and have not experienced excessive corrosion. Supports and handrails are in place and stable.

- ***Are catwalk railings provided and in good condition?***

  - Per OSHA standards (§1910.23), a standard railing consists of a top rail, middle rail, and posts, and has a height of 42 inches from the upper surface of the top rail to the platform floor. The top rail should be smooth for the entire length.

  - Check that the railings are in place, properly anchored, stable and free of excessive corrosion in order to provide fall protection for workers.

- ***Does decking design offer drainage and prevent accumulation?***

  - Self-explanatory.

K. CONTAINER – PRESENCE OF COMBUSTIBLES

- ***Is the area within 10 feet of the container(s) free of weeds, long grass, rags, paper, wood or other loose or piled combustible debris?***
  - Self-explanatory.

L. UNDERGROUND STORAGE TANKS

- ***Is protection against vehicular damage provided for the fitting housing, housing cover, tank connections and piping?***
  - Crash protection must be in place where LP-Gas storage equipment can be subjected to vehicular traffic.
- ***Is the container protected against corrosion by an external coating on the tank or by cathodic protection?***
  - When inspecting the components of the tank that are visible aboveground, check those portions of the coating system (e.g., paint) for damage.
  - When taking a tank-to-soil voltage reading, a minimum -0.85 voltage reading must be measured and maintained.

2. PIPING

A. CONDITION OF PIPE AND PAINT

- ***Are aboveground pipes properly painted?***
  - Piping should have paint and coatings systems in place that are not damaged and provide protection against external corrosion.
- ***Are pipes free of corrosion damage, dents, gouges or other damage?***
  - Check for excessive rust or corrosion that would indicate metal loss on the piping. Particular attention should be given to the areas around supports for localized corrosion.
  - Check for dents or gouges that could reduce the wall thickness of the pipe.
  - Check for evidence of localized pitting, especially at weld seams.
  - Check for any indications of fire damage.
- ***Are pipes adequately supported?***

- ❑ Check that supports are in place so that the piping is not bending or flexing in a manner that would appear to cause stress on the piping and subsequently cause leakage.

➢ ***Are pipes adequately protected against physical damage by vehicles?***

- ❑ Crash protection must be in place where piping can be subjected to vehicular traffic.

➢ ***Are pipes properly marked "vapor" or "liquid", or color coded accordingly?***

- ❑ Self-explanatory. Note: Labels are permitted to be on valves.

B. PIPE FITTINGS

➢ ***Are all flanges and fittings properly sized for the pressure rating, equal to or greater than the maximum allowable working pressure of the system?***

- ❑ Piping, flanges and fittings that can contain liquid LP-Gas, and that can be isolated by valves and require hydrostatic relief valves, must be designed for an operating pressure of 350 psig or a pressure that is equivalent to the maximum discharge pressure of any pump or any source feeding the piping system if it is greater than 350 psig.

- ❑ Otherwise, the minimum pressure rating is 250 psig for LP-Gas liquid or vapor at operating pressure over 125 psig and at or below container pressure.

- ❑ The minimum pressure rating is 125 psig for LP-Gas vapor at operating pressure of 125 psig or less.

➢ ***Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?***

- ❑ Check for mechanical or physical damage, excessive corrosion, cracking or bulging.

- ❑ Note: Flexible connectors should not be painted.

➢ ***Are all flow indicators and sight checks in proper working condition and leak-free?***

- ❑ Where installed, sight flow indicators must be either the simple observation type or be combined with a backflow check valve.

- ❑ Flow indicators <u>cannot</u> be constructed of cast iron.

- ❑ The sight indicators should be sufficiently clean and clear to see the flow upon liquid transfer.

- Check using a gas detector calibrated for LP-Gas or an ammonia-free leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should form.

➢ ***Are all fittings and pipes leak-free?***

- Check the piping and fittings using a gas detector calibrated for LP-Gas or an ammonia-free leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should appear. Listen and smell for possible leaks.

C. HYDROSTATIC RELIEF VALVES

➢ ***Are hydrostatic relief valves installed in each section of piping in which liquid can be isolated between shut-off valves?***

- Self-explanatory.

- Hydrostatic relief valves should be fitted with rain caps to prevent moisture and debris from accumulating inside the valve.

➢ ***Are the hydrostatic relief valves approved for use with LP-Gas?***

- Check the stamping on the valve body.

➢ ***Do the hydrostatic relief valves have pressure settings between 400 – 500 psig?***

- Hydrostatic relief valves designed to relieve pressure in sections of liquid piping between closed shut-off valves must have pressure settings not less than 400 psig and not more than 500 psig unless installed in systems designed to operate above 350 psig. In this case, the settings must be not less than 110% or more than 125% of the system design pressure.

D. PIPING – MANUAL SHUT-OFF VALVES

➢ ***Are valves located so that they can be easily reached during normal operations and in an emergency?***

- Check that valves are located so that they can be accessed and operated without the use of additional tools or equipment.

➢ ***Are valves in good condition and leak-free?***

- Check for any excessive corrosion or damage to the body.

- Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

- ❑ Check for loose or missing hand-wheels or levers.
- ❑ Some manual shut-off valves have a small hydrostatic relief valve installed in them. If a relief valve is present, be sure the outlet is clear and unrestricted. Be sure the rain cap is in place.

➢ ***Do valves have the proper service pressure rating, equal to or greater than the maximum allowable working pressure of the container?***

- ❑ Check to make sure that the pressure rating stamped on the valve is no less than 250 psig. Again, the possible exception is that the requirement could be 200 psig associated with some specific ASME tanks built before 1950. Check the container nameplate and discuss with your supervisor if other than 250 psig rating.

E. UNDERGROUND PIPING

➢ ***Is the metallic underground piping protected against corrosion by an external coating on the piping or by cathodic protection?***

- ❑ When inspecting the portions of the underground piping system that that are visible aboveground, those portions of the coating system (e.g., paint) are not damaged.
- ❑ When taking a pipe-to-soil voltage reading, a minimum -0.85 voltage reading must be measured and maintained.

3. LIQUID PUMP

A. GENERAL

➢ ***Are pumps free of corrosion or other damage?***

- ❑ Check for excessive external corrosion or mechanical damage to the casing and drive assemblies.

➢ ***Are pump pads and/or foundations in good condition and properly supporting the pumps?***

- ❑ They should be free of excessive cracking or significant loss of the supporting materials.
- ❑ They should be level and stable, positioned so that there is no misalignment with the piping system.

- ***Are base plate bolts in place and properly securing the pump to that foundation?***
  - Self-explanatory.
- ***Are the pumps properly lubricated?***
  - Lubrication will vary depending on the type of LP-Gas pump. Check the equipment manufacturer's instructions for specific lubricants and frequency of lubrication.
- ***Are the strainers in good working condition (i.e., strainer screens free of debris) and leak-free?***
  - Isolate the strainer from the transfer system, bleed off the trapped LP-Gas and remove the cylinder and filter screen to inspect and clean to clear of particles and heavy ends.
  - Using a calibrated gas detector or a leak testing solution, check that the inlet and outlet connections and the cover are gas tight.
- ***Are the hydrostatic relief valves installed in the appropriate location and in good working order?***
  - Self-explanatory.
  - Hydrostatic relief valves should be fitted with rain caps to prevent moisture and debris from accumulating inside the valve.
- ***Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?***
  - Check for mechanical or physical damage, excessive corrosion, cracking or bulging.
  - Flexible connectors should not be painted.
  - Flexible connectors should not be used to compensate for misalignment with the piping or to take the place of elbows.
  - Note: Check with your supervisor regarding company policies or state/local regulations to ensure compliance before installing or servicing flexible connectors.
- ***Are fittings and piping associated with the pump leak-free?***
  - Check the piping and fittings using a gas detector calibrated for LP-Gas or a leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should appear. Listen and smell for possible leaks.

B. PUMP DRIVE COMPONENTS

- ***Are drive belts aligned and in good working condition?***
  - ❑ This should be done when lubrication is scheduled. Check manufacturer's literature for additional information.
  - ❑ Check belts for excessive wear, cracking or weathering.
- ***For shaft coupling-driven pumps, are shaft couplings properly aligned?***
  - ❑ Self-explanatory. Check manufacturer's literature for additional information.
- ***For shaft coupling-driven pumps, are spacing bushings in good working order?***
  - ❑ Check for excessive wear on the space bushings.
- ***For gear reduction-driven pumps, are universal joints and couplings properly aligned?***
  - ❑ Check universal joints or couplings for excessive wear.
  - ❑ Check alignment of the drive shaft, motor ad gear box. Check the mounts and securing bolts.
  - ❑ The gearbox and U-joints should be lubricated per the manufacturer's instructions.
- ***Are drive belt guards in place and secure?***
  - ❑ Self-explanatory.

C. PUMP GAUGES

- ***Are pressure gauges in good condition (i.e., 0 - 400 psig)?***
  - ❑ The gauges must be readable, functioning and leak-free.
  - ❑ Check manufacturer's literature for additional information.

D. AUTOMATIC BYPASS VALVES

- ***Are bypasses in good working condition and leak-free?***
  - ❑ An automatic bypass valve and piping circuit is required; a manual bypass circuit is optional.

- ❑ If the bypass valve or recirculating device is equipped with a shut-off valve, a secondary device is required and designed to do one of the following:
  + Operate at no more than 400 psig.
  + Operate at a pressure of 50 psig above the operating pressure when the design pressure exceeds 350 psig.

- ❑ The secondary device must be designed and installed such that:
  + It cannot be rendered inoperative.
  + It discharges into either the storage container or the pump inlet.

- ❑ Check the piping and fittings using a gas detector calibrated for LP-Gas or a leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should appear. Listen and smell for possible leaks.

➢ ***Are bypasses set at the appropriate pressure differential?***

- ❑ The bypass valve should be set at least 15 – 20 psig below the pump's internal relief valve setting.

- ❑ The bypass valves should not be set for a pressure higher than the differential pressure rating of the pump or higher than the maximum 125 psig differential pressure typically recommended by the manufacturer.

- ❑ To determine the automatic bypass opening setting, check the equipment manufacturer's instructions.

E. PUMP – MANUAL SHUT-OFF VALVES

➢ ***Are valves located so that they can be easily reached during normal operations and in an emergency?***

- ❑ Check that valves are located so that they can be accessed and operated without the use of additional tools or equipment.

➢ ***Are valves in good condition and leak-free?***

- ❑ Check for any excessive corrosion or damage to the body.

- ❑ Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

- ❑ Check for loose or missing hand-wheels or levers.

- ❑ Some manual shut-off valves have a small hydrostatic relief valve installed in them. If a relief valve is present, be sure the outlet is clear and unrestricted. Be sure the rain cap is in place.

- ***Do valves have the proper service pressure rating, equal to or greater than the maximum allowable working pressure of the system?***
  - ❑ Check to make sure that the pressure rating stamped on the valves is consistent with the maximum design pressure of other components in the pump discharge and bypass system.

4. BULKHEADS

A. General

- ***Are bulkheads properly protected against vehicular damage?***
  - ❑ Crash protection must be in place where LP-Gas transfer equipment can be subjected to vehicular traffic.
- ***Are bulkheads (i.e., structure and foundation) in good condition and properly supporting the bulkhead, especially in the event of an attempted pull-away?***
  - ❑ Bulkheads are normally made from steel beams and reinforced concrete. Check for excessive corrosion of the steel and mechanical damage to the concrete or rebar.

B. BULKHEADS – PIPE AND FITTINGS

- ***Are pipe nipples and couplings that are attached to the bulkhead in good working condition and free of excessive wear?***
  - ❑ Check for leakage through normal leak testing means.
  - ❑ Check the threads for excessive wear or deformation.
- ***Are all flanges and fittings properly sized for the pressure rating, equal to or greater than the maximum allowable working pressure of the system?***
  - ❑ Piping, flanges and fittings that can contain liquid LP-Gas, and that can be isolated by valves and require hydrostatic relief valves, must be designed for an operating pressure of 350 psig or a pressure that is equivalent to the maximum discharge pressure of any pump or any source feeding the piping system if it is greater than 350 psig.
  - ❑ Otherwise, the minimum pressure rating is 250 psig for LP-Gas liquid or vapor at operating pressure over 125 psig and at or below container pressure.
  - ❑ The minimum pressure rating is 125 psig for LP-Gas vapor at operating pressure of 125 psig or less.

- ***Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?***

  - Check for mechanical or physical damage, excessive corrosion, cracking or bulging.
  - Flexible connectors should not be painted.

- ***Are all flow indicators and sight checks in proper working condition and leak-free?***

  - Sight flow indicators must be either the simple observation type or be combined with a backflow check valve.
  - Flow indicators <u>cannot</u> be constructed of cast iron.
  - The sight indicators should be sufficiently clean and clear to see the flow upon liquid transfer.
  - Check using a gas detector calibrated for LP-Gas or an ammonia-free leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should form.

- ***Are hydrostatic relief valves installed in the appropriate location and in good working condition?***

  - Hydrostatic relief valves are designed to relieve pressure in sections of liquid piping between closed shut-off valves, and must have pressure settings not less than 400 psig and not more than 500 psig unless installed in systems designed to operate above 350 psig. In this latter case, the settings must be not less than 110% or more than 125% of the system design pressure.
  - Hydrostatic relief valves should be fitted with rain caps to prevent moisture and debris from accumulating inside the valve.

- **Are all fittings and pipes leak-free?**

  - Check the piping and fittings using a gas detector calibrated for LP-Gas or a leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should appear. Listen and smell for possible leaks.

C. BULKHEADS – EMERGENCY SHUT-OFF VALVES

- ***Are ESVs in good working condition and leak-free?***

  - Check for leakage at all body seams, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

- ❑ Test (operate) the closing feature to ensure that it will close and open the valve.

➢ ***Has an annual test been performed and documented as required by NFPA 58?***

- ❑ The valves need to be tested for the following functions:
  + Automatic shutoff through thermal (fire) actuation. (Note: Check for the presence of the thermal element.)
  + Manual shutoff from a remote location.
  + Manual shutoff at the installed location.

➢ ***Are operating cables operating correctly?***

- ❑ Check operating cables to make sure they can move through their entire range without binding.

- ❑ Make sure the cable tension is not too tight since that might prevent the valve from latching properly, or vibration or jarring could cause inadvertent closure during normal transfer operations.

➢ ***Is the pneumatic control system in good working condition?***

- ❑ Check the operators to ensure proper functioning (typically, through release of air or nitrogen pressure and then repressurizing).

- ❑ The system should be checked for leaks by pressurizing the system and checking all connections with a leak detector solution. No bubbles should appear.

- ❑ The operator should fully open and completely close the valve.

➢ ***Are remote emergency shutoff devices between 25 and 100 feet from the ESV and within the path of egress?***

- ❑ Self-explanatory.

D. BULKHEADS – HOSES

➢ ***Are hose covers free of exposed reinforcement?***

- ❑ Self-explanatory.

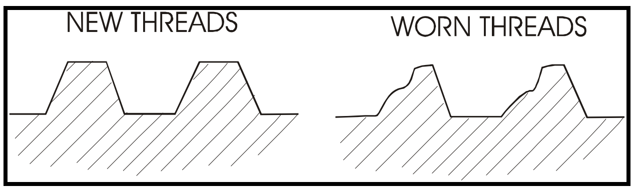
➢ ***Is wire braid reinforcement free of kinks and not flattened?***

- ❑ Self-explanatory.

- ***Are hoses free of soft spots when not under pressure, show no bulging under pressure, and have no loose outer coverings?***
  - Self-explanatory.

- ***Are hose coupling assemblies secure and in good working condition?***
  - Inspect each coupling for slippage, evidenced by misalignment of the coupling on the hose end, and/or if it is scored or exposed.

- ***Are the ACME threads, O-rings, or gaskets in good working condition (i.e., showing little sign of wear)?***
  - Check the threads on the hose end adapter or the CTMV filler connection for excessive wear to the point that the connection leaks with a new O-ring or gasket (see sketch below). The worn adapter or fitting must be replaced.



E. BULKHEADS – MANUAL SHUT-OFF VALVES

- ***Are valves located so that they can be easily reached during normal operations and in an emergency?***
  - Check that valves are located so that they can be accessed and operated without the use of additional tools or equipment.

- ***Are valves in good condition and leak-free?***
  - Check for any excessive corrosion or damage to the body.
  - Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.
  - Check for loose or missing hand-wheels or levers.
  - Some manual shut-off valves have a small hydrostatic relief valve installed in them. If a relief valve is present, be sure the outlet is clear and unrestricted. Be sure the rain cap is in place.

- ***Do valves have the proper service pressure rating, equal to or greater than the maximum allowable working pressure of the system?***

  - ❑ Check to make sure that the pressure rating stamped on the valves is consistent with the maximum design pressure of other components in the pump discharge and bypass system.

5. <u>VAPOR COMPRESSOR</u>

A. GENERAL

- ***Are compressors free of corrosion or other damage?***

  - ❑ Check for excessive external corrosion or mechanical damage to the casing, drive assembly, suction and discharge piping, liquid trap, strainer and motor.

  - ❑ Check the cooling systems fins. They must be kept clean and the flywheel must be kept free of obstructions to allow sufficient air flow and cooling.

- ***Are compressor pads and/or foundations in good condition and properly supporting the compressors?***

  - ❑ Note: To prevent damage to the piping network from vibration, the compressor must be bolted to a solid, level foundation that will fully support both the compressor and its drive system. This is especially important with large units where heavier vibrations can be expected.

  - ❑ They should be free of excessive cracking or significant loss of the supporting materials.

  - ❑ They should be level and stable, positioned so that there is no misalignment with the piping system.

- ***Are base plate bolts in place and securing the compressor to that foundation?***

  - ❑ Self-explanatory (see note above).

- ***Are the compressors properly lubricated?***

  - ❑ Lubrication could vary depending on the compressor design and manufacturer. Check the equipment manufacturer's instructions for specific lubricants and frequency of lubrication.

  - ❑ Before starting the compressor, check the crankcase for leaks, especially around the flywheel-end of the crankshaft, the dipstick, and the breather valve assembly. When checking the breather valve assembly, be sure that it is clear and free of any dirt or trash. If any leaks are noticed, notify your supervisor.

- ***Is the crankcase oil properly filled?***

  - Check the oil level in the crankcase before each operation. If the oil level is low, check the manufacturer's instructions for the type of oil to use and the amount to add.

- ***Is the crankcase oil pressure properly set?***

  - Check the oil pressure gauge frequently during every compressor operation. If the oil pressure is unusually high or low, shut down the compressor and notify your supervisor.

- ***Has the oil filter been changed at the manufacturer's recommended interval?***

  - Self-explanatory.

- ***Are strainer elements in good working condition (i.e., strainer screens free of debris) and leak-free?***

  - Note: Compressor strainers usually have coarser screens than pump strainers. However, they must be opened and cleaned on a regular basis to prevent them from being clogged and restricting flow to the compressor.

  - While the compressor is not operating, isolate the strainer, bleed off any trapped LP-Gas and remove the cylinder and filter screen to inspect and clean.

  - Using a calibrated gas detector or a leak testing solution, check that the connections and the cover are gas tight.

- ***Are pressure relief valves installed in the appropriate location and in good working order?***

  - The discharge line of most compressors is equipped with a discharge relief valve to protect the compressor system from damage due to excessively high pressure.

  - The valve is usually set to open at a pressure of 250 psig.

  - Check the discharge relief valve regularly for leaks and be sure the inside of the valve is free from corrosion and debris that would prevent the valve from opening and closing properly.

    CAUTION: When inspecting relief valves, use an inspection mirror to check the inside of the valve. Never look directly into the outlet of any pressure relief valve.

- If found to be defective, the valve cannot be repaired and must be replaced.

- Discharge relief valves on compressors installed indoors or in enclosed spaces must be vented to the outside.

➢ ***Are stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?***

- Check for mechanical or physical damage, excessive corrosion, cracking or bulging.

- Flexible connectors should not be painted.

- Flexible connectors should not be used to compensate for misalignment with the piping or to take the place of elbows.

- Note: Check with your supervisor regarding company policies or state/local regulations to ensure compliance before installing or servicing flexible connectors.

➢ ***Are all back check valves in proper working condition and leak-free?***

- Check to ensure that back check is completely shutting off any and all reverse flow.

- Check for any excessive corrosion or damage to the body.

- Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

➢ ***Are fittings and piping associated with the compressor leak-free?***

- Check the piping and fittings using a gas detector calibrated for LP-Gas or a leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should appear. Listen and smell for possible leaks.

B. COMPRESSOR DRIVE COMPONENTS

- ***Are drive belts properly aligned, tension properly set and in good working condition?***
  - V-belts should depress ½" to ¾" under moderate thumb pressure.
  - Check the equipment manufacturer's instructions if tension or alignment adjustments are necessary.
  - Check for belts for fraying and cracks; replace, if necessary.
- ***For direct drive compressors, are shaft couplings properly aligned and in good working condition?***
  - Self-explanatory. Check the manufacturer's instructions for additional information.
- ***Are drive belt guards in place and secure?***
  - Self-explanatory.

C. COMPRESSOR GAUGES

- ***Are pressure gauges (suction and discharge) in good condition (i.e., 0 – 400 psig)?***
  - The gauges must be readable, functioning and leak-free.
  - Check manufacturer's literature for additional information.

D. COMPRESSOR – MANUAL SHUT-OFF VALVES

- ***Are valves located so that they can be easily reached during normal operations and in an emergency?***
  - Check that valves are located so that they can be accessed and operated without the use of additional tools or equipment.
- ***Are valves in good condition and leak-free?***
  - Check for any excessive corrosion or damage to the body.
  - Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

- ❑ Check for loose or missing hand-wheels or levers.

- ❑ Some manual shut-off valves have a small hydrostatic relief valve installed in them. If a relief valve is present, be sure the outlet is clear and unrestricted. Be sure the rain cap is in place.

➢ ***Do valves have the proper pressure rating, equal to or greater than the required working pressure of the system?***

- ❑ Check to make sure that the pressure rating stamped on the valves is consistent with the maximum design pressure of other components in the compressor suction and discharge systems.

6. <u>TANK CAR UNLOADING TOWER</u>

A. TOWER FOUNDATIONS

➢ ***Are foundations in good condition?***

- ❑ They should be free of excessive cracking or significant loss of the supporting materials.

- ❑ They should be level and stable.

➢ ***Are footings free of settlement?***

- ❑ The footings should be level and stable, positioned so that no shifting of the tower has occurred.

B. TOWER – PIPING AND FITTINGS

➢ ***Are all flanges and fittings properly sized for the pressure rating, equal to or greater than the maximum allowable working pressure of the system?***

- ❑ Piping, flanges and fittings that can contain liquid LP-Gas, and that can be isolated by valves and require hydrostatic relief valves, must be designed for an operating pressure of 350 psig or a pressure that is equivalent to the maximum discharge pressure of any pump or any source feeding the piping system if it is greater than 350 psig.

- ❑ Otherwise, the minimum pressure rating is 250 psig for LP-Gas liquid or vapor at operating pressure over 125 psig and at or below container pressure.

- ❑ The minimum pressure rating is 125 psig for LP-Gas vapor at operating pressure of 125 psig or less.

- ***Are all stainless steel flex connectors in good working condition (i.e., reinforcement braid is not damaged)?***
  - Check for mechanical or physical damage, excessive corrosion, cracking or bulging.
  - Note: Flexible connectors should not be painted.
- ***Are all flow indicators and sight checks in proper working condition and leak-free?***
  - Where installed, sight flow indicators must be either the simple observation type or be combined with a backflow check valve.
  - Flow indicators <u>cannot</u> be constructed of cast iron.
  - The sight indicators should be sufficiently clean and clear to see the flow upon liquid transfer.
  - Check using a gas detector calibrated for LP-Gas or an ammonia-free leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should form.
- ***Are hydrostatic relief valves installed in the appropriate location and in good working condition?***
  - Check sections of liquid lines between shut-off valves for the presence of these valves.
  - Check regularly for leaks and inspect to ensure the valve is free from corrosion and debris that could prevent the valve from opening and closing properly.
  - Hydrostatic relief valves designed to relieve pressure in sections of liquid piping between closed shut-off valves must have pressure settings not less than 400 psig and not more than 500 psig.
  - Hydrostatic relief valves should be fitted with rain caps to prevent moisture and debris from accumulating inside the valve.
- ***Are all fittings and pipes leak-free?***
  - Check the piping and fittings using a gas detector calibrated for LP-Gas or an ammonia-free leak testing (soap) solution. No gas should be detected. For the leak test solution, no bubbles should appear. Listen and smell for possible leaks.

C. TOWERS – EMERGENCY SHUT-OFF VALVES (ESVs)

➢ ***Are ESVs in good working condition and leak-free?***

- ❑ Check for leakage at all body seams, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.
- ❑ Test (operate) the closing feature to ensure that it will close and open the valve.

➢ ***Are ESVs and/or back checks (including thermal release) on riser ends of the liquid hoses in good working condition?***

- ❑ Test (operate) the closing feature to ensure that it will close and open the ESV.
- ❑ Check to ensure that back check is fully functional.
- ❑ Check for any excessive corrosion or damage to the body.
- ❑ Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

➢ ***Are ESVs and/or back checks (including thermal release) on riser ends of the vapor hose in good working condition?***

- ❑ Test (operate) the closing feature to ensure that it will close and open the ESV.
- ❑ Check to ensure that back check is fully functional.
- ❑ Check for any excessive corrosion or damage to the body.
- ❑ Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

➢ ***Has an annual test been performed and documented as required by NFPA 58?***

- ❑ The valves need to be tested for the following functions:
  + Automatic shutoff through thermal (fire) actuation. (Note: Check for the presence of the thermal element.)
  + Manual shutoff from a remote location.
  + Manual shutoff at the installed location.

- ***Is the pneumatic control system in good working condition?***

  - Check the operators to ensure proper functioning (typically, through release of air or nitrogen pressure and then repressurizing).

  - The system should be checked for leaks by pressurizing the system and checking all connections with a leak detector solution. No bubbles should appear.

  - The operator should fully open and completely close the valve.

- ***Are remote emergency shutoff devices between 25 and 100 feet from the ESV and within the path of egress?***

  - Self-explanatory.

D. TOWER – HOSES AND LOADING ARM

- ***Are hose covers free of exposed reinforcement?***

  - Self-explanatory.

- ***Is wire braid reinforcement free of kinks and not flattened?***

  - Self-explanatory.

- ***Are hoses free of soft spots when not under pressure, show no bulging under pressure, and have no loose outer coverings?***

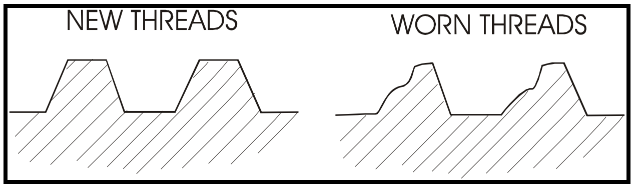
  - Self-explanatory.

- ***Are hose coupling assemblies secure and in good working condition?***

  - Inspect each coupling for slippage, evidenced by misalignment of the coupling on the hose end, and/or if it is scored or exposed.

- ***Are the ACME threads, O-rings, or gaskets in good working condition (i.e., showing little sign of wear)?***

  - Check the threads on the hose end adapter or the CTMV filler connection for excessive wear to the point that the connection leaks with a new O-ring or gasket (see sketch below). The worn adapter or fitting must be replaced.



- ***Are loading arms leak-free and in good working condition?***

  - See equipment manufacturer's instructions for leak testing and preventative maintenance/inspection requirements.

- ***Are loading arms swing joints properly lubricated?***

  - See equipment manufacturer's instructions for the proper lubricant(s) and the frequency of lubrication.

- ***Are all factory installed protective guards in place and secure?***

  - See equipment manufacturer's instructions for the required guards and check to ensure they are in place.

E. TOWER – MANUAL SHUT-OFF VALVES

- ***Are valves located so that they can be easily reached during normal operations and in an emergency?***

  - Check that valves are located so that they can be accessed and operated without the use of additional tools or equipment.

- ***Are valves in good condition and leak-free?***

  - Check for any excessive corrosion or damage to the body.

  - Check for leakage at all body seams and the stems/packing, plus the connections to the piping and hose. No gas should be detected through normal leak testing techniques.

  - Check for loose or missing hand-wheels or levers.

  - Some manual shut-off valves have a small hydrostatic relief valve installed in them. If a relief valve is present, be sure the outlet is clear and unrestricted. Be sure the rain cap is in place.

- ***Do valves have the proper pressure rating, equal to or greater than the required working pressure of the system?***

  - Check to make sure that the pressure rating stamped on the valves is no less than 250 psig.

7. <u>SCALES</u>

A. GENERAL

- ***Has the scale(s) been checked periodically using a certified/standard dead weight?***
  - Check with your supervisor regarding the frequency of checking the scale(s).
  - The certified or standard dead weight should be approximately equal to the typical tare weight of the cylinders being filled plus the LP-Gas contents of one of these cylinders.
- ***Is the scale(s) properly calibrated and been certified by the proper authority having jurisdiction?***
  - Check the scale manufacturer's instructions for their calibration procedure.
  - In most states and jurisdictions, scales must bear current certification decals from weights and measures officials.
- ***Have all loops, pivots and bearings been periodically lubricated?***
  - Check the scale manufacturer's instructions for lubrication requirements.
  - Note: Do not use oil on scale parts unless instructed to do so by the scale manufacturer.
- ***Are the scale pit(s) and/or platform(s) free of any debris?***
  - Check for accumulation of snow, ice, leaves and other debris that could cause the scale platform to bind and produce an inaccurate scale reading.
  - Check and clean these areas frequently.

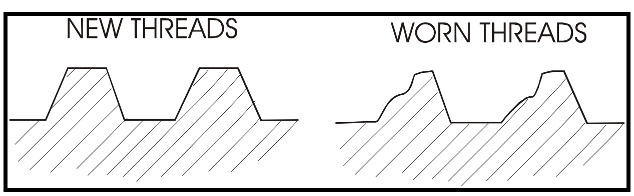
B. AUTOMATIC SHUT-OFF SYSTEM

- ***Are all actuators and control valves leak-free and in good working condition (i.e., proper fluid levels and proper alignment with scale)?***
  - Self-explanatory.
  - Also check scale manufacturer's instructions for any specific or unique requirements and instructions.

- ***Are all sensing lines leak-free and in good working condition (i.e., free of kinks and proper alignment with the scale)?***
  - Self-explanatory.

C. HOSES

- ***Are hose covers free of exposed reinforcement?***
  - Self-explanatory.
- ***Is wire braid reinforcement free of kinks and not flattened?***
  - Self-explanatory.
- ***Are hoses free of soft spots when not under pressure, show no bulging under pressure, and have no loose outer coverings?***
  - Self-explanatory.
- ***Are hose coupling assemblies secure and in good working condition?***
  - Inspect each coupling for slippage, evidenced by misalignment of the coupling on the hose end, and/or if it is scored or exposed.
  - Inspect for loose or missing bolts or fastenings on bolted hose coupling assemblies.
- ***Are the ACME threads, O-rings, or gaskets in good working condition (i.e., showing little sign of wear)?***
  - Check the threads on the hose end adapter or the CTMV filler connection for excessive wear to the point that the connection leaks with a new O-ring or gasket (see sketch below). The worn adapter or fitting must be replaced.



8. METERS (For Retail Sales Only)

A. GENERAL

- ***Is the meter properly calibrated or "proved" at the appropriate time intervals?***

  - In most states, meter proving is under the jurisdiction of a state-level government authority such as the Bureau of Weights and Measures.

  - The responsible agency places a seal on the meter when it has been proved and found to be accurate.

  - Note: Many state and local codes require companies to recalibrate meters on a regular basis. Generally, this is accomplished by filling a volumetric prover (a tank of certified capacity) through the meter being tested. The reading on the meter is then compared to the quantity of LP-Gas in the prover and the meter adjusted accordingly. Only personnel who are properly trained and qualified to prove meters should do so.

- ***Is the seal(s) in place by the appropriate authority having jurisdiction?***

  - Check to see that the seal is not broken. If broken, the meter must be proved again and resealed before it is placed back into service.

- ***Is the meter in good working condition and free of leaks?***

  - Be alert for erratic meter operation, obvious over or under registration, increasingly noisy operation and excessively low delivery rates.

  - Check the seal that is either on the input or the output shaft of the gear train to prevent the LP-Gas from leaking out of the meter body and entering the register. The seal is usually a U-shaped packing or O-ring that fits around the drive shaft and is designed to be replaceable in case it begins to leak.

B. HOSES

- ***Are hose covers free of exposed reinforcement?***

  - Self-explanatory.

- ***Is wire braid reinforcement free of kinks and not flattened?***

  - Self-explanatory.

- ***Are hoses free of soft spots when not under pressure, show no bulging under pressure, and have no loose outer coverings?***

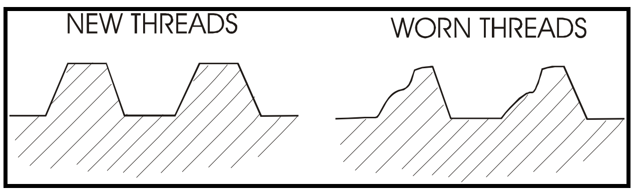
  - Self-explanatory.

- ***Are hose coupling assemblies secure and in good working condition?***

  - Inspect each coupling for slippage, evidenced by misalignment of the coupling on the hose end, and/or if it is scored or exposed.

- ***Are the ACME threads, O-rings, or gaskets in good working condition (i.e., showing little sign of wear)?***

  - Check the threads on the hose end adapter or the CTMV filler connection for excessive wear to the point that the connection leaks with a new O-ring or gasket (see sketch below). The worn adapter or fitting must be replaced.



- ***Are pull-away couplings in place and in good working condition?***

  - Check that the breakaway device is UL 567 approved (*Standard Pipe Connectors for Flammable and Combustible Liquids and LP-Gas*) and is capable of retaining liquid on both sides of the breakaway point. If this not the case, check with your supervisor and determine whether there is a device in place that provides equivalent protection and has been approved by the authority having jurisdiction.

9. <u>VAPORIZERS</u>

A. GENERAL

- ***Is the vaporizer(s) leak-free and in good working condition?***

  - The specific inspection steps will vary depending on the type of device being used to heat the liquid LP-Gas and the manufacturer's design. Refer to the equipment manufacturer's instructions for inspection requirements and procedures.

- ***Have pilot lights been cleaned on a regular basis?***
  - Refer to the equipment manufacturer's instructions for the frequency and instructions for inspecting and cleaning pilots.
- ***On a periodic basis, have all strainers been cleaned at the inlet side of the vaporizer(s)?***
  - Refer to the equipment manufacturer's instructions for the instructions and suggested frequency for inspecting and cleaning strainers.
- ***Have heavy ends been cleaned from the vaporizer?***
  - Refer to the equipment manufacturer's instructions for the instructions and suggested frequency for cleaning heavy ends from the vaporizer.
- ***Have the burner openings, thermostat and flue been cleaned?***
  - Self-explanatory.
- ***Is the vaporizer(s) located in accordance with NFPA 58?***
  - Vaporizers are generally installed outdoors. If the vaporizer is installed in a separate or attached structure, check with your supervisor for the specific requirements in Chapter 10 of NFPA 58 that are associated with the type of vaporizer in use.
  - Vaporizing burners must be installed outside of buildings, per NFPA 58. The minimum separation distance between a burner and container having >2,000 gallons water capacity is 50 feet. The minimum distance between a burner and container ≤500 gallons is 10 feet, and 25 feet for containers in the 501 – 2,000 gallon range.

10. REGULATORS

A. GENERAL

- ***Is the first-stage or high-pressure regulator directly attached by flexible connectors to the vaporizer outlet or to the interconnected piping of manifolded vaporizers?***
  - Self-explanatory. (Exception: Flexible connectors are not required for first-stage regulators that are installed downstream of high pressure regulators.)

- ***Are all first-stage and high-pressure regulators installed outside of buildings?***

  - Self-explanatory.

- ***Are all regulators that are outside of buildings installed and protected so that their operation will not be affected by environmental elements (e.g., freezing rain, sleet, snow, ice, mud or debris) or insects?***

  - The regulator must be installed such that the vent is protected against water accumulation in the form of rain, sleet, snow, mud or ground water. Typically, vents and pipe-aways are pointed downward and the opening protected with a screen.

  - The vent must be open to the atmosphere.

  - The bonnet cap must be in place and tightened.

- ***Is the point of discharge on the regulator's relief device at least 3 feet horizontally away from any building opening that is below the level of the discharge?***

  - Self-explanatory.

- ***Is the point of discharge on the regulator's relief device located at least 5 feet in any direction from any source of ignition or mechanical ventilation air intakes?***

  - Self-explanatory.

11. <u>ELECTRICAL SYSTEMS</u>

A. GENERAL

- ***Are all electrical components and wiring in compliance with Table 6.20.2.2 (Electrical Area Classification) in NFPA 58-2004?***

  - To accurately check ignition source control through assessment of the installation of electrical equipment, you should be knowledgeable of the requirements in the NFPA 58 Electrical Classification Table in Chapter 6. Also, you need to be familiar with the definitions of electrical classes, groups and divisions in NFPA 70, *National Electric Code*.

  - When classifying the extent of a hazardous area, consider the possible variations in the spotting of railroad tanks cars and CTMVs at the unloading points.

- ***Are electrical control switches and wiring in compliance with Class1, Group D, Division 1 or 2 (where applicable) and in compliance with Table 6.20.2.2 (Electrical Area Classification) in NFPA 58-2004?***

  - See comment in the previous guideline.

- ***Are pump and/or compressor switches readily accessible to the operator?***

  - Generally, NFPA 58-2004 simply requires that a pump or compressor operating control or disconnect switch be "located nearby", as stated in Chapter 6. For dispensers, see the fifth item in this checklist series.

- ***Are electrical controls for equipment clearly marked or color-coded to indicate the on and off (stop) positions?***

  - The designated color (by OSHA) for the off (or stop) position is **red**.

- ***Is the electrical emergency shutdown located not more than 20 feet (but less than 100 feet) from any dispensing devices, and prominently labeled?***

  - This is a specific requirement in Chapter 6 of NFPA 58 for dispensers.

  - The markings for the switches (or breakers) must be visible at the point of liquid transfer.

- ***Is electrical wiring in Division 1 or 2 areas installed in rigid conduit? Class1, Group D in flexible sections?***

  - Self-explanatory. Check with your supervisor if you need additional information regarding electrical area classifications.

- ***For electric motors, are flexible connectors Class1, Group D, Division 1 or 2 where applicable?***

  - Self-explanatory. Check with your supervisor if you need additional information regarding electrical area classifications.

- ***Are all seal-off fixtures filled with suitable putty and installed in the appropriate locations?***

  - A conduit seal-off fixture filled with a suitable putty must be installed within 18 inches of any spark producing device within a Hazardous Classified Location, unless the enclosure is outfitted with a factory seal at the conduit connection.

  - A conduit seal-off fixture filled with a suitable putty must be installed where a conduit is entering or leaving a Hazardous Classified Location (i.e., between the Hazardous Classified Location dispenser area and the main electrical supply) in order to prevent LP-Gas vapor from entering open wiring.

Section Purpose and Objectives

This section of the Handbook provides owners or operators of LP-Gas bulk plants with an introduction and general guidance for complying with the requirements of NFPA 58-2004 for maintaining fire protection equipment, as defined in Chapter 14 (§14.3.3).

References

- NFPA 10, *Standard for Portable Fire Extinguishers,* 2002 Edition
- NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2002 Edition

General Requirements

Facilities must prepare and implement a program for all plant fire protection equipment. Maintenance activities of fire protection equipment must be scheduled so that a minimum of equipment is taken out of service at any time and is returned to service in a reasonable time period. NFPA has not defined what "minimum" and "reasonable" mean in terms of number and length of time. Therefore, site management should make every effort to meet the intent of the requirement.

8.1 Portable Fire Extinguishers

Portable fire extinguishers must be maintained in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*

Since NFPA 10 provides the detailed requirements regarding the placement, maintenance, inspection and recharging, this handbook section simply provides an overview of the basic requirements for placement, maintenance and inspection of fire extinguishers such that LP-Gas marketers and distributors have a familiarity with the basic requirements. Additionally, a sample maintenance and inspection recordkeeping list is provided.

Summary of Requirements

a) Where cylinders of 1000 lb water capacity or less are stored and are awaiting use, resale or exchange, the following fire protection requirements apply:

- At least one approved portable fire extinguisher with a capacity of 18 pounds dry chemical with a B:C rating must be provided if the aggregate quantity of LP-Gas stored is more than 720 pounds.

- Each required fire extinguisher must be located no more than 50 ft from the storage location. (*Note: Where fire extinguishers have more then one letter classification, they can be considered to satisfy the requirements of that letter.*)

b) Fire extinguishers must be located, identified, and be readily accessible to all employees.

c) A fire extinguisher must be on each vehicle that transports a hazardous material (LP-Gas).

d) Each fire extinguisher must be maintained in a fully charged and operable condition at all times.

e) Each fire extinguisher must be visually inspected monthly by a designated employee. Each monthly inspection must be recorded on a tag or label affixed to the fire extinguisher, showing the date of inspection and initials of inspector.

f) An annual maintenance check must be performed on each fire extinguisher by an authorized service company. Each maintenance check must be recorded on a label affixed to the extinguisher by the service company.

g) Each location must maintain a record of the monthly inspections and annual maintenance, and retain this record for one year after the last entry or the life of the shell of the extinguisher, whichever is less (see sample Chart 8.1).

h) Each location must provide training to all employees upon initial hiring and at least annually thereafter to familiarize them with the general principles and proper operation of the fire extinguisher.

Chart 8.1 (Sample)
Maintenance & Inspection Record
Portable Fire Extinguishers

Company: ________________ ***Location:*** __________________ ***Year:*** ______

Extinguisher *(# or Location)*	**Inspection or Maintenance Performed** *(Monthly / Annual)*	**Corrective Action**	**Qualified Individual or Certifying Company Name** *(as applicable)*	**Date**	**Signature** *(Owner Rep.)*

8.2 Water-Base Fire Protection Systems

Water-base automatic fire extinguishers must be maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Base Fire Protection Systems.*

Water-base fire protection systems are designed and built by various manufacturers and construction firms. Since they are usually unique in design and operation, manufacturer recommendations should be consulted for testing and maintenance.

The following information and material are provided for those plants where water-base fire protection systems have been installed due to jurisdictional requirements.

Summary of Requirements

a) NFPA 25 stipulates the required testing and maintenance items. These requirements will be dependent upon the type and design of the systems that have been installed.

b) These inspections and maintenance requirements are required to be performed on a daily, weekly, monthly, quarterly or annual basis, depending on the specific type of system and components utilized in system.

c) Annual inspections of all types of systems must be performed by a qualified individual.

d) Records of the inspection and maintenance (including repairs) must be maintained at the location (see sample Chart 8.2).

Chart 8.2 (Sample)
Maintenance & Inspection Record
Water-Base Fire Protection Systems

Company: ____________________ Location: ____________________ Year: ______

Equipment Description	Procedure Performed	Qualified Individual or Certifying Company Name	Date	Signature *(Owner Rep.)*

Section Purpose

Section 7 of this handbook provided a checklist of maintenance and inspection procedures for maintaining the mechanical integrity of LP-Gas Systems. As mentioned previously, maintenance and inspection procedures are typically similar at LP-Gas bulk storage facilities and large-volume storage/vapor distribution systems. However, equipment can vary in capacity, design or complexity. Therefore, all equipment inspections and maintenance procedures should be conducted as specified in the equipment manufacturers' instructions.

Manufacturer's literature provides the recommended procedures for operations, maintenance and repairs on equipment specific to your facility.

Owners and managers/supervisors must obtain that information and include it within this section of this handbook for ready reference and use by operators, technicians, drivers and other personnel in carrying out their responsibilities.

Bulk plant personnel should review this information to determine the appropriate action to take when operating equipment or performing equipment inspections, maintenance and repairs.

► ACTION ◄

ADD YOUR COMPANY AND/OR THE MANUFACTURERS' EQUIPMENT INFORMATION THAT IS SPECIFIC TO YOUR LP-GAS BULK STORAGE FACILITY.

The documents, or portions of them, that are listed in this appendix are referenced in or used to perform the procedures noted in one or more sections within this handbook.

☐ American Petroleum Institute, API-ASME *Code for Unfired Pressure Vessels for Petroleum Liquids and Gases*, Pre-July 1, 1961.

☐ American Society of Mechanical Engineers, "Rules for the Construction of Unfired Pressure Vessels," Section VIII, *ASME Boiler and Pressure Vessel Code*, 2001.

☐ Association of American Railroads, *Field Manual of the Interchange Rules (#70, 88, 89, and 90)*.

☐ Association of American Railroads, *Manual of Standards and Recommended Practices, Section c, Part III, Specifications for Tank Cars, (M-1002)*.

☐ Canadian General Standards Board, CAN/CGSB 43.147-2005, *Construction, Modification, Qualification, Maintenance and Selection and Use of Means of Containment for the Handling, Offering for Transport, or Transporting of Dangerous Goods by Rail*.

☐ Compressed Gas Association, CGA C-6, *Standard for Visual Inspection of Steel Compressed Gas Cylinders*, 1993.

☐ Compressed Gas Association, ANSI/CGA C-6.3, *Guidelines for Visual Inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders*, 1991.

☐ Compressed Gas Association, ANSI/CGA C-7, *Guide to the Preparation of Precautionary Labeling and Markings of Compressed Gas Containers*, 2000.

☐ National Fire Protection Association, NFPA 10, *Standard for Portable Fire Extinguishers*, 2002 Edition.

☐ National Fire Protection Association, NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*, 2002 Edition.

☐ National Fire Protection Association, NFPA 58, *Liquefied Petroleum Gas Code*, 2004 Edition.

☐ National Fire Protection Association, NFPA 58, *Liquefied Petroleum Gas Code*, 2001 Edition.

☐ National Fire Protection Association, NFPA 58, *Liquefied Petroleum Gas Code*, 1995 Edition.

☐ National Fire Protection Association, NFPA 70, *National Electric Code*®, 2002 Edition.

☐ National Propane Gas Association, *Certified Employee Training Program*, 2nd Edition, Modules 1.0 - 4.2.

☐ Propane Education & Research Council, *Dispensing Propane [Safely],* 2005 Edition.

☐ U.S. Government Publication, Occupational Health and Safety Administration, OSHA Publication 3072, *Sling Safety,* 1996 Revision.

☐ U.S. Government Publication, Title 21, Code of Federal Regulations, "Food and Drugs", Chapter I, Part 184.1655.

☐ U.S. Government Publication, Title 29, Code of Federal Regulations, "Labor", Part 1910, *General Industry Standards.*

☐ U.S. Government Publication, Title 40, Code of Federal Regulations, "Protection of Environment."

☐ U.S. Government Publication, Title 49, Code of Federal Regulations, "Transportation", Subtitle B.

Fire Safety Analysis Manual

for

LP-Gas Storage Facilities

Based on the 2014 Edition of NFPA 58 Liquefied Petroleum Gas Code

Developed by the National Fire Protection Association and the

National Propane Gas Association

Funded by a Grant from the Propane Education & Research Council

PRC-005025

<u>Fire Safety Analysis Manual</u>
<u>For</u>
<u>LP-Gas Storage Facilities</u>

Based on the 2014 Edition of NFPA 58 *Liquefied Petroleum Gas Code*

The official position of the NFPA on all aspects regarding propane storage facility safety is in NFPA 58, the *Liquefied Petroleum Gas Code*. This manual is not intended to replace NFPA 58.

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Origin and Development of the Fire Safety Analysis Manual

The requirement for a Fire Safety Analysis (FSA) was introduced in the 1976 edition of NFPA 58, along with the requirement for emergency shutoff valves at locations where hoses and swivel type piping were used (for connection to cargo tank vehicles and rail cars). A Fire Safety Analysis was required for new propane storage plants with capacities of more than 4,000 gallons located in "heavily populated or congested areas".

This requirement was basically unchanged until the 2001 edition of NFPA 58, where the FSA was required for all propane storage plants with capacities of more than 4,000 gallons, with a three year period for existing facilities to be brought into compliance. As the majority of plants requiring a FSA did not have one in 2001, the need for guidance on how to conduct the FSA became apparent. Prior to 2001, the FSA was usually conducted by an independent consultant with knowledge of propane and fire safety. The concept of a consistent methodology was identified by a propane marketer in New England, Jim Hurley of Eastern Propane. The first two editions of the Manual were dedicated to Jim in recognition of his vision.

The recommendation resulted in NFPA working with NPGA to submit a proposal to PERC to develop a FSA manual to assist marketers in complying with the FSA requirement. When the project was approved, NPGA established an advisory committee and worked with NFPA to develop the manual.

Since the 2001 edition of the manual, it has been updated thrice to retain correct numbers of the paragraphs referenced in NFPA 58, as they are sometimes revised and renumbered. No technically substantive changes have been made to the manual since the first edition was published.

The models used in the Fire Safety Analysis (FSA) Manual to determine the distances to hazards (presented in Table B-1 of the FSA Manual) are based on published models in the literature. These models have been published in government reports, journal articles[1,2] , EPA-suggested procedures[3] and engineering monographs and books. The models used are considered conservative and have been simplified for the purposes of the FSA Manual.

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1 A general reference on hazard distance assessment models is: Lees, F.P. (Editor), "*Loss Prevention in the Process Industries*," 2nd Edition, Vol 1, 2 & 3, Butterworth Heinemann Publishers, Oxford, England, 1996.

2 Raj, P.K.,"*Exposure of a liquefied gas container to an external fire*," Journal of Hazardous Materials, v 122, Issues 1-2, p 37-49, June 2005.

3 US EPA, "*Technical Guidance for Hazard Analysis*," Emergency Planning for Extremely Hazardous Substances, EPA/FEMA/DOT, December 1987.

Acknowledgments

This fifth edition of the Fire Safety Analysis (FSA) Manual, based on the 2014 edition of NFPA 58, is a continuation of the effort to fulfill a need for an easily used and simple aid for the members of propane industry to fulfill their obligations under NFPA 58 (2001, 2004, 2008, 2011 and 2014 editions) which require developing a written FSA. The project was funded by the Propane Education & Research Council through the National Propane Gas Association (NPGA). The National Fire Protection Association (NFPA) was the principal contractor for the first edition of the manual. Technology & Management Systems, Inc. (TMS) developed the technical analyses and several chapters of the first edition of the manual, as a subcontractor to NFPA.

Mr. Theodore C. Lemoff, Principal Gases Engineer, was the principal investigator at NFPA. Dr. Phani K. Raj was the principal investigator and analyst at TMS. Mr. Bruce Swiecicki, P.E., Senior Technical Advisor at NPGA, served as a staff technical reviewer.

In preparation for the first edition, NPGA assembled an Advisory Committee consisting of representatives from the propane industry, a Fire Department of a major city in the US and a Fire Protection Engineer. The Committee provided technical inputs and guidance to the project team on industry safety practices, types of information that an authority having jurisdiction and emergency responders would want to see in an FSA, an insight into the levels of understanding of various issues related to FSA in the industry, etc. The Advisory Committee set not only the direction of the project but made policy decisions related to the scope of the FSA manual. Except for the contractors, every member of the Advisory Committee had a vote and many decisions were made on the basis of a Committee vote. The Advisory Committee consisted of the following (voting) members.

1	Michael Merrill **(Chairman)**	Suburban Propane LP	Whippany, NJ
2	Mr. Greg Benton	Georgia Gas Distributors	Atlanta, GA
3	Mr. Billy Cox	O'Nealgas Inc.	Choudrant, LA
4	Mr. James Howe	Howe Engineers, Inc.	West Falmouth, MA
5	Mr. Jerry Lucas	Heritage Propane Partners, LP	Sallisaw, OK
6	Mr. Rob Scott	Scott & Associates	Kingsburg, CA
7	Mr. Cliff Slisz	Ferrellgas	Liberty, MO
8	Mr. Scott Stookey	City of Phoenix Fire Department	Phoenix, AZ
9	Mr. Ron Stover	Mutual Liquid Gas & Equipment	Gardena, CA
10	Mr. Robert Wallace	Dowdle Butane Gas Co Inc	Maryville, TN
11	Mr. Brent Wolcott	Ag Valley Coop	Edison, NE

Mr. Theodore Lemoff and Dr. Phani Raj participated in the deliberations of the meetings of the Advisory Committee as non-voting members.

About the Authors

Phani K. Raj, Ph.D.
Dr. Raj is the President of Technology & Management Systems, Inc. (TMS). He holds S.M. and Ph.D. degrees in Mechanical Engineering as well as an MBA degree.

He has over 30 years professional experience in conducting safety research and assessing risks in the storage, transportation, handling and utilization of hazardous materials, including energy fluids. His research has included the development of mathematical models to describe the accidental release behavior of chemicals and flammable materials. In addition, he has developed easy to follow safety guideline documents and hazard assessment manuals for a number of clients including the Federal Agencies and industrial clients.

Dr. Raj developed a number of models for the "Chemical Hazard Response Information System" (CHRIS), which the U.S. Coast Guard and the National Response Center use for assisting in case of hazardous material emergencies. He is the author of CHRIS Manual III "Hazard Assessment Handbook."

Since 1996 he has been a member of the NFPA's Technical Committee on Liquefied Petroleum Gases which writes NFPA 58, *Liquefied Petroleum Gas Code*. He was a member of the Committee Transportation of Hazardous Materials (of the National Research Council), and emeritus member of the Editorial Board of the Journal of Hazardous Materials. He has held the post of visiting lecturer at MIT and taught, in the Chemical Engineering Department, a graduate level course. He is the principal author of over 100 technical reports and over 40 technical papers.

Theodore C. Lemoff, PE
Mr. Lemoff is retired from the National Fire Protection Association (NFPA). While at NFPA, he served as the Principal Gases Engineer. He holds a Bachelor of Engineering degree in Chemical Engineering and is a registered professional engineer in Massachusetts.

He has over 40 years experience in the fire safety and the chemical industry, including 25 years at NFPA working in the flammable gases area. He served as the staff liaison and secretary to the NFPA Technical Committee on Liquefied Petroleum Gases, responsible for NFPA 58, and for other NFPA codes and standards on flammable gases.

Mr. Lemoff is a member of the American Institute of Chemical Engineers, the Society of Fire Protection Engineers, the Society of Gas Engineers, and the American Society of Plumbing Engineers.

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CHAPTER 1

Introduction

1.1 Background

The Fire Safety Analysis (FSA) is a self-conducted audit of the safety features of a propane installation and an assessment of the means to minimize the potential for inadvertent propane releases from storage containers and during transfer operations. The assessment also includes an evaluation of the capabilities of local emergency response agencies as well as an analysis of potentially hazardous exposures from the installation to the neighborhood and from the surroundings to the LP-Gas facility.

Since 1976, NFPA 58, *Liquefied Petroleum Gas Code* (hereinafter referred to as the "code" or "NFPA 58") has required that a facility operator or owner conduct a FSA for propane facilities having ASME containers of aggregate storage greater than 4,000 gallons water capacity. The FSA requirement was changed in the 2001 edition to require a written FSA. The requirements for fire protection are indicated in the 2014 edition of NFPA 58 in §6.27, which addresses fire protection requirements for industrial plants, bulk plants and dispensing stations. Specifically §6.27.2 ("Planning") and §6.27.3("Protection of ASME Containers") require, in part, the following:

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.

6.27.3.1 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 gallons (15.2 m^3)and for ASME containers on roofs. Existing installations 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.

The FSA and required assessment of the installation provides several important benefits:

1) A structured assessment by which each facility can be evaluated for conformity of installed equipment with code requirements.

2) A means to evaluate the capability of systems and equipment installed to control and contain potential LP-Gas releases during day-to-day operations.

3) An approach to evaluate the informational needs of the facility, based on factors such as the type and frequency of transfer operations, size of the storage containers, location of the facility with respect to other buildings and the existing procedures and systems in place.

4) A means to describe product control and fire protection features which exceed the comprehensive requirements of NPFA 58[1].

5) A tool for facilitating a cooperative and effective dialogue with local emergency response agencies and authorities having jurisdiction.

1.2 Scope of the Manual

The manual addresses a number of subjects, including:

(1) A review of the product control measures required in the NFPA 58, "Liquefied Petroleum Gas Code"
(2) Local conditions of hazards within the facility site
(3) Exposures to and from other properties
(4) Effectiveness of local fire departments
(5) Effective control of leakage, fire and exposure
(6) Illustrative examples using four different sizes of typical LP-Gas facilities

This FSA manual is intended for use by propane plant owners or operators, consultants, authorities having jurisdiction (AHJs) and emergency response personnel. The manual addresses the process by which a FSA can be conducted for a LP-Gas facility containing one or more stationary ASME containers.

The FSA manual is designed to provide a guide for identifying the requirements in NFPA 58 and determining compliance with them. Section 6.27.3.5 of NFPA 58 provides that:

> 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, pull away protection where installed, and the optional requirements of Section 6.28.

The philosophy of NFPA 58 is to minimize fires by minimizing the accidental release of propane if an incident should occur. Or put in simple terms, "no fuel, and no fire."

The manual **does not** address the following:

---

[1] All reference, henceforth, to the "code" in this document should be construed as referring to NFPA 58, 2014 edition.

1. Marine terminals, refrigerated LP-Gas storage and the transportation of LP-gas by either rail tank cars or by cargo tank trucks. Marine terminals are governed by the OSHA Process Safety Management regulations and the US EPA Risk Management Plan regulations; refrigerated storage of LP-gas is a high-volume operation requiring special considerations; and, the transportation of LP-gas is addressed by Title 49 of the Code of Federal Regulations, *Transportation*.[i]
2. Storage of LP-Gas in salt domes and caverns.
3. Installations of ASME LP-gas containers on roofs of buildings. This type of installation, for which a fire safety analysis is required, is excluded from the scope of this manual primarily because of the rarity of such installations in the United States.
4. Cylinder filling operations at a dispensing facility, unless the storage threshold for LP-Gas has been exceeded, requiring an FSA to be prepared.
5. The use of facility employees performing as a "fire brigade."

The above facilities may be required to comply with other safety analysis requirements.

1.3 Need for a FSA Manual

Neither NFPA 58 nor the "Liquefied Petroleum Gas Code Handbook"[ii] provide detailed guidance on how to prepare or develop a written FSA. Since each industrial plant, bulk plant, or dispensing stationpresents unique physical and operational characteristics, the fire safety analysis is a tool used to assess the level of fire safety performance that a specific industrial plant, bulk plant or dispensing station can be expected to provide. This FSA will also provide essential information on the facility and its operation to the local authority having jurisdiction (AHJ) and local emergency response agency.

An informal survey was taken of AHJ's on the fire safety analyses used for existing and new plants in their jurisdictions (conducted by the author) at the time the first edition of this manual was being prepared. It indicated that there was no uniformity either in content, the details of information, or final assessment of the facility in the FSAs submitted. They ranged from a single page submission for a medium size bulk plant to very detailed assessment including risk assessment and management plan for a 30,000 gallon bulk storage facility. Without a guidance manual, potential confusion would almost certainly occur as each AHJ would be required to establish an individual set of criteria that would meet the FSA in their area. Thus, the need in the LP-Gas industry for assistance with the following tasks was clearly established.

1) Providing a FSA template that allows for consideration of different size installations
2) Establishing a uniform approach and defining common elements
3) Developing simplified checklists and an example-based methodology for completing the analysis
4) Utilizing technically-based guidance and support

The intent of this FSA manual is to provide an easy-to-use procedure for LP-gas facility owners or operators who are most familiar with the equipment technology and system operations and therefore qualified to complete the document. Knowledge of fire science and engineering principles is not required for this document to be useable by an owner, operator or an AHJ, because those principles have already been factored into the assessment criteria contained within the FSA.

By utilizing the expertise of industry, engineering and fire service representatives in the development of the material to follow, this manual provides a comprehensive, uniform, objective approach that was designed to provide for the uniform and objective application of FSA requirements by the AHJs. Further, the joint input of the Propane Education & Research Council (PERC), National Propane Gas Association (NPGA), and the National Fire Protection Association (NFPA) provides additional assurance of the manual's depth, credibility and broad-based consensus.

This FSA manual has been developed based on the requirements of NFPA 58, 2014 edition. Using this manual to perform a FSA at a facility constructed to meet the requirements of prior editions of NFPA 58 or other state-specific codes may produce conflicts between actual facility construction and the checklists in this manual. The code or standard in effect at the time of construction of the facility should be used as the source of requirements to perform the FSA. Checklist items contained within this manual can be revised to indicate the appropriate code items required at the time of facility construction.

1.4 LP-Gas Safety Record and Risks

The LP-Gas industry has a long history of safe operations. With the requirement in the 1976 edition of NFPA 58 to retrofit LP-Gas plants with emergency shutoff valves (ESVs) in transfer lines, the safety of LP-Gas facilities was further improved.

The FSA provided in this manual, in addition to other safety programs currently enacted at any workplace, is intended to reduce or eliminate the risk of fatality or injury to both the plant employees and the public. In an effort to identify the level of risk a propane installation poses to the general public, as well as employees and emergency responders, the U.S. Department of Energy (DOE) instituted a study[iii] in 1981. Accident data from a variety of sources was analyzed, including: the US Department of Transportation hazardous material incident report database, reports of the National Transportation Safety Board, National Fire Protection Association, technical journals and other sources. Data analyzed for the period 1971 through 1979 addressed LP-Gas transportation and product releases from stationary storage facilities. The special focus of the study was the fatalities suffered by employees and the general public. The study concluded that a fatality to the general public as a direct result of an LPG transportation or storage incident involving the loss of product is very small and the risk (expressed in expected number of fatalities per year) is smaller than that from natural phenomena (lightning, tornadoes, objects falling from the sky, etc).

An analysis conducted by the National Fire Protection Association[iv] of LP-Gas fire damage and casualty data during the period between 1980 and 1999 also indicates that the LP-Gas storage facility operations in the US are very safe. The number of reported fires at LP-Gas bulk storage facilities remains small and has fallen since 1980, but substantial variation exists from year to year. During the five-year period from 1994 through 1998, an estimated 49 fires, on average, were reported per year at LP-Gas bulk storage facilities. These fires caused an annual average of one civilian death, five civilian injuries and $754,000 in direct property damage. In 1999, an estimated 58 reported fires on these properties caused four civilian injuries and $722,000 in direct property damage. The 58 fires reported in 1999 accounted for .003% of all fires reported that year.

1.5 Organization of the FSA Manual

The manual has been organized to address the requirements outlined in the 2014 edition of NFPA 58, Sections 6.27 and 6.28.

Chapter 2 discusses the requirements of the 2014 edition of NFPA 58 in regard to product control requirements, and their evolution. The philosophy and the advantages of product control systems are discussed. Also included are the various appurtenances used in a typical LP-Gas facility. More detailed information on the types of valves, their functions and example photographs of various appurtenances are provided in Appendix B. Chapter 3 provides an overview of the FSA process including its principal elements.

The input of data into the FSA procedure begins with Chapter 4. In Chapter 4, basic information about the LP-Gas facility is input into appropriate tables and a decision is made (based on the data provided) as to the extent of the analysis that should be completed. The assessment of conformity with code requirements of the product control requirements for containers and in transfer piping is performed in Chapter 5. To aid this assessment a series of sketches of possible configurations of container appurtenances (satisfying 2014 code requirements) are provided. Note that several section references have been changed from the published edition of the 2014 edition due to the acceptance of Tentative Interim Amendment 14-3, which is reprinted with permission in Appendix C. When necessary, the year when specific equipment was required by the code is also indicated on the sketches to facilitate application of the Manual to facilities constructed to the requirements in previous editions of NFPA 58. The analysis of the local conditions of hazard is presented in Chapter 6, followed by the assessment in Chapter 7 of the hazard exposure to off-site properties and persons. Also, the potential exposure to LP-Gas installations from off-site activities is covered in Chapter 7.

The evaluation of the capabilities of the local emergency responder (usually the fire department) and the availability of water to fight in-plant fires and exposures are presented in Chapter 8. Summary of evaluations and actions that may need to be initiated for proposed LP-Gas facilities are presented in Chapter 9. The use of this manual in preparing a written FSA for a LP-Gas facility is demonstrated with examples of four different generic cases. Several different sizes of facilities are considered.

A set of blank forms required to perform a FSA is provided in Appendix A. The results of calculating the hazard distances for a set of credible LP-gas release scenarios are provided in Appendix B. Also provided in Appendix B are the thermodynamic properties of propane and the values of other parameters used in calculating the hazard distances.

[i] U. S. Code of Federal Regulations, Title 49, Transportation

[ii] Liquefied Petroleum Gas Handbook, Beach, 2014, NFPA, Quincy MA

[iii] LPG Land Transportation and Storage Safety, Department of Energy report No. DOE/EV/06020-TS 9/18/81"

[iv] Fires at LP-Gas Bulk Storage Plants Statistical Analysis, NFPA, 2003, Quincy, MA

CHAPTER 2

LP-Gas Storage Container Safety Features

The fundamental premise on which the requirements for LP-Gas facility safety specified in several recent editions of NFPA 58 is based is the following:
If product release can be either controlled or eliminated, safety is effectively addressed.

A product release creates the potential for the occurrence of a fire. Therefore, the focus of both NFPA 58 and the Fire Safety Analysis Manual is on the need to design systems (incorporating product controls) to ensure, to the extent possible with current technology and procedures, the elimination of the accidental release of LP-gas from storage or during transfer operations.

2.1 A Historical Perspective

In the late 1960's and the early 1970's there were a number of fires and BLEVEs (Boiling Liquid Expanding Vapor Explosions) of propane and other liquefied petroleum gases resulting from derailments of railcars carrying propane and other flammable liquefied gases. These incidents involved fire fighter fatalities and highlighted the need for safety improvements. As a result, the U. S. Department of Transportation (DOT) implemented new regulations for the tank cars used to transport propane and other liquefied flammable gases, and made them mandatory and retroactive in 1980. These improvements included:

- Head shields to reinforce the pressure vessel on the railcar
- "Shelf" couplers to reduce the potential for railcars to be uncoupled during a derailment
- Thermal protection to reduce the potential for the tank to experience a rise in temperature due to flame impingement

Since these improvements in rail car safety were made in the 1980's, there have been no fire fighter fatalities from any railroad tank car BLEVEs and the number of these incidents has been greatly reduced, to the authors' knowledge.

In 1973, product control requirements to prevent the uncontrolled release of LP-gas from storage containers consisted primarily of manually operated valves, backflow check valves and excess-flow check valves.

On July 3, 1973 a propane incident occurred in Kingman, Arizona involving a propane fire at a propane tank car unloading area in a propane bulk storage plant. Though the plant's equipment conformed to the requirements of NFPA 58 and other safety standards for flammable materials at that time, the incident resulted in the death of several fire fighters and one plant employee.

A direct result of this incident (and others that occurred at approximately the same time) was the addition of a new fire protection requirement in the 1976 edition of NFPA 58. The requirement stated that planning "for the effective measures for control of inadvertent LP-Gas release or fire" shall be done and coordinated with local emergency responders. In addition, the primary consideration of a fire safety analysis at that time was the use of water as a suppressing agent to control fires. The requirements today are very similar to those original requirements except in two areas.

- As of the 2001 edition, fire safety analyses are required to be written;
- The primary consideration in performing such an analysis has changed from the emphasis of using water for fire control to the emphasis of avoiding product release altogether using technology and training.

This modern approach takes advantage of the inherent safety present in a controlled environment such as a bulk plant, as well as the safety features of the most current product control hardware.

In early editions of NFPA 58, the primary consideration of water as the means to control a fire was based on the fact that at that time, there were few reliable ways to stop the flow of LP-gas after failures in the system and the need to apply water quickly to storage containers being impinged by flames was important.

Another significant change in the 1976 edition of NFPA 58 was the requirement for including an emergency shutoff valve (ESV) in the transfer lines used between stationary storage containers of over 4,000 gallons capacity and cargo tank vehicles. This revision was intended to prevent product release from storage containers in the event of a vehicle pulling away with its hoses still connected. All existing plants were required to comply with this requirement by the end of 1980. Since this retrofit program was completed, there has not been, to the knowledge of the authors, a pull-away accident involving an ESV installation that resulted in serious consequences.

The 1980's enjoyed a reduced number of propane incidents in the U. S., and the next major product control enhancement was the revision to introduce an optional requirement for internal tank valves in containers over 2,000 gallons in the 1992 edition of NFPA 58. These tank valve requirements included:

Vapor and Liquid Withdrawal Openings in Tanks

1. Positive shutoff valve in line with excess flow valve installed in the tank, or
2. Internal valve with integral excess flow shutoff capability

Vapor and Liquid Inlet Openings in Tanks

1. Positive shutoff valve in combination with either an excess flow valve or backflow check valve installed in the tank, or
2. Internal valve with integral excess flow valve, or
3. Internal valve with remote means of closure

These revisions were made to enhance the operational features of product control hardware. Internal valves are capable of being closed from a remote location (using a cable, pneumatic, or hydraulic device) and by thermal activation, which is accomplished using an element that melts when it is subjected to fairly moderate temperatures (in the 200ºF - 250º F range).

The 2001 edition of NFPA 58 was further revised to require internal valves for liquid connections to containers over 4,000 gallons, with remote and thermal shutoff activation. This change was the result of the Committee desiring improved safety performance with this advanced hardware, due to the following incidents:

- **Sanford, NC**. A hose separation resulted in the loss of the contents of a transport vehicle (9700 gallons water capacity). The contents within the storage containers were also lost because of a failed check valve.
- **Albert City, Iowa**. An exposed liquid pipe installed in violation of the code between an 18,000 gallon water capacity storage container and a vaporizer was broken when a recreational vehicle accidentally drove over it. The leaking gas found a source of ignition and impinged on the container, resulting in a BLEVE.
- **Truth or Consequences, NM**. A small, parked truck rolled into a propane bulk storage plant, breaking plant piping. The resulting fire caused the failure of several cylinders.

These improvements in product control are considered critically important, and in addition to requiring them for all new installations after 2001, the requirements were made retroactive to all existing installations, allowing 10 years for the conversion. All existing containers over 4,000 gallons water capacity will be retrofit with an internal valve or similar protection on all liquid connections. Alternatively, the use of an emergency shutoff valve (ESV) as close to the container as practical is also allowed, in recognition that some containers cannot accommodate an internal valve without extensive modification. The ESV has the same remote and thermal activation closing features as an internal valve.

2.2 Current LP-Gas Storage Container Safety Features

As of the 2001 edition, NFPA 58 requirements for product release control include the provision for a number of different types of valves or appurtenances in the product storage containers, transfer piping network and at liquid transfer facility locations. Generally, code requirements for product control appurtenances on containers used in industrial plants and bulk plants, as well as dispensing stations, are more stringent than for residential and commercial use containers.

In the 2014 edition of NFPA 58, changes to the definitions of “Bulk Plant” and “Industrial Plant” clarified the intent of the NFPA Technical Committee on Liquefied Petroleum Gases by stating that each of those types of facilities utilize only containers greater than 4,000 gallons water capacity. Therefore, modifications were made to Chapter 5 of this manual to remove references to containers between 2,000 and 4,000 gallons water capacity. The manual does retain information on containers less than 4,000 gallons water capacity due to the fact that some dispensing stations may be utilizing more than one container less than 4,000 gallons, but with an aggregate capacity greater than 4,000 gallons.

Unless product is being transferred, product control valves are normally in the closed position. However, some of the installations require an automatic shutoff feature when either a fire (or heat) is sensed or when other abnormal conditions occur. The product control valves include the following:

Positive shutoff valve: A shutoff valve that, in the closed position, does not allow the flow of product in either direction. [NFPA 58, 3.3.75.7]

Backflow check valve: This valve allows flow in one direction only and is used to allow a container to be filled while preventing product from flowing out of the container.

Excess-flow valve: A valve designed to close when the liquid or vapor passing through it exceeds a prescribed flow rate. [NFPA 58, 3.3.75.3]

Internal valve: A container primary shutoff valve that can be closed remotely, which incorporates an internal excess flow valve with the seat and seat disc located within the container so that they remain in place should external damage occur to the valve. [NFPA 58, 3.3.75.6]

Emergency shutoff valve: A shutoff valve incorporating thermal and manual means of closing that also provides for a remote means of closing. [NFPA 58, 3.3.75.2]

Hydrostatic pressure relief valve: A type of relief valve that is set to open and relieve pressure in a liquid hose or pipe segment between two shutoff valves when the pressure exceeds the setting of the valve.

Container pressure relief valve: A type of pressure relief device designed to open and then close to prevent excess internal fluid pressure in a container without releasing the entire contents of the container. The valve is located in the vapor space of the container.

Bulk storage installations incorporate several product release control appurtenances. This fire safety analysis manual outlines alternative schematics for the various facilities covered (4,000 gallons or less and greater than 4,000 gallons water capacity).

CHAPTER 3

Principal Elements of the Fire Safety Analysis

The principal elements of the Fire Safety Analysis (FSA) required by NFPA 58 (in §6.27, and container protection requirements in §6.27.3) are described in this chapter. This manual for performing the FSA addresses the following LP-Gas facility-related items:

1. Effectiveness of Product Control measures
2. Local conditions of hazard within the container site, including congestion within the site
3. Exposure to off-site properties and populations and the impact of neighboring industrial activity on the facility
4. Effectiveness of the local Fire Department that may respond to an emergency within the facility
5. Requirements for and availability of adequate water supply
6. Full compliance with Code requirements for existing LP-Gas facilities and corrective actions to be implemented for a proposed facility to address any deficiencies

The details of how each of the above items is evaluated in performing the FSA are indicated in Chapter 4 though Chapter 9. Shown below is a brief review of the various steps involved in conducting the FSA.

3.1 Important Steps in Conducting the Analysis

The development of a Fire Safety Analysis (FSA) involves a number of important steps. These steps are indicated in Table 3.1. Also shown in Table 3.1 are the chapters in this manual where the referenced analysis steps are discussed in detail.

Each set of FSA requirements is presented in one or more tables and fill-in forms. The tables provide either factual information or calculated results; the user obtains information from the tables for further analyses. The fill-in forms specify NFPA 58 requirements or other assessment parameters, and provide two columns, one with a “Yes” column heading and the other with a “No” heading. In some cases either schematic or pictorial representations are provided to clarify a requirement. The fill-in forms require some information input from the user, either checking a “Yes” column or a “No” column or writing a numerical value. Also provided are notes under each table or fill-in form, which explains conditions, if any, associated with the table or the form or how a calculation is performed for entering data into the form.

Appropriate explanations are provided in the text either preceding a form or after the form, if any action is necessary depending upon the values/contents in the forms. A blank copy of each form presented in Chapter 4 through Chapter 9 is provided in Appendix A. These can be reproduced and used for any number of LP-Gas facilities.

The FSA for a LP-Gas facility is conducted by systematically completing the forms in Chapter 4 through Chapter 9. The person completing the FSA must indicate a “Yes” or “No” in the appropriate column for each requirement, depending upon whether the LP-Gas facility fulfills the specific requirement. Any items, which may need to be undertaken to correct a deficiency in a proposed (as opposed to existing) LP-Gas facility are referred to in Chapter 9.

Once the FSA is complete, the forms together with information about the facility, can be filed to satisfy the “written” requirement of NFPA 58, §6.27.3.2 & 6.27.3.3. Any emergency planning for the facility is required to be coordinated with the local fire department or equivalent responding authority (§ 6.27.2.1).

3.2 Completing the FSA

Chapters 4 through 9 provide a framework with which the Fire Safety Analysis can be conducted to satisfy the requirements of NFPA 58. It is important to note the following in performing the analysis using the tables, fill-in forms and steps indicated in the following chapters.

1. All references to the “Code” in this manual are to the 2014 edition of the NFPA 58 “Liquefied Petroleum Gas Code.”

2. If a LP-Gas facility was built to satisfy the requirements of an edition of NFPA 58 earlier than the 2014 edition, then you may obtain a copy of the appropriate edition of the Fire Safety Analysis Manual and use that resource for your evaluation. If you must use this manual and an appurtenance or other requirement is specified in one or more of the forms in this manual (developed based on the 2014 edition), and this requirement was not in the edition to which the facility was built, then it is recommended that the “Yes” and “No” column corresponding to the particular appurtenance or requirement be left blank or marked “NA,” to signify the requirement is not applicable to the facility in question.

3. If the facility for which the analysis is being performed was constructed to satisfy the requirements of a previous edition of NFPA 58, it must still comply with all requirements that have been made applicable retroactively in later editions of the code, through the 2014 edition. Such retroactive provisions are indicated where they are applicable.

Table 3.1
Description of the Various Steps in Performing the FSA

Step #	FSA Steps	Chapter where described
1	Gather data on the volume of LP-Gas stored and other information pertinent to the facility.	Chapter 4
2	Perform simple calculations and determine whether the facility is subject to the requirements for developing an FSA.	
3	Evaluate the product control appurtenances and other safety features of the facility relative to the requirements of the NFPA 58 code.	Chapter 5
4	Assess the appurtenance requirements for containers of different capacities and compare them to the actual installation.	
5	Evaluate the requirements for valves on transfer piping and compare them to the valves provided in the facility.	
6	Assess conformance to the code of a Redundant and Fail-Safe Product Control System, if such a system is provided in the facility.	
7	Evaluate the code conformance of the Low Emission Transfer Equipment if installed in the facility.	
8	Analyze the protection measures against local conditions of hazard. That is, assess whether all requirements of the code for the physical protection of containers and transfer piping are implemented.	Chapter 6
9	Analyze the code requirements for the control of ignition sources and whether these requirements are complied with.	
10	Assess conformance to the code requirements for separation distances between (i) containers of different sizes and property lines and, (ii) LP-Gas transfer points and other exposures.	
11	Evaluate conformance to the code requirements for Special Protection Systems, if they are provided on containers in the facility.	
12	Evaluate the potential hazards to off-site populations and property from propane releases in the facility. This step includes selecting credible LP-Gas release scenarios and assessing the distance (and area) over which the hazard exists.	Chapter 7
13	Assess whether any off-site populations, especially people in institutional occupancies, are potentially subject to the LP-Gas release hazards	
14	Evaluate whether there exists a hazard from other industrial operations around the LP-Gas facility	
15	Evaluate the effectiveness of the local Fire Department, including the availability and capability of response personnel, training level, equipment and response time to an emergency in the facility.	Chapter 8
16	Evaluate the amount of water needed to cool containers exposed to a fire and the adequacy of the facility (or locally available) water supply.	
17	For a proposed facility, develop corrective actions to address deficiencies found.	Chapter 9 (Only applicable for proposed facilities)
18	Assess, based on specific criteria, the need to provide Redundant and Fail-Safe Product Control Systems.	
19	Assess, based on specific criteria, the need to provide Low Emission Transfer Systems.	
20	Assess when Special Protection Systems are needed	
21	Evaluate alternative approaches to using water in a special protection system	

CHAPTER 4

Facility Information

In this chapter basic information on the LP-Gas facility is recorded and a decision is made on whether the facility is required to have a completed Fire Safety Analysis (FSA) performed. If it is determined that a FSA is required, additional information on the facility is recorded.

4.1 Initial Data for the LP-Gas Facility

Complete Form 4.1 to provide basic information on the facility.

Form 4.1
Initial Data on the LP-Gas Facility

A	B	C
Item #	**Information Item**	**Data**
1	Name of the LP-Gas Facility Owner or Operator	
2	Contact Name:	
3	Contact Telephone & Fax Numbers	
4	Contact Email Address	
5	Mailing Address	Street 1:
		Street 2:
		City, State, Zip:

4.2 Facility Storage Capacity and Other Details

Complete Form 4.2. Multiply Column B by its corresponding entry in Column C, write the answer in the corresponding cell in Column D, then sum all the entries in Column D and write it in Row 2, Column D. This number is the “Aggregate Water Capacity” of the facility.

Form 4.2
Facility Storage Capacity [1,2,3]

A	B	C	D
Item #	**Individual Container Water Capacity (w.c.) (gallons)**	**Number of containers**	**Total Water Capacity (w.c.) of each container size (gallons)**
1	500		
	1,000		
	2,000		
	4,000		
	10,000		
	18,000		
	30,000		
	60,000		
	Other:		
	Other:		
	Other:		
	Other:		
2	**Aggregate Water Capacity[4]**		

Notes:
(1) Column D = Column B x Column C.
(2) Parked bobtails, transports and tank cars should not be considered for aggregate capacity calculations.
(3) Do not consider containers that are not connected for use.
(4) For the purpose of this manual, "Aggregate Water Capacity" means any group of single ASME storage containers separated from each other by distances less than those stated in the aboveground containers column of Table 6.3.1.1.

If the aggregate water capacity of the LP-Gas facility is less than or equal to 4,000 gallon (w.c.), no further assessment is required.

YOU CAN STOP HERE.

If the aggregate water capacity of the facility is greater than 4,000 gallons, continue the analysis.

4.3 Additional Facility Information

Complete Form 4.3 below and record additional information on the facility.

Complete also the remainder of Fire Safety Analysis indicated in Chapter 5 through Chapter 8 (plus Chapter 9 for proposed facilities).

Form 4.3
Additional Information on the LP-Gas Facility

☐ Existing Facility built to NFPA 58 Edition _______ ☐ Proposed Facility

a) Name of the Facility (if applicable) ____

b) Type of LP-Gas Facility ☐ Dispensing Station ☐ Industrial Plant ☐ Bulk Plant

c) Facility is located in ☐ Rural Area ☐ Suburban Area ☐ City Commercial Zone ☐ City Industrial Zone

d) Facility neighbors§: ☐ Agri. fields ☐ Commercial Bldgs. ☐ Flammable Liquids Storage
(Check all that apply) ☐ Industrial Activity (metal fabrication, cutting and welding, etc)
☐ Manufacturing ☐ Others (explain) ______________________

e) Geographic Location of Facility/Address: ________________________________
____

f) Landmarks, if any: ________________________________
____

g) LP-Gas liquid supply by: ☐ Bobtail ☐ Truck Transport ☐ Rail Tank Car
(Check all that apply) ☐ Pipeline

h) LP-Gas Distribution by: ☐ Bobtail ☐ Truck Transport ☐ Vapor Piping
(Check all that apply) ☐ Liquid Piping ☐ Dispensing or Vehicle Liquid fueling

i) Number of Vehicle Entrances: ☐ One ☐ Two ☐ More than two

j) Type of Access Roads to the Facility ☐ Rural ☐ City or Town ☐ Highway
(One check per line) Entrance 1 ☐ Dirt road ☐ Gravel road ☐ Paved
(One check per line) Entrance 2 ☐ Dirt road ☐ Gravel road ☐ Paved

k) Staff presence ☐ Not staffed ☐ Only during transfer operations
☐ Staffed always (24/7) ☐ Only during business hours
☐ Other (Explain) ____________________________

l) Location and distances to Assembly, Educational or Institutional Occupancies surrounding the facility, if any, within 250 ft from the facility boundary in the direction of the assets.

____
____

m) Overview plot plan of the facility attached? ☐ Yes ☐ No

§ All properties either abutting the LP-Gas facility or within 250 feet of the container or transfer point nearest to facility boundary.

CHAPTER 5

Analysis of Product Control Measures
In Containers and Transfer Piping

5.1 Product Control Measures in Containers

NFPA 58 requires the installation of several product control safety devices both on containers and in transfer piping to minimize the accidental release of LP-Gas, either liquid or vapor. The requirements for product control equipment depend on the following:

- The size of individual containers,
- The type of service,
- Whether the containers in a facility are individually filled or filled through a common liquid manifold,
- Whether the product is transferred from the storage container as a liquid or vapor (or both).

A facility may have LP-Gas containers of different sizes; it is therefore necessary to evaluate compliance with the code requirements on a container-by-container basis as well as on a facility basis.

In this chapter, the appurtenance requirements of the code are listed for LP-Gas containers of different sizes and configured for different types of service. A series of forms are provided which indicate the code-required product control hardware for container and facility piping. The forms also provide space to record the product control equipment actually installed on the containers as well as transfer piping at the facility. These forms must be completed as a part of this Fire Safety Analysis.

Complete Forms 5.1, 5.2 or 5.3 depending upon the size of the individual containers in the facility. Then, perform an analysis of the product control appurtenances for each container located in the facility.

Table 5.1
Container Size-Dependent Evaluations

If the LP-Gas facility contains individual containers in the volume range (gallons w.c.)		Type of Service	Perform the analysis specified in Section
Greater than	And Less than or equal to		
0	2,000	All service types	5.1.1
2,000	4,000	Other than bulk or industrial plant	5.1.1
2,000	4,000	Bulk or industrial plant	5.1.2
4,000	-	All service types	5.1.3

NOTE: While the schematics of various container service configurations provided in this manual show separate product control valves (such as manual shutoff, excess-flow, back check, etc.) on containers, multipurpose valves are also allowed. Multipurpose valves combine the functions of two or more valves. For the purposes of this FSA consider each function in the multipurpose valve as a separate valve for completing the forms.

5.1.1 Individual Containers of Water Capacity less than or equal to 4,000 gallons

Containers of 4,000 gallons water capacity (w.c.) or less can be configured with product control appurtenances in a number of different ways. These are schematically illustrated in Figures 5-1A through Figure 5-1E. *Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes*

Complete the following steps using the schematics in Figure 5-1A through Figure 5-1E

1. Select the first container at the facility, which has a water capacity of 4,000 gallons or less. Enter this as container number 1 in Column A of Form 5.1, below.
2. Review each of the service configurations given in Figure 5-1A through Figure 5-1E. Select the schematic that most closely represents the configuration in the facility for this container. Enter the figure number of the configuration selected for this container in Column B.
3. Count the total number of "Yes" shown in this configuration. This represents the number of required appurtenances for the specific configuration. Enter this number in column C of Form 5.1.
4. Check "Yes" under each appurtenance that is actually installed on the container. If the appurtenance is not provided, then check "No."
5. Count the number of boxes checked "Yes." Enter this number in Column D of Form 5.1.
6. Repeat steps 1 through 5 for each container of 4,000 gallons water capacity or less at the facility.

Form 5.1

Compliance with Code Requirements for Appurtenances on Containers of 4,000 Gallons Water Capacity or Less

<table>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th></tr>
<tr><th rowspan="2">Container #</th><th rowspan="2">Service Configuration Sub Figure (in Figure 5-1)</th><th colspan="2">Number of Product Control Appurtenances</th><th rowspan="2">NFPA 58 Section Reference (2014 edition)</th></tr>
<tr><th>Required by NFPA 58 (applicable edition)</th><th>Installed on the Container</th></tr>
<tr><td>1</td><td></td><td></td><td></td><td rowspan="6">5.7.4.1(D)
Table 5.7.4.1(D)
and
5.7.4.5</td></tr>
<tr><td>2</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td><td></td></tr>
<tr><td>6</td><td></td><td></td><td></td></tr>
</table>

If, in Form 5.1, any one of the numbers in column D is less than the number in Column C of the corresponding row, then these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

Figure 5-1
Schematic Representation of the NFPA 58 Requirements for Product Control Appurtenances on Containers of Water Capacity Less Than or Equal to 4,000 Gallons, with Different Service Configurations

(Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes)

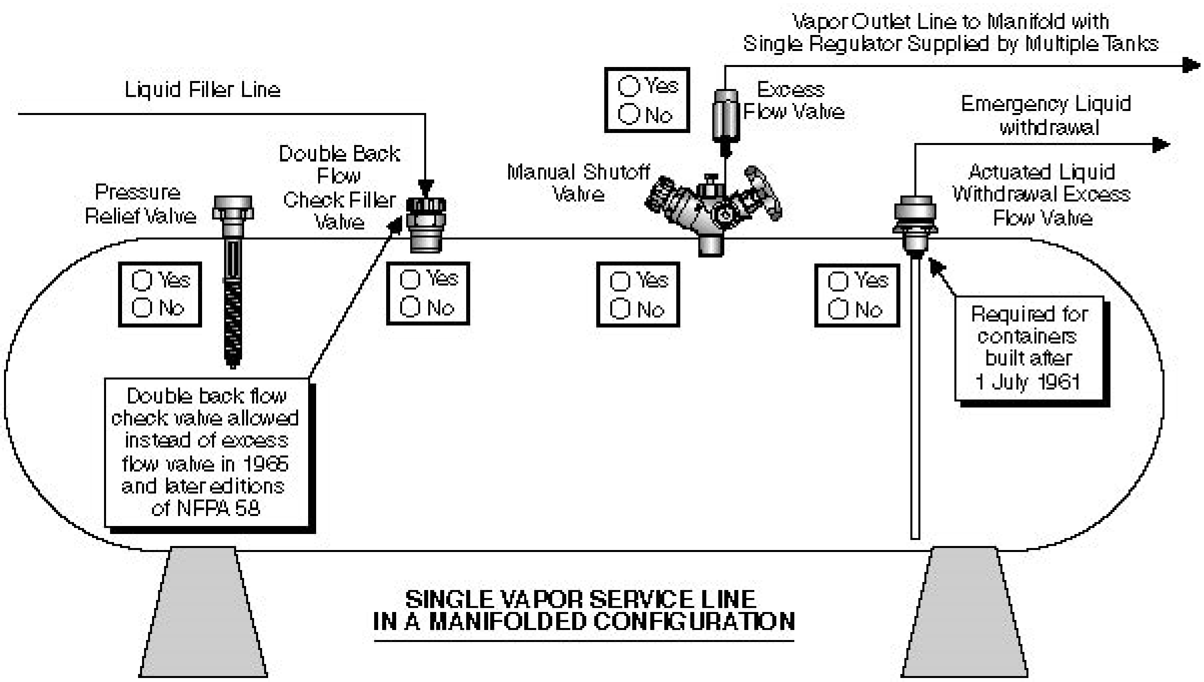


Figure 5-1A: Single Vapor Service Line in a Manifolded Configuration

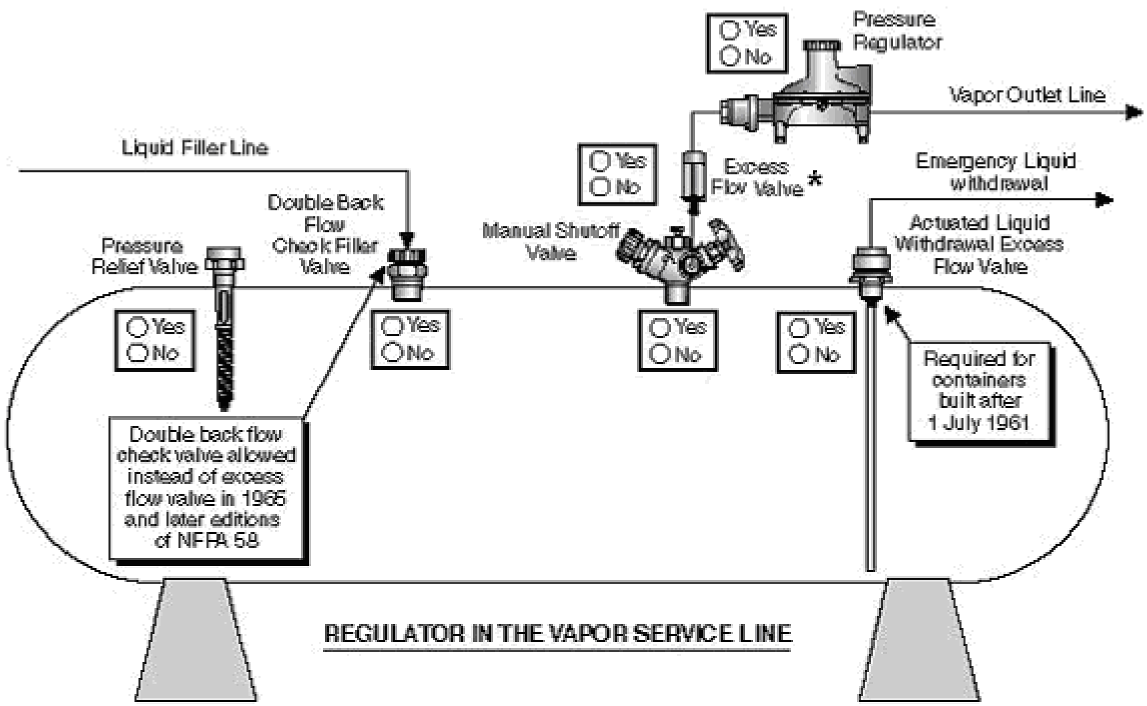
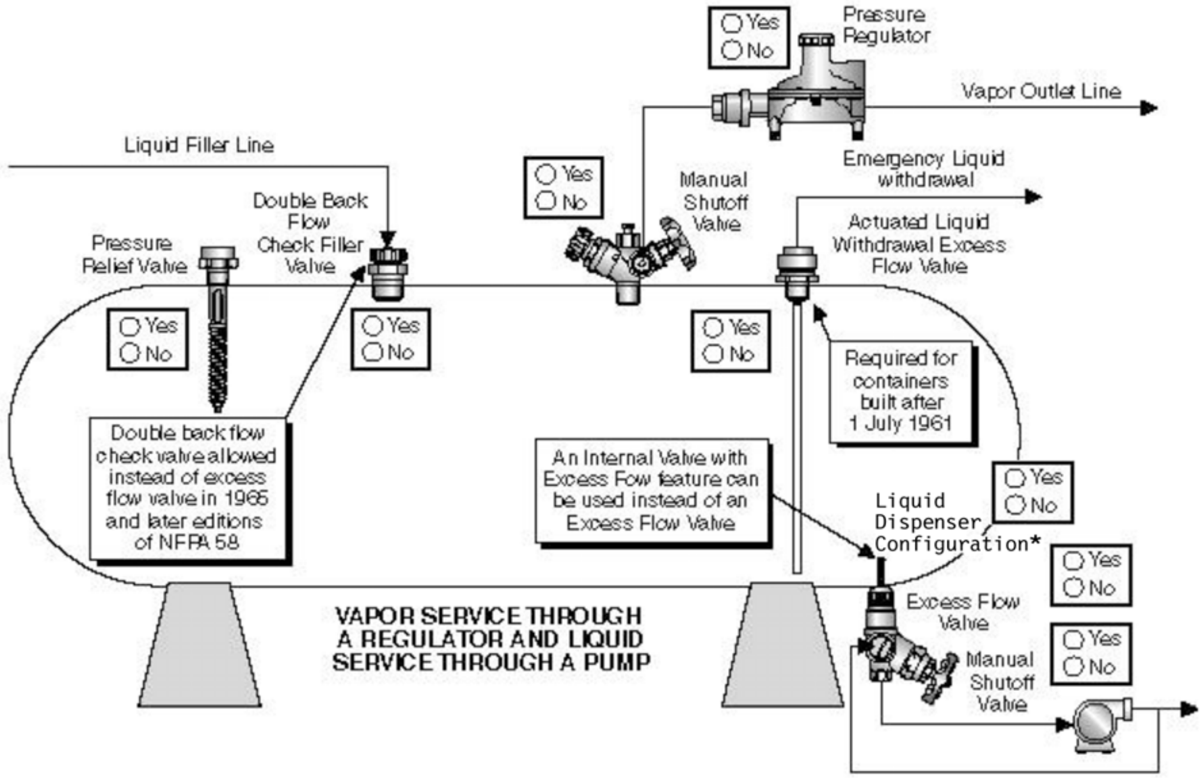


Figure 5-1B: Regulator in the Vapor Service Line

*** Excess-flow protection is not required for manual shutoff valves for vapor service where an approved regulator is directly attached or attached with a flexible connector (*"pig tail"*) to the outlet of the manual shutoff valve for vapor service, and the controlling orifice between the container contents and the shutoff valve outlet does not exceed 5/16 inch (8 mm) in diameter (5.7.4.1 (D)(8), NFPA 58).**



***For liquid dispenser configuration, see 6.25.3.8.**

Figure 5-1C: Container with Both Liquid and Vapor Service, Regulator in the Vapor Service Line.

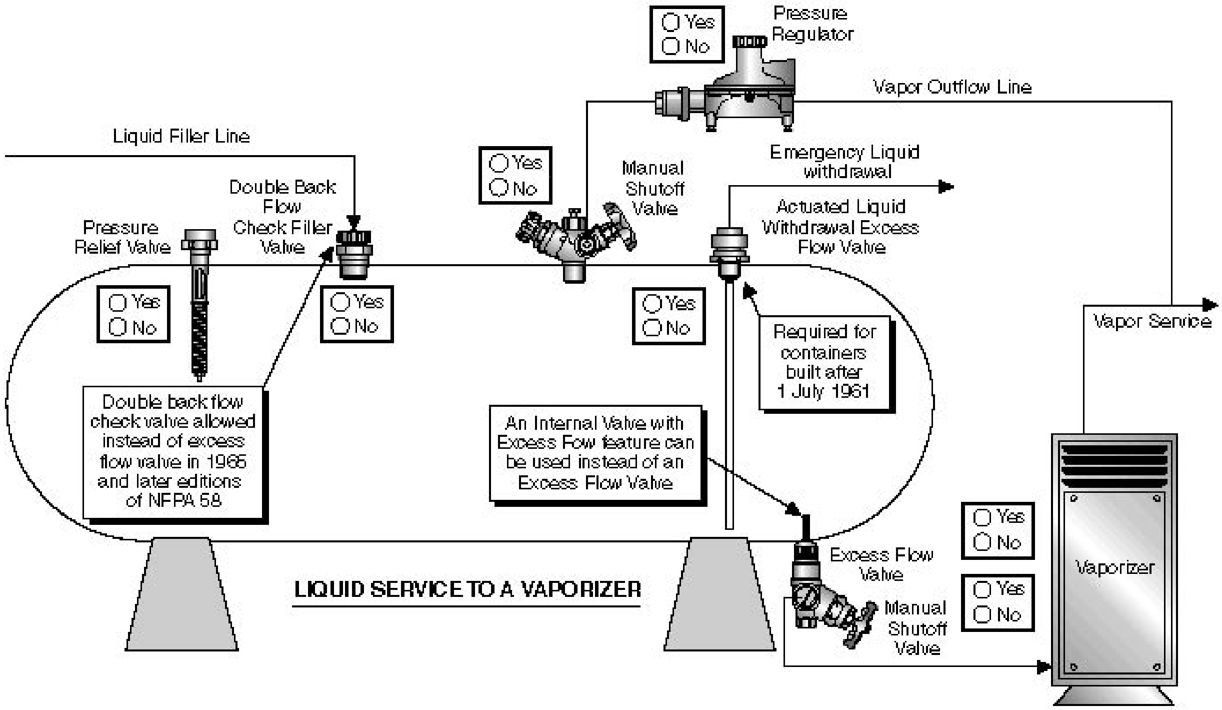
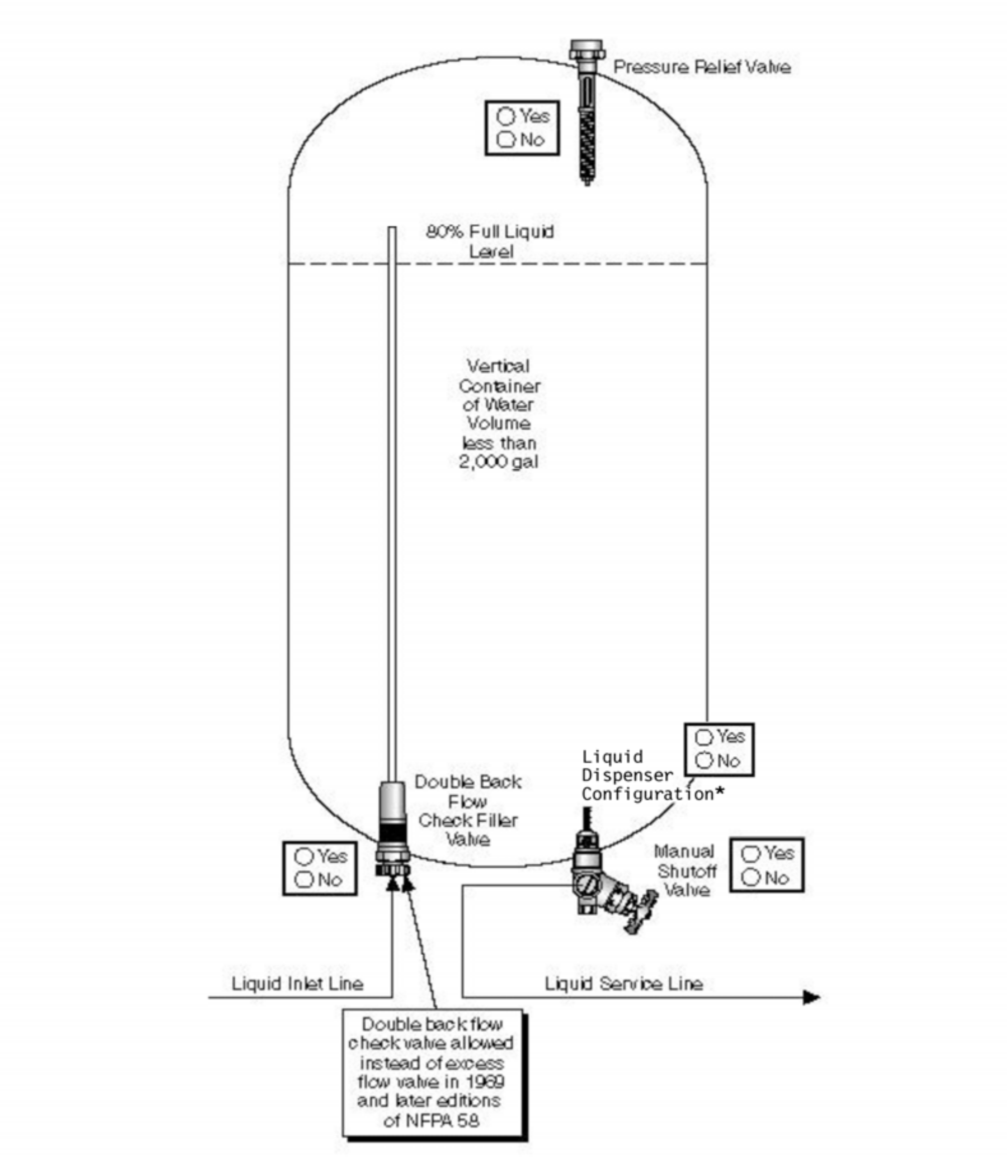


Figure 5-1D: Container Feeding Liquid to a Vaporizer.



***For liquid dispenser configuration, see 6.25.3.8.**

Figure 5-1E: Vertical Container for Liquid Service.

5.1.2 Individual Containers greater than 2,000 gallons water capacity and less than or equal to 4,000 gallons water capacity used in Bulk Plants and Industrial Plants

The code requirements for product control appurtenances on containers used at industrial plants and bulk plants are more stringent than those used for residential and commercial service. Several different service configurations are acceptable. These are indicated in Form 5.2. *Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes.*

Enter the information in Form 5.2 by following the steps indicated below

1. Select the first container in the facility of 2,001 through 4,000 gallons water capacity. Enter this as container number 1 in Column A of Form 5.2 below.
2. Complete, for each container, the rows identified as vapor inlet, vapor outlet, liquid inlet and liquid outlet service.
3. Select the appurtenance configuration for vapor service corresponding to the design used in the facility. Figure 5-2 shows different vapor inlet configurations. Enter, in column E, the configuration number that corresponds to the design used in the facility.
4. Count all "Yes" in the schematic sketch corresponding to this configuration. This is the number of appurtenances required by NFPA 58. Enter this number in column F of the row corresponding to "Vapor Inlet."
5. Check "Yes" corresponding to each appurtenance that is installed on this container. If the appurtenance is not provided, then check "No" for that appurtenance. Count the total number of installed appurtenance boxes marked "Yes" in the facility. Record this number in column G of the same row.
6. Repeat steps 3, 4 and 5 for each vapor outlet configuration (using Figure 5-3), liquid inlet configuration using Figure 5-4, and liquid outlet configuration using Figure 5-5.
7. Repeat steps 1 through 6 for each container 2,001 through 4,000 gallons water capacity located in the facility.

Form 5.2

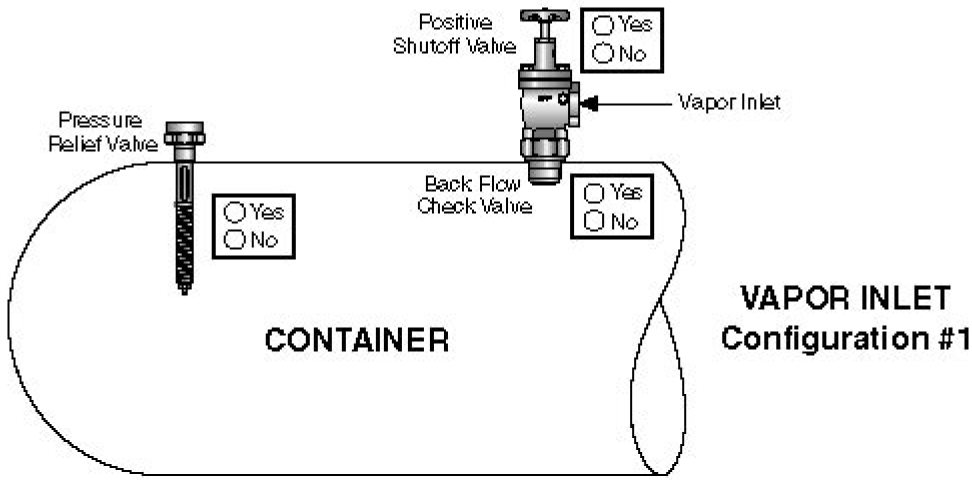
Compliance with Code Requirements for Appurtenances on Containers Having a Water Capacity of 2,001 through 4,000 Gallons Used in Bulk Plants and Industrial Plants

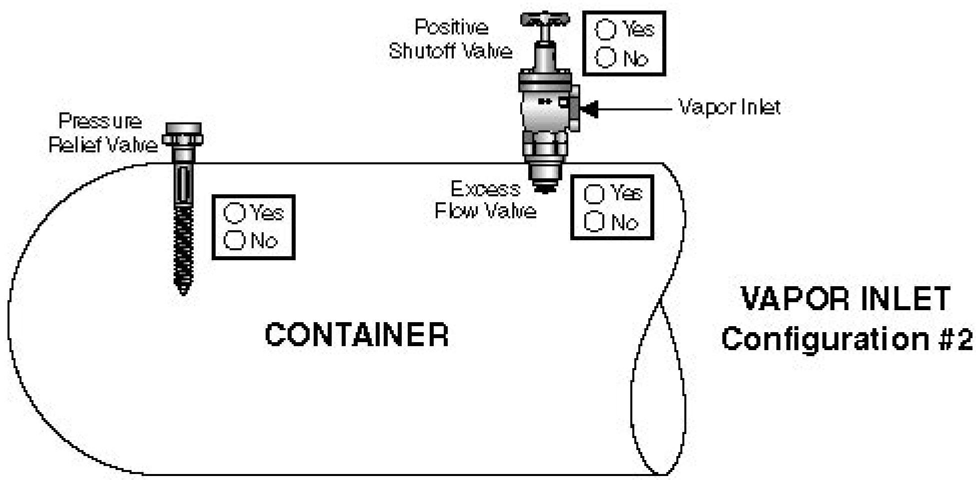
A	B	C	D	E	F	G
Container #	**LP-Gas inlet to and outlet from the container****		**Figure #**	**Total Number of Product Control Appurtenances**		**NFPA 58 Section Reference (2014 edition)**
				Required by NFPA 58 (applicable edition)	**Installed on the container**	
1	**Vapor**	Inlet	5-2			5.7.4.3, 5.7.4.5 and Table 5.7.4.2
		Outlet	5-3			
	Liquid	Inlet	5-4			
		Outlet	5-5			
2	**Vapor**	Inlet	5-2			
		Outlet	5-3			
	Liquid	Inlet	5-4			
		Outlet	5-5			
3	**Vapor**	Inlet	5-2			
		Outlet	5-3			
	Liquid	Inlet	5-4			
		Outlet	5-5			
4	**Vapor**	Inlet	5-2			
		Outlet	5-3			
	Liquid	Inlet	5-4			
		Outlet	5-5			

** If the container does not provide an opening for the specific function listed, enter 0 (zero) in columns E and F corresponding to that row.

If, in Form 5.2, any one of the numbers in column F is less than the number in Column E of the corresponding row, these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes.





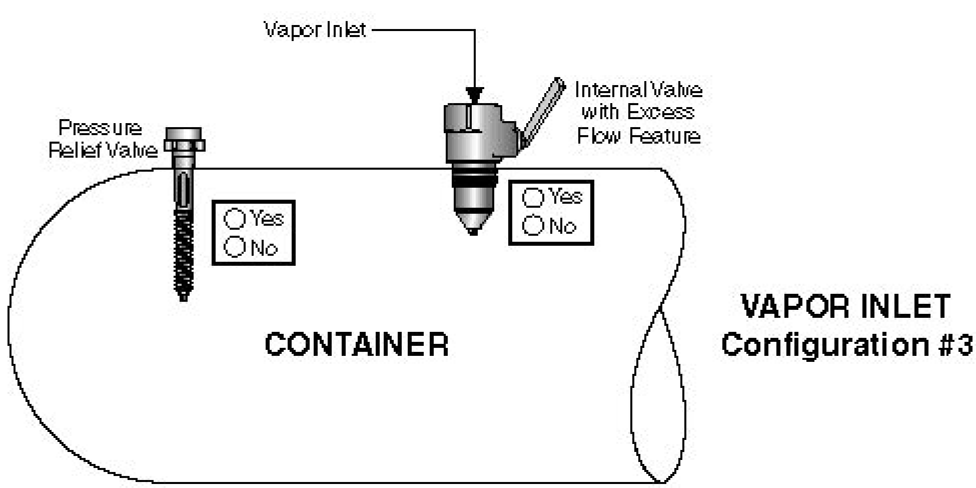


Figure 5-2: Vapor Inlet Appurtenances on Containers of Water Capacity Greater Than 2,000 Gallons in bulk and industrial plants

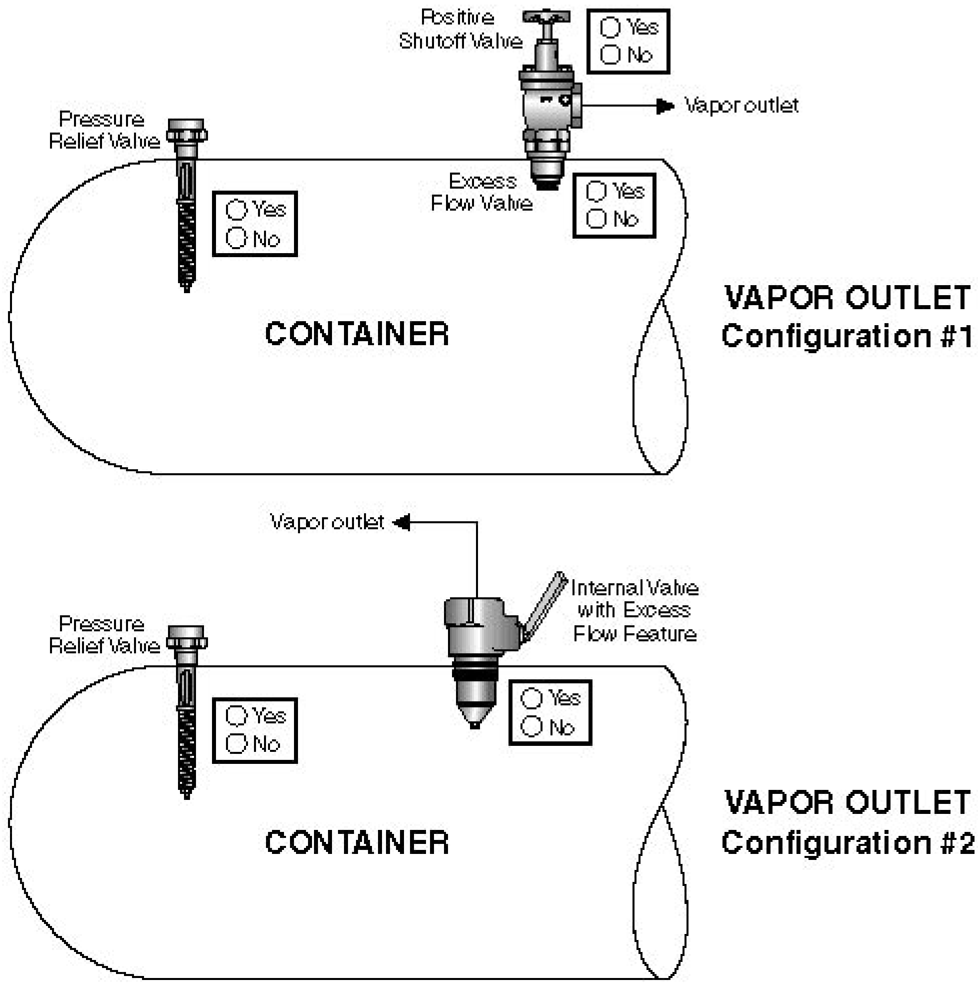


Figure 5-3: Vapor Outlet Appurtenances on Containers of Water Capacity Greater Than 2,000 Gallons in bulk and industrial plants

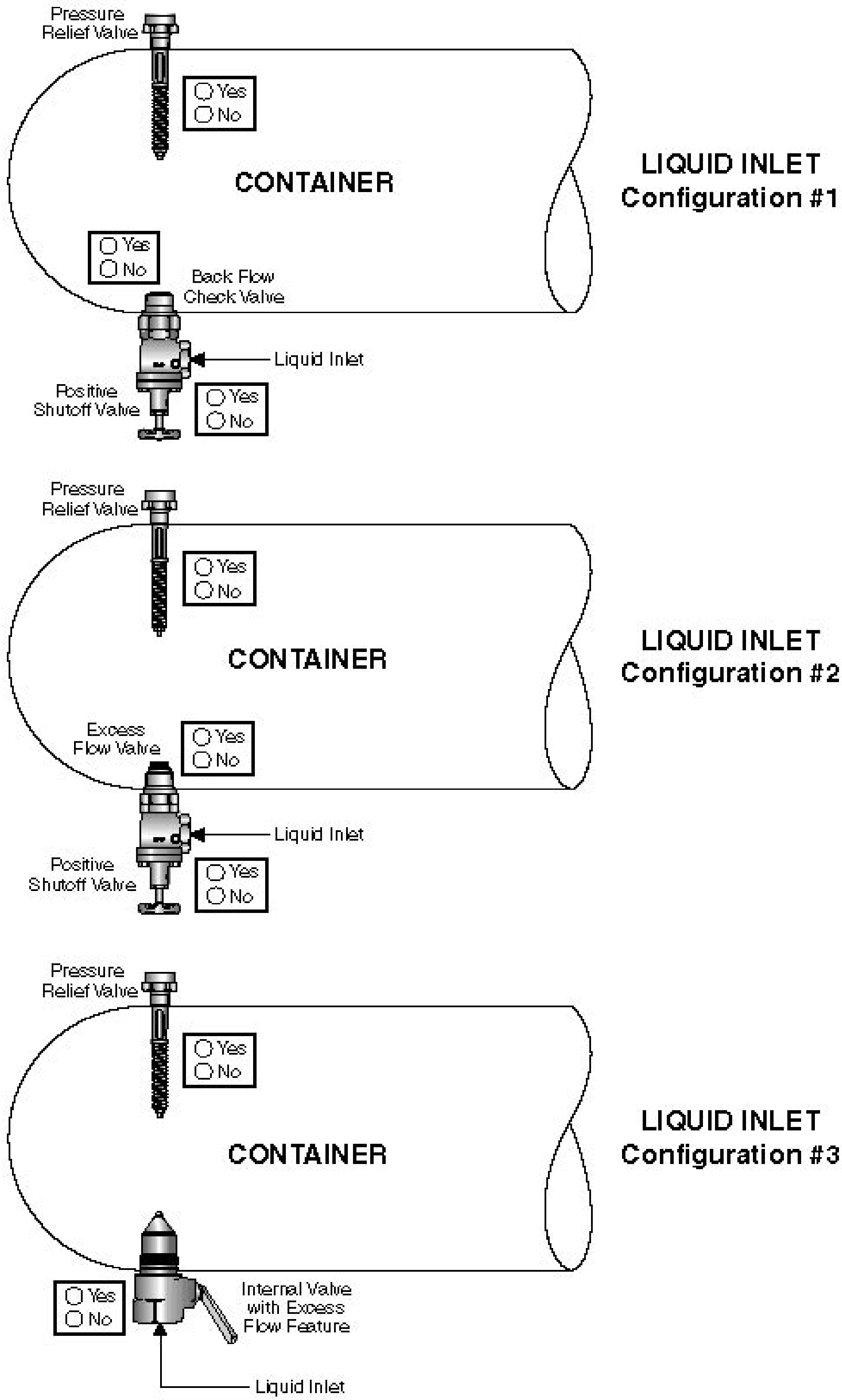


Figure 5-4: Liquid Inlet Valves on Containers 2,001 through 4,000 Gallons Water Capacity in Bulk and Industrial Plants

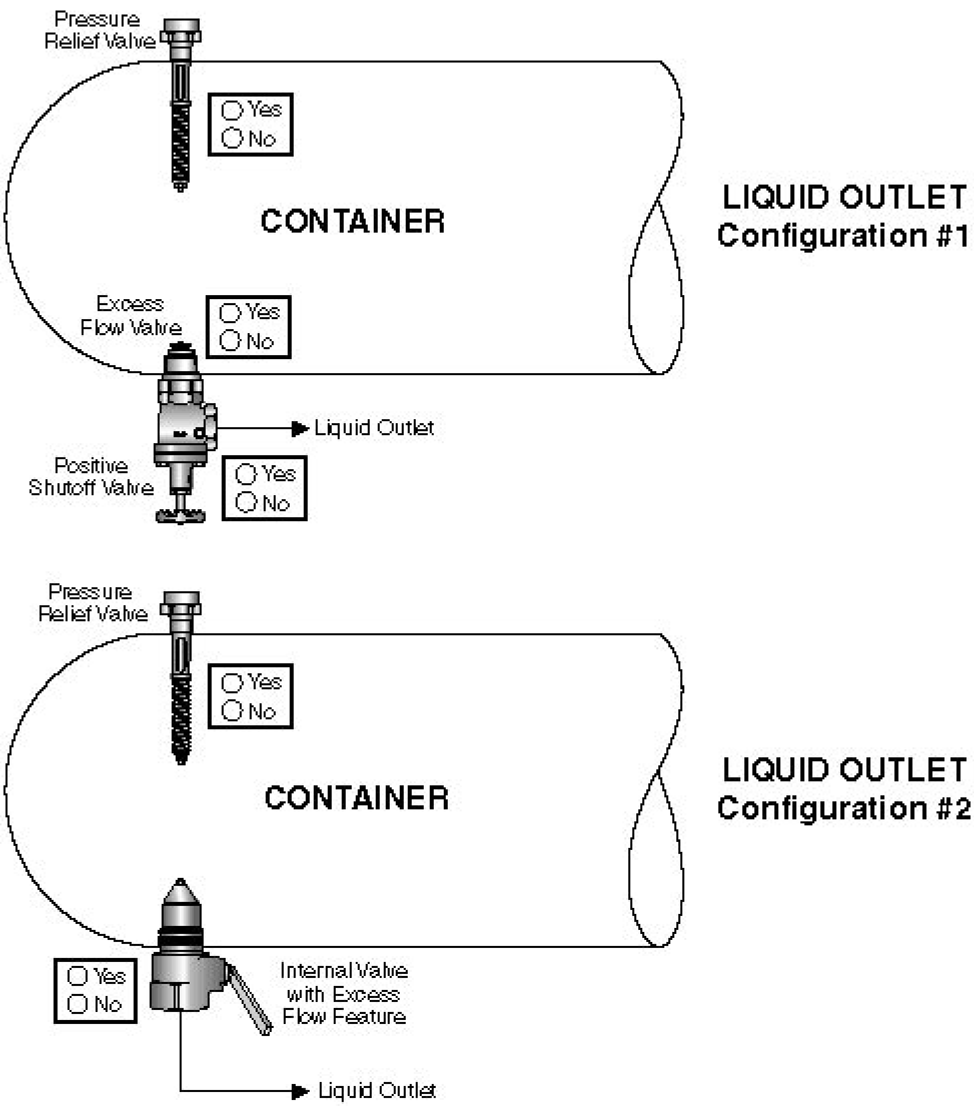


Figure 5-5: Liquid Outlet Valves on Containers 2,001 through 4,000 Gallons Water Capacity in Bulk and Industrial Plants

5.1.3 Individual Containers Having a Water Capacity Greater than 4,000 Gallons

The product control appurtenances for containers larger than 4,000 gallons water capacity are similar to those for the more than 2,000 through 4,000 gallon water capacity containers. However, there are retrofit requirements for existing containers without internal valves in liquid service that were to be completed by July 1, 2011.

The compliance with the code requirements for appurtenances in this container size range must be evaluated for LP-Gas flow both into the container (vapor and liquid) and out of the container (vapor and liquid). Several different appurtenance service configurations meet these requirements. These are indicated in Form 5.3. *Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes.*

Enter the information in Form 5.3 by following the steps indicated below

1. Select the first container in the facility having a water capacity greater than 4,000 gallons. Enter this as container number 1 in Column A of Form 5.3 below.
2. Complete each of the rows identified as the vapor inlet, vapor outlet, liquid inlet and liquid outlet service for this container.
3. Select the appurtenance configuration for vapor service which most closely corresponds to the design used in the facility. Figure 5-2 shows different vapor inlet configurations. Enter in column D the configuration number that corresponds to the design used in the facility.
4. Count all “Yes” in the schematic sketch corresponding to this configuration and which provide for vapor inlet into the container. This is the number of required appurtenances that should be provided according to the code. Enter this number in column E of the row corresponding to “Vapor Inlet.”
5. Check “Yes” corresponding to each appurtenance that is installed on this container. If the appurtenance is not provided, then check “No”. Count the total number of boxes with installed appurtenance marked “Yes” in the facility. Record this number in column F of the same row.
6. Repeat steps 3, 4 and 5 for each vapor outlet configuration (using Figure 5-3), liquid inlet configuration (using Figure 5-6) and liquid outlet configuration (using Figure 5-7).
7. Repeat steps 1 through 6 for each container of water capacity greater than 4,000 gallons located at the facility.

Form 5.3
Compliance with Code Requirements for Appurtenances on Containers Having a Water Capacity Greater Than 4,000 Gallons

A	B	C	D		E	F	G
Container #	**LP-Gas inlet to and outlet from the container****		**Enter Configur-ation Number**		**Total Number of Product Control Appurtenances**		**NFPA 58 Section Reference (2014 edition)**
					Required by NFPA 58 (applicable edition)	**Installed on the container**	
1	**Vapor**	Inlet	5-2				5.7.4.2, Table 5.7.4.2 and 5.7.4.4
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				
2	**Vapor**	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				
3	**Vapor**	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				
4	**Vapor**	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				

** If the container does not provide an opening for the specific function listed, enter 0 (zero) in columns E and F corresponding to that row.

If in Form 5.3 any one of the numbers in column F is less than the number in Column E of the corresponding row, these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

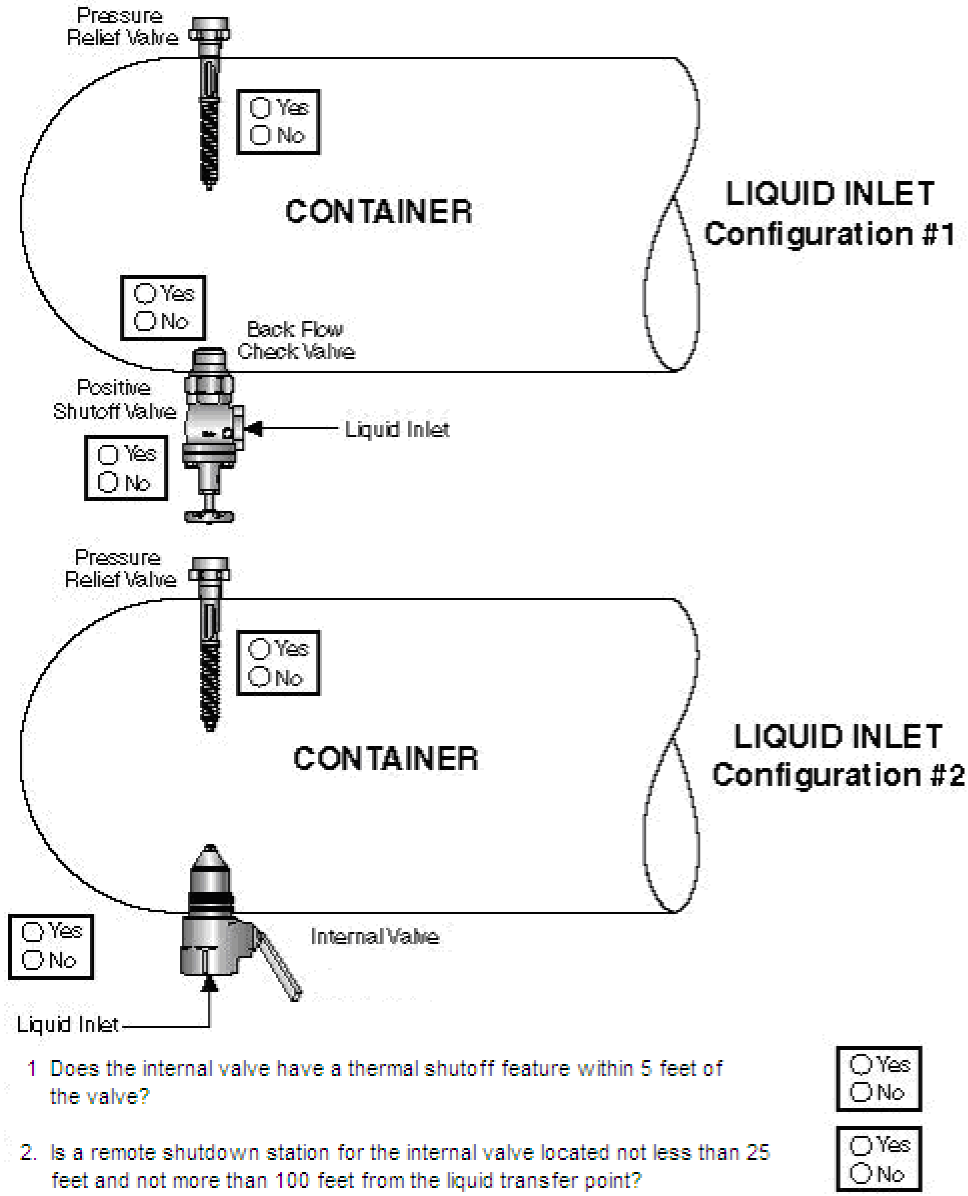
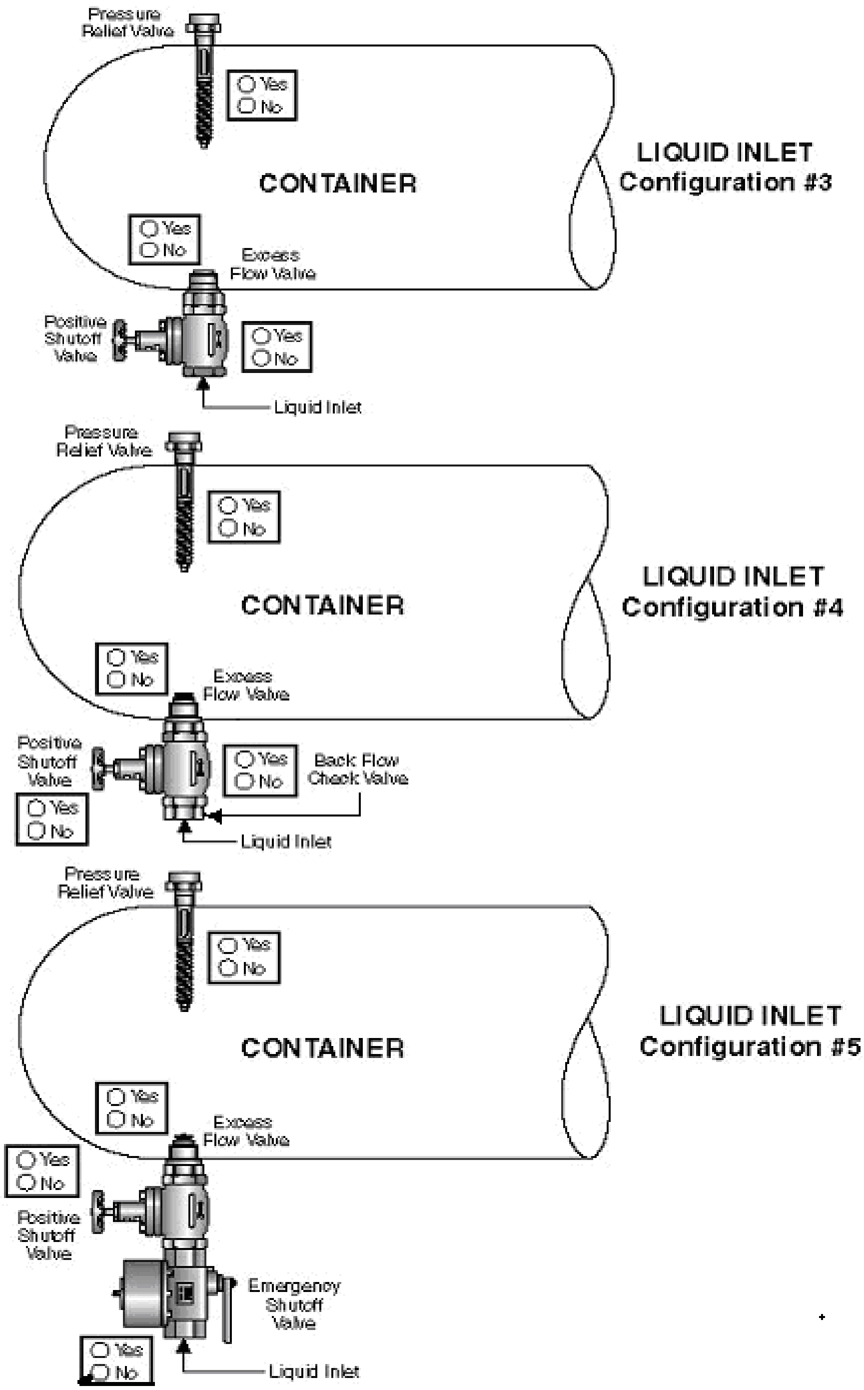


Figure 5-6A Liquid Inlet Valves on Containers With Water Capacity Greater Than 4,000 Gallons in New installations

(*NOTE: Prior to July 1, 2011 <u>existing</u> installations may utilize Configurations 3, 4 or 5 of Fig 5-6B, or either configuration in Figure 5-6A. After July 1, 2011, installations must comply with Configurations 4 or 5 below, or Configuration 1 or 2 in Figure 5-6A.)*



Note: *The emergency shutoff valve in configuration #5 must be equipped for remote closure. This valve must be installed in the line upstream as close as practical to the positive shutoff valve/excess- flow valve combination.*

Figure 5-6B: Liquid Inlet Valves on Containers With Water Capacity Greater Than 4,000 Gallons in Existing installations

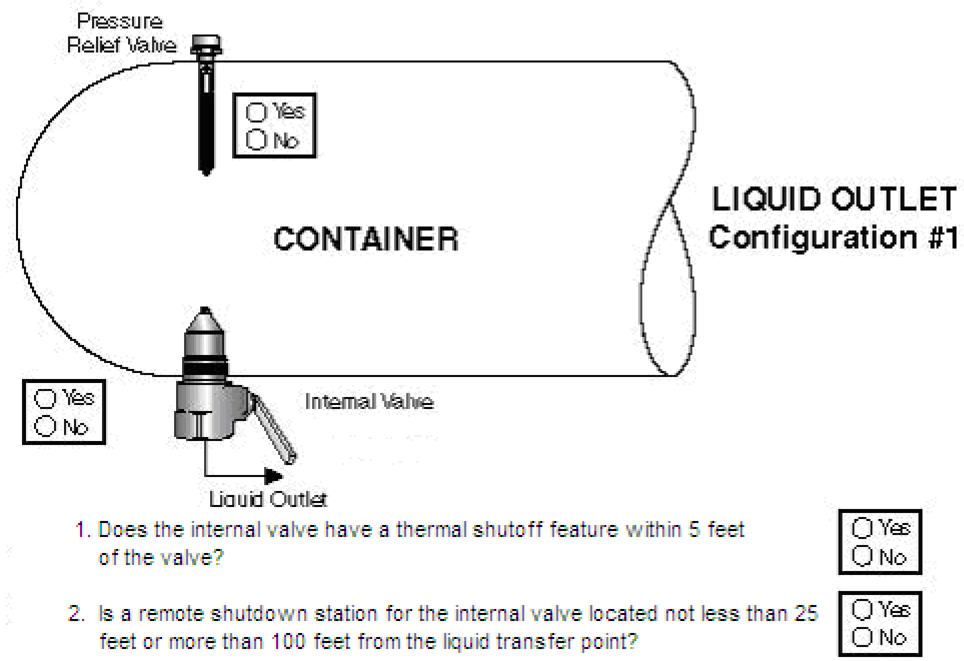
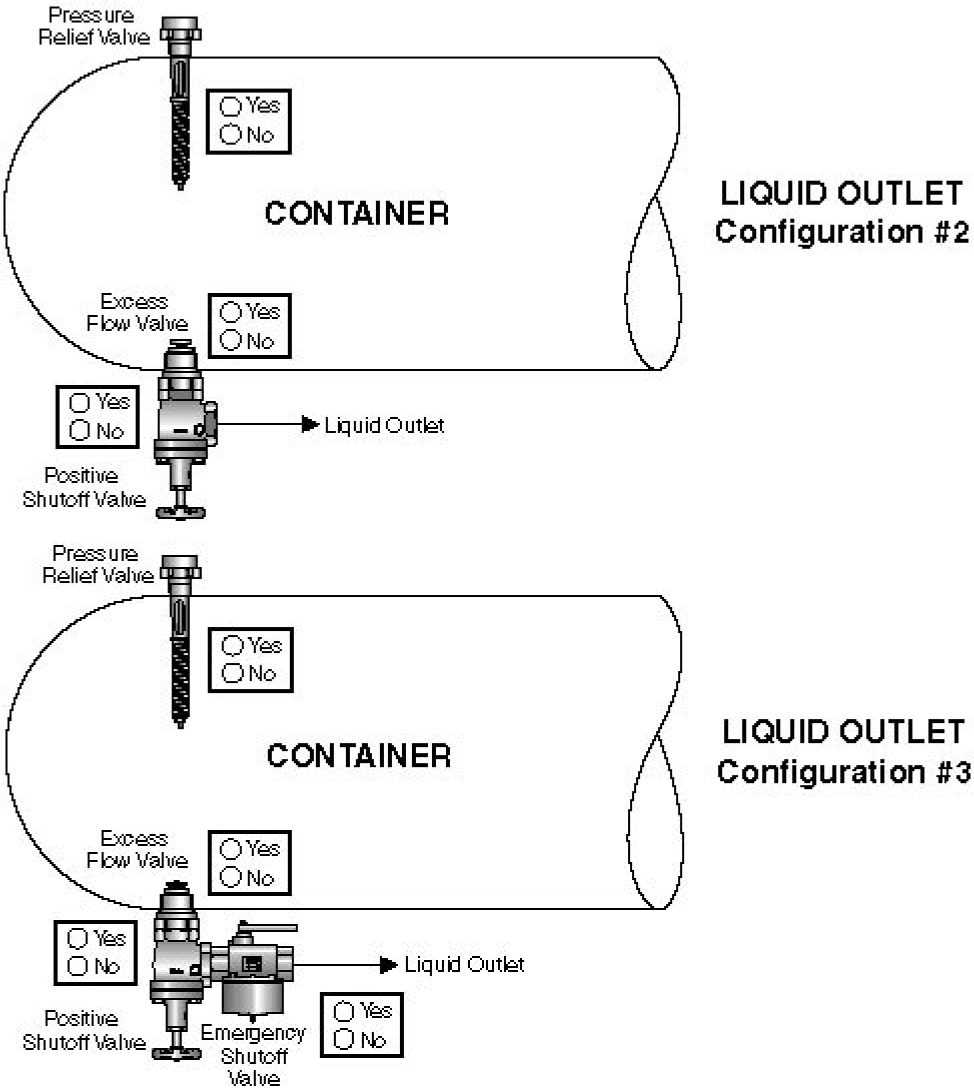


Figure 5-7A: Liquid Outlet Valves on Containers with Water Capacity Greater Than 4,000 Gallons in New installations

(***NOTE:*** ***Prior to July 1, 2011, <u>existing</u> installations may utilize Configurations 2 or 3 of Fig 5-7B or Configuration 1 in Figure 5-7A. After July 1, 2011, installations must comply with Configuration 3 in Figure 5-7B or Configuration 1 in Fig. 5-7A***).



Note: *The emergency shutoff valve in configuration # 3 must be equipped for remote closure. This valve must be installed in the line downstream, as close as practical to the positive shutoff valve/excess- flow valve combination.*

Figure 5-7B: Liquid Outlet Valves on Containers with Water Capacity Greater Than 4,000 Gallons in Existing installations

5.2 Product Control Measures in Transfer Piping

5.2.1 Manifolded and Remotely Filled Containers

The containers in some LP-Gas facilities, especially in bulk plants, may be remotely filled with an inlet manifold connected to one or more containers. The vapor withdrawal or liquid withdrawal from containers may also be through a common manifold. In such cases, there are several appurtenance requirements to control the potential release of product.

If the facility contains a liquid transfer line header (manifold) 1½-inch diameter or larger, and a pressure equalizing vapor line that is 1¼-inch diameter or larger, then continue with the analysis in this section by completing Form 5.4, Form 5.5 and Form 5.6. Otherwise, skip this section and go to section 5.3. *Note: Container appurtenances shown are illustrative of product control equipment only. See NFPA 58 for all container appurtenances required. Illustrations are not intended to be used for system design purposes.*

Form 5.4
Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid-into-Containers

A	B	C	D	E	F
Item #	**Appurtenance (Either No. 1 or No. 2)****	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.			6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ^{o}F			6.12.6
		Temperature sensitive element (fusible link) installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.			6.12.6
		Manually operated remote shutoff feature provided for ESV.			6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.			6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of size 1½ inch in diameter or larger on the other side.			6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.			6.12.8

Form 5.4 (continued)

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection			6.12.3
		BCK is designed for this specific application.			6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.			6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.			6.12.8
3	Debris Protection++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.			6.19.2.5
4	Emergency discharge control	Flow through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention.			6.19.2.6 (3)

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

Form 5.5
Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal From Containers

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.			6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF.			6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.			6.12.6
		Manually operated remote shutoff feature provided for ESV.			6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.			6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.			6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.			6.12.8
		Number of ESV's in liquid withdrawal service			

Note: If more than one ESV is installed in the facility, use one Form 5.5 for each ESV.

Form 5.6
Requirements for Vapor Transfer Lines 1¼-inch Diameter or Larger

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.			6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF			6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.			6.12.6
		Manually operated remote shutoff feature provided for ESV.			6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.			6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.			6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.			6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection			6.12.3
		BCK is designed for this specific application.			6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.			6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.			6.12.8

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and it shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

If a checkmark is made in the "No" column of any one of Form 5.4, Form 5.5 or Form 5.6, then these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

If the LP-Gas facility is designed using ALTERNATE PROVISIONS for the installation of ASME CONTAINERS, then continue the analysis below. Otherwise skip section 5.3 and go to Chapter 6.

5.3 Alternate Provisions for the Installation of ASME Containers

Facilities may be provided with redundant fail-safe product control measures (section 5.3.1) and incorporate equipment designed for low emissions during transfer operations (section 5.3.2). These types of (redundant and fail-safe) product control measures and low emission transfer equipment provide additional safety and qualify the facility for the following benefits:

- Reduced separation distances from adjacent properties, and
- Mitigation of the need for special protection requirements.

Note that the reduced separation distance applies only to underground and mounded containers 2,001 through 30,000 gallons where all the requirements of NFPA 58 Section 6.28 (summarized in Forms 5.7 and 5.8) are complied with.

5.3.1 ASME Container Appurtenances and Redundant Fail-Safe Product Control Systems

If the facility incorporates redundant, fail-safe equipment, complete Form 5.7 below. The evaluation will indicate whether the design of the facility complies with the requirements for redundant and fail-safe product control systems. If redundant, fail-safe equipment are not provided, skip this section.

Form 5.7
Evaluation of Redundant Fail-Safe Design

A	B		C	D	E	F
Item #	Description		Features	Installed in the facility? Yes	No	NFPA 58 Section Reference (2014 edition)
1	Container sizes for which the appurtenances are provided		Appurtenances and redundant fail-safe equipment are provided for <u>each</u> container of water capacity 2,001 gal. through 30,000 gal.			6.28.3 and 6.28.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve having internal excess-flow valve			6.28.3.1 and 6.28.3.2
			Positive shutoff valve installed as close as practical to the internal valve			6.28.3.4
3	Liquid or vapor inlet		Internal valve having internal excess-flow valve or backflow check valve			6.28.3.5
			Positive shutoff valve installed as close as possible to the internal valve or the back-flow check valve			6.28.3.5
4	Railcar transfer	Flow into or out of railroad tank car	Approved emergency shutoff valves installed in the transfer hose or the swivel-type piping at the tank car end			6.19.2.6 (1) and 6.28.4
		Flow only into railroad tank car	Approved emergency shutoff valve or backflow check valve installed in the transfer hose or the swivel-type piping at the tank car end			6.19.2.6 (2) and 6.28.4
5	Cargo tank transfer		Protection provided in accordance with 6.12			6.28.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (Fire) actuation			6.28.4.2
			Actuated by a hose pull-away due to vehicle motion			6.28.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft of the point of transfer			6.28.4.3 (A)
			Another remote shutdown station between 25 ft and 100 ft of the transfer point			6.28.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and all primary valves (Internal & Emergency Valves).			6.28.4.3
			Signs complying with the requirements of 6.26.4.3 (C) provided			6.28.4.3 (C)

Note: If the facility does not have a rail terminal, write the word NA in both the "Yes" column and the "No" column in item 4 of this Form in the railroad tank car row. Similar option is also available if there is no cargo tank vehicle transfer station.

If the LP-Gas facility is provided with LOW EMISSION TRANSFER EQUIPMENT, then continue the analysis below. Otherwise skip section 5.3.2 and go to Chapter 6.

5.3.2 Low Emission Transfer Equipment

If the facility is designed with low emission transfer hoses and associated equipment, complete Form 5.8 below. Compliance with Section 6.28.5 of NFPA 58 results in a 50% reduction in the separation distances between transfer points described in Table 6.5.2.1 and Section 6.25.4.3. If the facility does not have low emission transfer equipment engineered into the facility design, skip this section.

Form 5.8
Evaluation of Low Emission Transfer Equipment

A	B	C		D	E	F
Item #	**Description**	**Features**		**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	Transfer into permanently mounted ASME containers on vehicles	Delivery nozzle and filler valve- Max. liquid release after transfer of 4 cm^3 (0.24 in^3).	Fixed maximum liquid level gage not used during transfer operations			6.28.5.3 (A) & (B)
2	Transfer into stationary ASME containers. delivery valve and nozzle combination	During product transfer or post transfer uncoupling of the hose, liquid product volume released to the atmosphere	Does not exceed 4 cm^3 (0.24 in^3) from a hose of nominal size 1 in or smaller			6.28.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 in.			6.28.5.4 (B)
3	Transfer into stationary ASME containers maximum filling limit	Do containers of less than 2,001 gal (w.c.) have an overfilling prevention device or another approved device?				6.28.5.4 (F)
		Do containers 2,001 gal (w.c.) or greater have a float gage or other non-venting device?				6.28.5.4 (E)
4	Transfer into stationary ASME containers fixed maximum liquid level gage	Not used during routine transfer operations but used to calibrate other non-venting liquid level gages in the container				6.28.5.4 (C) & (D)

Note: 1) If the facility does not have a particular feature described in items 2 or 3, write "NA" in both the "Yes" and "No" columns corresponding to its row .

If separation distance reductions are intended, checkmarks made in the "No" column of either Form 5.7 or Form 5.8 must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

CHAPTER 6

Analysis of Local Conditions of Hazard

6.1 Physical Protection Measures

Protection should be provided for LP-gas facilities, systems and appurtenances against the risk of tampering and from the accidental collision of vehicles with containers and/or transfer lines. Requirements to prevent such tampering or accidents are specified in the code. Compliance requirements for the facility are indicated in Form 6.1. Complete all forms in this chapter. (**NOTE:** See NFPA 58 for complete requirements.)

Form 6.1
Evaluation of Physical Protection and Other Measures

A	B	C	D	E	F
#	**Item**	**Features**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment			6.19.5
2	Vehicle impact protection	Protection against vehicular (traffic) impacts on containers, transfer piping and other appurtenances is designed and provided commensurate with the size of vehicles and type of traffic in the facility. (Example protection systems include but not limited to (1) Guard rails, (2) Steel bollards or crash posts, (3) Raised sidewalks.			6.6.1.2 and 6.9.3.10
3	Protection against corrosion	Provide protection against corrosion where piping is in contact with supports or corrosion causing substances.			6.9.3.11, 6.9.3.14, and 6.17
Complete only 4A or 4B					
4 A	Perimeter Fence	Is an industrial type or chain link fence of at least 6 ft high or equivalent protection provided to enclose (all around) container appurtenances, pumping equipment, loading and unloading and container filling facilities?			6.19.4.2
		Are at least two means of emergency egress (gates) from the enclosure provided? **NOTE: Write "N.A." (not applicable) if** (i) The area enclosed is less than 100 ft^2, or (ii) The point of transfer is within 3 ft of the gate, or containers are not filled within the enclosure			6.19.4.2 (A)
		Is a clearance of at least 3 feet all around to allow emergency access to the required means of egress provided?			6.19.4.2 (B)
	Guard Service	If a guard service is provided, does this service cover the LP-Gas plant and are the guard personnel provided with appropriate LP-Gas related training, per section 4.4 of NFPA 58?			6.19.4.3
4 B	Lock-in-Place devices	Are Lock-in-Place devices provided to prevent unauthorized use or operation of any container appurtenance, system valves, or equipment in lieu of the fence requirements above?			6.19.4.2 (C)

Note: Fill only items 1, 2, 3, and 4A or 4B. Indicate with "NA" when not filling the "Yes" or "No" column.
‡ Indicate with "NA" if the facility is not operated at night.

6.2 Ignition Sources and Control

The potential for the ignition of LP-Gas vapors released in a facility is reduced by eliminating as many ignition sources as possible, designing electrical equipment to reduce or eliminate sparking and ensuring that during transfer operations known ignition sources are turned off. The ignition source control involves both passive methods as well active methods. Form 6.2 is used to evaluate whether your facility satisfies the code requirements for ignition source control. (**NOTE:** See NFPA 58 for complete requirements.)

Form 6.2
Assessment of Sources of Ignition and Adjacent Combustible Materials

A	B	C	D	E
#	**Sources of Ignition and Requirements Pertaining to Adjacent Combustible Materials**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
		Yes	**No**	
1	Are combustible materials not closer than 10 ft. from each container?			6.4.4.3
2	Is a distance at least 20 ft. provided between containers and tanks containing flammable liquids with flash point less than 200 ºF (ex., gasoline, diesel)?			6.4.4.6
3	Are electrical equipment and wiring installed per Code requirements?			6.23.2
4	Is open flame equipment located and used according to Code?			6.23.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with?			7.2.3.2
6	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided in the facility?			6.27.4.2
7	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided on each truck or trailer used to transport propane?			9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?			7.2.3.2 (B) and 9.4.10

Note: Insert "NA" in both "Yes" and "No" columns of any items that are not applicable.

6.3 Separation Distances

6.3.1 Separation Distances between Container and Important Buildings, Other Properties and Transfer Points

The separation distance provisions in NFPA 58 are minimum requirements and are intended to buy time in an emergency and to implement appropriate response. The requirements are dependent upon the size of the container. Complete the appropriate section of Form 6.3. (**NOTE:** See NFPA 58 for complete requirements.)

Form 6.3
Separation Distances from Containers to Buildings, Property Lines that can be Built upon, Inter-container Distances, and Aboveground Flammable or Combustible Storage Tanks

A	B	C	D	E	F	G
#	**Container Size Range in gal (W.C.)**	**Separation between a property line, important building or other property and the nearest container which is**	**Minimum Distance (ft)**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	501 through 2,000	Aboveground	25			6.3.1, 6.3.2 and Table 6.3.1.1
		Underground or Mounded	10			
		Between containers	3			
2	2,001 through 30,000	Aboveground	50			
		Underground or Mounded	50			
		Between containers	5			
3	30,001 through 70,000	Aboveground	75			
		Underground or Mounded	50			
		Between containers	¼ sum of diameters of adjacent containers			
4	70,001 through 90,000	Aboveground	100			
		Underground or Mounded	50			
		Between containers	¼ sum of diameters of adjacent containers			
5	All sizes greater than 125 gal	Separation distance between an aboveground LP-Gas container and an aboveground storage tank containing flammable or combustible liquids of flash points below 200 ºF.	20			6.4.4.6 and 6.4.4.7

If the LP-Gas plant is provided with every one of the redundant and fail-safe product control-design equipment indicated in Form 5.6, then the minimum distance in column D of Form 6.3 can be reduced to 10 feet for underground and mounded containers of water capacity 2,001 gal to 30,000 gal

Note: If any of the container sizes indicated in the above form are not present in the facility, enter "NA" in both Yes and No columns.

6.3.2 Separation Distances between Transfer Points and other Exposures

If the liquid transfer point is not on the container but is at a remote location complete Form 6.4. **Do not complete Form 6.4 when the filling is through a container valve**.
(**NOTE:** See NFPA 58 for complete requirements.)

Form 6.4
Separation Distances between Points of Transfer and other Exposures

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr>
<tr><th rowspan="2">#</th><th colspan="2" rowspan="2">Type of Exposure within or outside the facility boundary</th><th rowspan="2">Check if exposure is present</th><th rowspan="2">Minimum Distance (ft)</th><th colspan="2">Is the Facility compliant?</th><th rowspan="2">NFPA 58 Section Reference (2014 Edition)</th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td colspan="2">Buildings, mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls</td><td></td><td>10</td><td></td><td></td><td rowspan="12">Section 6.5.2 and Table 6.5.2.1</td></tr>
<tr><td>2</td><td colspan="2">Buildings with other than at least 1-hour fire-rated walls</td><td></td><td>25</td><td></td><td></td></tr>
<tr><td>3</td><td colspan="2">Building wall openings or pits at or below the level of the point of transfer</td><td></td><td>25</td><td></td><td></td></tr>
<tr><td>4</td><td colspan="2">Line of adjoining property that can be built upon</td><td></td><td>25</td><td></td><td></td></tr>
<tr><td>5</td><td colspan="2">Outdoor places of public assembly, including school yards, athletic fields, and playgrounds</td><td></td><td>50</td><td></td><td></td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Public ways, including public streets, highways, thoroughfares, and sidewalks</td><td>From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers.</td><td></td><td>10</td><td></td><td></td></tr>
<tr><td>From other points of transfer</td><td></td><td>25</td><td></td><td></td></tr>
<tr><td>7</td><td colspan="2">Driveways</td><td></td><td>5</td><td></td><td></td></tr>
<tr><td>8</td><td colspan="2">Mainline railroad track centerlines</td><td></td><td>25</td><td></td><td></td></tr>
<tr><td>9</td><td colspan="2">Containers other than those being filled</td><td></td><td>10</td><td></td><td></td></tr>
<tr><td>10</td><td colspan="2">Flammable and Class II combustible liquid dispensers and the fill connections of non-stationary containers</td><td></td><td>10</td><td></td><td></td></tr>
<tr><td>11</td><td colspan="2">Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers</td><td></td><td>20</td><td></td><td></td></tr>
<tr><td>12</td><td colspan="2">LP-Gas dispensing device located close to a Class I liquid dispensing device.</td><td></td><td>10</td><td></td><td></td><td>6.25.4.3</td></tr>
</table>

NOTE: Place a checkmark in column C against an exposure that is present in or around the facility. Fill columns E or F for only those rows for which there is a checkmark in column C.

If the facility contains low emission transfer equipment (i.e, all equipment identified in Form 5.7 are installed and are in working order), then the minimum separation distances in column D of Form 6.4 can be reduced to one half of the indicated values.

If the containers in the LP-Gas facility are provided with SPECIAL PROTECTION MEASURES, then continue the analysis below. Otherwise skip Forms 6.5 and 6.6 and go to Section 6.5. Also see Chapter 9.

6.4 Special Protection

In the event that a proposed installation is adjacent to a property containing extremely high combustible fuels and the location of the storage containers is such that exposure of the containers to a fire on the adjacent property would severely impact the integrity of the containers, special protection methods may be utilized to reduce the exposure hazard to the containers. Installed special protection systems must comply with section 6.27.5 of NFPA 58, which addresses both passive and active protection systems.

- Passive approaches include insulating the outside of the containers, mounding above grade or burying the container.
- Active special protection includes fixed water spray systems or placement of monitor nozzles at strategic locations with respect to the containers to be protected.

Complete form 6.5 to determine compliance of the installation with the code. Similarly, Form 6.6 indicates the requirements for active protection. This Form also should be completed as part of the fire safety analysis process.
(**NOTE:**. See NFPA 58 for complete requirements.)

Form 6.5
Special Protection Measures –Passive Systems

A	B	C	D		E
#	**Special Protection Option**	**Question**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Container Insulation	Insulation provided on each of the containers?			6.27.5.1
		Insulation material complies with the requirements of NFPA 58?			6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?			6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58.			6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?			6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.			6.6.6.1 and 6.27.5.4

Form 6.6
Special Protection Measures –Active Systems

#	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Water spray systems	Are fixed water spray systems, complying with NFPA 15[1] requirements, used for each container in the facility?			6.27.6.1
		Do fire responsive devices actuate water spray system automatically?			6.27.6.2
		Can the water spray systems be actuated manually also?			6.27.6.2
2	Monitor nozzle systems	Are the monitor nozzles located and arranged so that the water stream can wet the surfaces of all containers exposed to a fire?			6.27.6.3
		Can the water stream from a monitor nozzle reach and wet the entire surface of, at least, one half of a length from one end of each of the containers it is designed to protect? [1]			6.27.6.3
		Do fixed monitor nozzles comply with NFPA 15[2] requirements?			6.27.6.1
		Do fire responsive devices actuate the monitor nozzles?			6.27.6.2
		Can the monitor nozzles can be actuated manually also?			6.27.6.2

1. See discussion in Section 8.2
2. Refer to Chapter 8 for a discussion on NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*

6.5 Vehicular Protection

In the event that an installation is located where an immediate threat due to vehicular traffic is present, a barrier or other suitable protection may be necessary.

Form 6.7
Protection Against Vehicular Impact

#	System Protected	Is physical protection provided?		Type of physical protection installed	NFPA 58 Section Reference (2014 Edition)
		Yes	No		
1	Storage containers				6.6.1.2, 6.6.6.1(B), 6.6.6.1(C), 6.9.3.10, and 6.25.3.13
2	Transfer stations				
3	Entryway into plant				

CHAPTER 7

Exposure To and From Other Properties, Population Density

7.1 Exposure to Off-Site Properties and Persons From In-Plant Propane Releases

Types of Propane Fires: A propane release inside the LP-Gas facility may affect adjacent properties and off-site populations if the release is of a sufficiently large size. An immediately ignited release will result in a local fire. Depending upon the characteristics of the release and ignition two types of local fires can occur, namely, a pool fire on any liquid pool of propane on the ground or a burning rising fireball.

If the released propane is not immediately ignited, then a dispersing cloud (or plume) of vapor will form. The cloud or plume will move in the direction of the wind. Because of the mixing of air with the dispersing propane, propane concentration decreases continuously both with downwind distance as well as in the crosswind direction. This cloud or plume can be ignited at any distance downwind by an ignition source when the concentration at the point of ignition is within the Lower Flammability Limit (LFL) to Upper Flammability Limit (UFL) range. For propane the range of flammable concentrations in air is between 2.15% and 9.6% by volume.

Ignition of a dispersing vapor cloud or plume may result in a flashback type of vapor fire. In extremely rare cases, and only when the physical conditions are conducive, with partial or full confinement of the propane-air mixture of proper concentration and its ignition, a vapor explosion can occur, resulting in a blast wave. If the dispersing cloud is not ignited it poses no hazard to the surrounding area.

Propane vapor at ambient pressure and temperature is heavier than air. Hence, any vapor released will tend to flow towards and accumulate in low-lying areas adjacent to the release location. If a building or other semi-confined area exists adjacent to the release location wherein the vapor can accumulate in the lower parts of the building, a potential explosion hazard will result.

Hazardous Effects of a Fire: The effect of a propane fire on an off-site property will depend on the type and material of construction of the structure and its distance from the fire and fire size. Similarly, the number of off-site persons adversely impacted by a fire inside a LP-Gas facility will also depend on, (in addition to the characteristics of the fire and the distance between the fire and the population) the type of population, the timeliness of notification, the effectiveness of the evacuation planning and implementation, etc.

Release Cases: In this manual, a number of mathematical models were developed for credible accident scenarios, to describe the effects of the release of propane inside LP-Gas facilities and its subsequent behavior. These models were used to calculate potential hazard areas for each scenario of release. Each potential release discussed has very low probability of occurrence. However, because of the flammability of propane, such releases may pose hazards. The hazard distance (to a property outside the facility boundary or to off-site persons) from a propane release within the facility will depend on the size and duration of release, and the type of fire that occurs.

The calculated distance to which a hazard extends under each scenario of release and for each hazard behavior is indicated in Table 7.1.

To assess the hazards posed to offsite population from in-plant releases of propane it is necessary to:

1. Note the type of occupancies surrounding the facility, and
2. Describe in detail the characteristics and density of the population surrounding the facility.

To evaluate the impact on the surrounding population from an in-plant propane release, complete Form 7.2 using the results indicated in Table 7.1.

Table 7.1
Distances to Various Types of Propane Hazards Under Different Release Models**

Model #	Details of the Propane Release Model Releases from or due to		Vapor Dispersion Distance to LFL (ft)	Explosion Hazard Distance (ft)	Fire Ball Radiation Distance (ft)
1a	Bobtail hose failure. Release of the entire inventory in the hose, quickly.	1” ID x 150 ft hose length	250	110	50
1b		1” ID x 120 ft hose length	230	103	45
1c		1” ID x 75 ft hose length	190	90	40
2a	Release of the inventory in a transfer piping 1" x 30 ft @ 20 gpm for 10 min., due to failed excess flow valve.		135	120	25
2b	Release of the inventory in a transfer piping 2" x 30 ft @80 gpm for 10 mins.		230	252	48
2c	Release of the inventory in a transfer piping 2” x 80 ft. @ 70 gpm for 10 mins.		328	235	74
2d	Release of the inventory in a transfer piping 2.5" x 30 ft @80 gpm for 10 mins.		269	252	59
2e	Release of the inventory in a transfer piping 3" x 30 ft @100 gpm for 10 mins.		312	287	69
2f	Release of the inventory in a transfer piping 3" x 18 ft @100 gpm for 10 mins.		256	284	55
2g	Release of the inventory in a transfer piping 3" x 80 ft @100 gpm for 10 mins		455	284	106
2h	Release of inventory from transfer piping 4” x 30 ft. + 200 gpm for 10 minutes		407	410	89
3	Release from the container pressure relief valve		No ignitable vapor concentration at ground level		
4	Release from a 1” ID x 150 ft transfer piping to a vaporizer and reduced flow from a partially open excess flow valve @ 20 gpm for 10 min.		250	120	50
5	Leak from a corrosion hole in a transfer pipe at a back		110	120	5

	pressure of 130 psig (corresponding to 80 ºF) for 60 min. Hole size is ¼” ID.			
6a	Release of the entire inventory in a 2” ID x 20 ft., transfer hose.	195	90	40
Model #	**Details of the Propane Release Model Releases from or due to**	**Vapor Dispersion Distance to LFL (ft)**	**Explosion Hazard Distance (ft)**	**Fire Ball Radiation Distance (ft)**
6b	Release of the entire inventory in a 2.5 inch dia. transfer hose x 16 ft. length	215	98	45
6c	Release of the entire inventory in a 3-inch dia. transfer hose x 12 ft. length	230	100	46
6d	Release of the entire inventory in a 1.25-inch diameter transfer hose x 20 ft. in length	138	66	27
7a	Transport hose blow down: Hose size 2" ID, 20 ft length release for 3min., from a Transport after the tank is filled.	25	30	<5
7b	Transport hose blow down: Hose size 2.5" ID, 16 ft length release for 3min., from a Transport after the tank is filled.	25	29	<5
7c	Transport hose blow down: Hose size 3" ID, 16 ft length release for 3min., from a Transport after the tank is filled.	31	36	<5

** Results from models described in Appendix B.

Form 7.1

Types of Occupancies[(1)] Near or Surrounding the LP-Gas Facility

Type of Occupancies	Model # from Table 7.1	Hazard Distance[(2)] (feet)	Is Occupancy located within the hazard distance from the Facility?	
			Yes	No
Assembly Occupancies (Places of worship, Libraries, Theaters and Auditoriums, Food or Drink Bars, Sports Stadiums, Amusement Parks, Transportation Centers, etc. with 50 or more people).				
Institutional Occupancies (Elderly Persons Home or Nursing Home, Hospitals, Alcohol & Drug Rehabilitation Centers, Prisons)				
Educational Occupancies (Elementary Schools, Day Care facilities, etc).				

NOTES: (1) Different types of occupancies are defined in NFPA 5000

(2) Table 7.1 provides a number of scenarios that can result in propane release, and the resulting area exposed for different ignition mechanisms. Determine the scenarios that are applicable to the facility, for the quantities that can be released, and enter the greatest value from Table 7.1. Use the hose diameters and length that will be used at the facility if they differ from the ones in Table 7.1 and recalculate the hazard distances using a spreadsheet method that is available at npga.org. Some scenarios may not be applicable to an installation because of other mitigation measures implemented, such as a hose management procedure to minimize the possibility of hose failure.

7.2 Exposure to the Propane Facility From External Events

A large fire or an explosion occurring outside the plant boundary may have detrimental effects on the plant equipment, containers or electrical systems. The most likely scenario is that the LP-Gas plant equipment is affected by intense heat radiation from the external fire.
In order to assess the effects on in-plant personnel, equipment, containers and safety systems from exposure to off-site hazards it is necessary to:

1. Identify industrial or other operations surrounding the LP-Gas plant and also note the type of occupancies surrounding the plant;
2. Discuss with owners of facilities or operations surrounding the LP-Gas plant any potential detrimental effect due to their presence or operations upon the LP-Gas plant;
3. Implement suitable precautions and develop quick notification or other effective communication system protocol between the LP-Gas plant and its neighboring industrial plants, to minimize the potential detrimental effects on a proposed LP-Gas plant from surrounding operations.

The description of the LP-Gas plant surroundings was specified in Form 4.2. Form 7.2 should be completed as a part of the Fire Safety Analysis to note any outside hazards that may affect the integrity of the LP-gas system.

Form 7.2
Exposure to LP-Gas Facility from External Hazards

A	B	C	D
Item #	**Type of Neighboring Operation**	**Hazard exists to the LP-Gas Facility**	
		Yes	**No**
1	Petroleum and other hazardous material storage, wholesale dispensing, etc.		
2	Metal cutting, welding, and metal fabrication		
3	Industrial Manufacturing that can pose external hazards		
4	Ports, rail yards and trans-shipment terminals handling flammable and explosive materials.		
5	Other operations that may pose hazards (gasoline and other hazardous material dispensing stations, fertilizer storage, etc).		

NOTE: If a particular activity indicated in column B does not exist, fill both "Yes" and "No" columns with "NA."

Where a "Yes" has been checked in either Form 7.1 or Form 7.2:
1) For an existing facility, communicate this information to local emergency responders for inclusion in their emergency planning.
2) For a proposed facility, implement the actions indicated in Chapter 9.

External Fire Effects on LPG Containers: An evaluation of the effects of thermal radiation from fires outside the facility on LP containers in the LPG plant was conducted to provide guidance to those using this manual. (This evaluation, the associated mathematical model and detailed results with and without the effects of wind have been published in a peer reviewed technical journal)[1]. The maximum temperature attained by the vapor-wetted wall of a propane container exposed to heat radiation from an external, non-impinging fire was calculated for various sizes of containers. The assumptions made in regard to the size and location of the external fire included the following:

- The fire used in the model was a highly radiative liquid hydrocarbon pool fire. The value assumed for the heat radiation emanating from this liquid pool fire was greater than that from fires occurring due to the burning of wooden buildings, tires, forest trees, and other flammable liquids such as oil fires, which burn with high degree of smoke production.

- A fire diameter of 100 ft (30.5 m) was used for duration of 30 minutes. This is a very large fire.

- The edge of the fire was located at distances to buildings required by Table 6.3.1.1 of NFPA 58 and consistent with the size of the container nearest to the plant boundary.

- Convective cooling of the heated surface and the effects of reflective paint on the containers were included.

- Bending of the fire plume towards the containers due to the effects of wind was also included.

The maximum temperatures calculated for the steel surface of the container in contact with vapor in different size containers were as follows:

Container Size Gal. (W.C.)	Maximum Temperature attained in 30 min exposure
1,000	660 ºF
2,000	648 ºF
4,000	507 ºF
12,000	507 ºF
18,000	437 ºF
30,000	384 ºF
60,000	340 ºF

[1] Raj, P.K., "Exposure of a liquefied gas container to an external fire," Journal of Hazardous Materials, v122, Issues 1-2, p 37-49, June 2005.

The temperature at which the yield strength of steel of a propane tank begins to decrease is close to 800 ºF. Based on this, there is no threat of propane tank failure from thermal radiation from an external fire occurring at the minimum separation distances specified in Table 6.3.1.1 of NFPA 58.

CHAPTER 8

Evaluation of Fire Services and Water Supply Requirements

In this chapter the procedure for evaluating the capability and resources of the local fire department (FD) that would respond to an emergency at the LP-Gas facility is discussed. This evaluation includes the training of FD personnel, availability of suitable fire apparatus and equipment, and determination of water requirements if such a system were to be installed at the facility.

8.1 Details of the Fire Service

Use Form 8.1 to record the relevant data on personnel and resources from the local FD or fire company that is responsible for the area where the LP-Gas facility is located. This is a good opportunity to establish a working relationship with the fire department as you will need their support as you go forward with this planning and evaluation process and they will need to understand the facility to provide maximum assistance should an incident occur at the facility.

Analyzing the data from Form 8.1: The designation of the fire fighters as career personnel or volunteers has no bearing on the expertise of the department. The purpose of items 4 and 5 in Form 8.1 is to help determine how fast the initial help might be available. Career fire fighters are in the station and available to respond. Volunteer fire fighters may have to come from home or their place of business. Career fire fighters can normally have a piece of fire apparatus responding within one minute of receiving the call, volunteers may take 4-5 minutes to reach the station before they can respond.

Item # 6 helps determine the level of skill of the fire fighters in the fire department. NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, defines the expertise required of a fire fighter to be qualified to Levels I and II. A Level I fire fighter can do general fire fighting tasks under close supervision and a Level II fire fighter can do those and more tasks under general supervision.

Item # 7A is critical to determining if an effective operation can be conducted. For fighting a fire, at least two fire fighters are required for each 125 gpm hose line used. In addition, an incident commander, a safety officer, additional supervisory officers (depending on the size of the incident), and an operator for each piece of fire apparatus that is being used (pumping or performing some other function) is required. Also required is a rapid intervention crew (RIC) of 2 fire fighters when the first firefighting crew is deployed into a hazardous area, with that team growing to 4 fire fighters when the second and subsequent crews enter the hazardous area. The role of the RIC is to perform a rescue of one or more fire fighters that may be injured during the operation.

Item # 7B and Item # 7C help determine the training and knowledge of the fire fighters in hazardous materials and the specific hazards of LP-Gas. NFPA 472 is *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*.

Form 8.1

Data on the Responding Fire Department

A	B		C
Item #	**Data Item**		**Data Entry**
1	Name of the Fire Department (FD).		
2A	Name of the person in the FD assisting with the data acquisition.		
2B	Position of the person in the FD assisting with the data acquisition.		
3A	Date on which FD data was collected.		
3B	Name of the person collecting the data.		
4	Number of fire fighters on duty at any time.		
5	Average number of fire fighters available for response.		
6A	Number of fire fighters qualified to	"Fire Fighter I" level.	
6B		"Fire Fighter II" level.	
7A	Number of fire fighters who would:	Respond on the first alarm to the facility.	
7B		Respond on the first alarm and who are qualified to the operations level requirements of NFPA 472 or similar local requirements	
7C		Respond on the first alarm with specific knowledge and training on the properties of LP-Gas and LP-Gas fires.	
8A	Number of fire apparatus that have the capability to deploy a 125 gpm hose line supplied by onboard water for at least 4 minutes, and, which:	Are in service in the department.	
8B		Would respond on a first alarm.	

Item # 8A and Item # 8B help determine the capability of fire apparatus that will or could respond to an incident. A 125 gpm hose line is a typical hose line used for firefighting where the fire fighters are expected to advance and maneuver the line while it is flowing.

Response time: Another important consideration of the effectiveness of the Fire Department to respond to an incident is the time it takes the FD to reach the LP-Gas facility. Many fire departments have multiple fire stations or use mutual aid fire companies from other communities to assist them so resources are coming from different locations. It is therefore important to determine the total time for not only the first arriving apparatus but for subsequently arriving apparatus dispatched on the first alarm as well. You will need to work with the fire department and gather this information as well.

Using Form 8.2, determine the time for all resources that would be dispatched on the first alarm to an emergency at the facility. Start by identifying and listing in column A the fire companies that would respond on a first alarm to an emergency. Then, for each company record the time it would take to receive and handle an alarm, for the company to turnout, and the time to respond. If the fire department does not have data that can help, some good averages to use are:

- **Alarm Receipt & Handling Time -** 1 minute for the fire department first receiving the alarm and 3 minutes for mutual aid fire departments,
- **Turnout Time -** 1 minute if the apparatus is staffed by career fire fighters and 4 minutes if the apparatus is staffed by volunteer fire fighters,
- **Travel Time -** 2 minutes for each mile the fire apparatus must travel in an urban/suburban setting and 1.5 minutes for each mile the fire apparatus must travel in a rural setting.

Total the times in columns B, C, and D for each company and enter the sum in Column E. This response time will give you an idea of how long it will take resources to reach the facility gate. Fire fighters must then determine the nature and severity of the emergency, determine how they are going to deal with the emergency, maybe establish a water supply from a hydrant or other source, and implement their attack. This can take anywhere from a couple of minutes to upwards of 30 minutes.

8.2 Water Needs and Availability

The requirements for water to cool a container exposed to a fire are indicated in NFPA 15. A flow rate of 0.25 gpm/ft^2 (10 liter/min/m^2) is specified as being adequate to cool a LP-Gas container exposed to a fire. Since a majority of the containers in the LP-Gas facilities have container penetration for liquid inflow or liquid outflow at only one end of the container and since any product leak occurring at one end and a subsequent fire will affect only the end zone of a container, it has been assumed that the container surface within only one half length of the container needs to be cooled for an effective prevention of damage to the container. Also, calculate the total volume of water required on the basis of a stream flow time of 10 minutes.

Based on these parameters and the surface area of various size ASME containers, the cooling water rate requirements for each container size are determined using Form 8.3. Complete Form 8.3 with information relevant to the facility. Start by identifying the largest container at the facility. Assume that a fire occurs at the end of that container where the appurtenances for product inflow and outflow are located, and determine whether other containers are within 50 feet of this largest container.

Identify the largest container at the facility and all stationary containers within 50 feet of the largest container. Record in column F of Form 8.3 the largest container. Next, record in Column F the two containers that are within 50 feet of the largest, **and** which have the most surface area exposed to the end of the largest container at which the appurtenances are installed. These are the containers, which are most likely to be affected by a fire occurring at the appurtenances of the largest container. Multiply the number of containers recorded in Column F by the required water flow rate per container in Column E and enters the result in Column G. Sum the values in Column G and enter the sum in Cell 2a, Column G. Round this number up to the next multiple of 125 (i.e. 725 gpm would round up to 750 gpm). This is done because the application of water by the fire department is generally going to be in increments of 125 gpm. Enter that figure in Cell 2b, Column G.

You have now determined the application rate for cooling water that is necessary if the largest container is subjected to fire. Add 250 gpm (Cell 3, Column G) for use by fire fighters to protect personnel when approaching the container or its valves to control the flow of product. Sum the numbers in Cells 2b and 3 of Column G. Enter that number in Cell 4, Column G.

To determine the total volume of water required for a 10-minute application time, multiply the total water flow rate in Cell 4, Column G by 10 and enter that figure into Cell 4, Column H.

Form 8.2

Response Time data for the Fire Departments

A	B	C	D	E
Company or Department	Time in Minutes for			
	Alarm Receipt & Handling	Turnout	Travel	Total Time

Note: Number in Column E = Sum of numbers from Columns B through D.

Form 8.3

Water Flow Rate and Total Water Volume Required to Cool Containers Exposed to a Fire

A	B	C	D	E	F	G	H
Item #	**ASME Container Size (gallons)**	**Total Surface Area of each Container[1] (ft^2)**	**Surface Area of each container to be Cooled (ft^2)**	**Water flow rate required per container (gpm)**	**Number of containers of the size indicated‡**	**Total Water flow rate required (gpm)**	**Total volume of water required for 10 min (gal)**
1	500	86	43	10.8			
	1,000	172	86	21.5			
	2,000	290	145	36.3			
	4,000	374	187	46.8			
	6,500	570	285	71.3			
	9,200	790	395	98.8			
	12,000	990	495	123.8			
	18,000	1,160	580	145.0			
	30,000	1,610	805	201.3			
	45,000	2,366	1,183	295.8			
	60,000	3,090	1,545	386.3			
	90,000	4,600	2,300	575.0			
	Other Size						
2a	Calculated water flow rate for container protection						
2b	Water flow rate rounded up to nearest multiple of 125						
3	Water for fire fighter protection, if required					250	
4	Total water flow rate and volume						

Note: Column D = (1/2) x Column C   Column E = 0.25 (gpm/ft^2) x Column D ;

Column G = Column F x Column E   Column H = 10 x Column G

Line 2a, Column G and Column H are the sum of numbers in each row above line 2 of each column.

Line 4, Column G and Column H are the sum of numbers in rows 2b and 3.

‡ Consider only 3 containers for water supply evaluations even if the number of containers in a group is more than 3. See Section 8.2.

1 ASME container approximate dimensions

The total water requirement for the facility is indicated in item 4, column G (water flow rate) and column H (total water volume or quantity) of Form 8.3. If multiple groups of containers are present in the facility, repeat the calculations in Form 8.3 for each group of containers. The total water requirement for the facility is the largest value for any single group of containers.

Water Availability Evaluation

If a water system is installed, Form 8.3 calculates the total water requirement for a 10-minute duration. This time period allows for manual shutdown, rescue of any injured, and the possibility of dispersing unignited gas.

If there is a public or private water supply with hydrants available within 1000 feet of the container or containers on which water will be applied, determine the available flow rate from that system with 20 psi residual pressure. The water company may have flow test data or it may be necessary to conduct flow tests. If that flow rate is equal to or greater than the needed flow rate determined using Form 8.3, you can assume your water supply is adequate. If the hydrant flow rate is less than the needed flow rate, determine what other sources of water are available. Sources fall into two categories: water on fire apparatus responding to the incident, and water in rivers, ponds or lakes near the facility. Start by talking with the fire department about whether they have a tanker shuttle capability. Some departments have well-organized operations that can deliver 250 gpm or more on a continuous basis using tanker shuttles. This may be the only capability available or it may be a supplement to a weak hydrant system. Be sure to determine how long it would take to get the water shuttle established.

If there is a river, pond or lake in the area, the fire department may be capable of drafting from that water source and pumping water through hose lines to the facility. There are a number of things that need to be considered before relying on this type of water supply.

1. Can a fire apparatus get close enough to the water source to reach the water with the suction hose it carries (normally 20 feet) and not have the lift (distance from the surface of the water to the center of the pump) greater than 10 feet?
2. Is the water source available year round? Does it dry up in the summer or freeze in the winter? The strainer on the suction hose needs to be at least 2 feet below the surface of the water.
3. Is the water source of adequate size or flow to supply the water needed?
4. Does the fire department have the hose and pumping apparatus to relay the water from the source to the fire?
5. How long will it take to set up this relay?

These factors should be evaluated and discussed with the fire department before any decision is made to use such a supply. It might also be useful to have the fire department conduct an actual timed drill to deliver the needed water supply to the facility site using the normally responding complement of personnel and equipment.

Complete Form 8.4 to document the water supply that will be available to the facility site.

Form 8.4

Evaluation of Water Availability in or Near the LP-Gas Facility

<table>
<tr><th>A</th><th>B</th><th>C</th><th colspan="3">D</th></tr>
<tr><th>Item #</th><th>Water from…</th><th>Available?</th><th colspan="3">Quantitative information</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Public supply or from another piped-in supply through one or more fire hydrants in or near the facility</td><td rowspan="4">☐ Yes ☐ No</td><td>Hydrant data</td><td>Distance from Container(s) on which water will be applied
(feet)</td><td>Available water flow rate from all hydrants[1]
(gpm)</td></tr>
<tr><td>Hydrant 1</td><td></td><td rowspan="3"></td></tr>
<tr><td>Hydrant 2</td><td></td></tr>
<tr><td>Hydrant 3</td><td></td></tr>
<tr><td>2</td><td>A nearby static water source (stream, pond, lake, etc).</td><td>☐ Yes ☐ No</td><td colspan="3">Distance to water source = _______ Feet
Time to set up relay = _____ min.
Rate of delivery = ______ gpm</td></tr>
<tr><td>3</td><td>Only through mobile water tanker shuttle.</td><td>☐ Yes ☐ No</td><td colspan="3">Time to set up shuttle = _____ min.
Sustainable flow rate = ______ gpm</td></tr>
</table>

(1) Obtain the available flow rate from the local municipal water authority or the entity that supplies water to the hydrant or conduct a test to determine total available flow rate.

Having the water available does not guarantee that the fire department has the resources to apply the water in a timely manner. Completed Form 8.2 will indicate how much time it will take for the fire department to have initial resources at the facility and how long before additional resources will be on-site. If the capability to apply cooling water within the first 10 minutes of initial fire exposure to the container is not present, extremely dangerous conditions could begin to develop. Note that it will take several minutes after the apparatus arrives at the facility gate before cooling water is actually applied to the containers and that hand held hose lines will be used with water supplied from the water tank on the apparatus. Even if hydrants are available, the staffing on the first arriving fire apparatus will probably not be sufficient to establish a water-supply from the hydrant. Depending on the hydrant system and the fire department's standard operating guidelines, it may be necessary to connect a pumper to the hydrant. If the distance is over 1000 ft. it may also be necessary to use hose from more than one fire apparatus to reach the hydrant and in some cases, to use intermediate pumpers in the hose line to boost the pressure.

Form 8.1 contains information on responding apparatus capable of applying 125 gpm for 4 minutes. This is adequate to begin operations for a single container of 30,000 gallons or less water capacity if no other adjacent containers are exposed to the fire. However, a continuous water supply then has to be established within that 4 minutes or other apparatus must be available with onboard water to continue the cooling until a continuous water supply is set up. A larger facility or multiple containers exposing each other is a different situation. In those cases, cooling water may need to be applied using larger hand held hose lines or ground monitors to achieve the reach necessary with the water stream. Both of these require considerably more water than may be supplied by 125 gpm hose lines. Unless a hydrant system with an adequate flow rate is readily available, the time needed to establish an adequate water supply from remote hydrants, a relay operation from a static water source, or a sustainable tanker shuttle operation will greatly exceed the initial 10 minutes of fire exposure to the container and dangerous conditions could begin to develop. For these facilities, a fixed water spray system is the only practical means by which adequate protection can be provided to installations consisting of multiple 30,000 gallon or larger containers.

Using the data you have gathered, it is recommended that you discuss with the fire department the resources available to protect the facility. This would include evaluating the knowledge and training of the fire fighters who would be arriving at the facility.

1) For an existing facility, communicate this information to local responders for inclusion in their emergency planning.
2) For a proposed new facility, refer to Chapter 9

CHAPTER 9

Evaluation Summary for a Proposed New LP-Gas Facility

In this chapter the results of analyses performed in Chapter 4 through Chapter 8 for a proposed (new) LP-Gas facility are summarized. If noncompliance with NFPA 58-2014 is found, the design must be altered to bring the proposed facility into compliance. In some cases, several alternative approaches for complying with the code are presented.

Complete Form 9.1, Form 9.2 and Form 9.3 (and if necessary, Form 9.4 and Form 9.5) and implement any necessary changes to the design to bring the new facility into compliance with the code.

Form 9.1
Analysis Summary on Product Control and Local Conditions of Hazard

A	B	C	D	E
Item #	**CHAPTER Title**	**Section & Title**	**Reference FORM #**	**Number of "No" checked**
1	Product Control Measures in Containers & Transfer Piping	5.1: Product Control in Containers	5.1 or 5.2	
		5.2 Product Control in Transfer Piping	5.3	
			5.4	
			5.5	
			5.6	
			5.7	
2	Analysis of Local Conditions of Hazard	6.1 Physical Protection Measures	6.1	
		6.2 Ignition Source Control	6.2	
		6.3.1 Separation distances; Container and outside exposures	6.3	
		6.3.2 Separation distances; Transfer points and outside exposures	6.4	
		6.4 Special Protection Measures	6.5	
			6.6	

§ The number of "No" for Forms from Chapter 5 is the difference between the required number of appurtenances according to NFPA 58-2014, and a lesser number found to be actually installed on the container or the transfer piping.

If, in any row of column E ("No") of Form 9.1, the entry number is greater than zero, the proposed LP-Gas facility is not in compliance with the requirements of NFPA 58-2014 for product control appurtenances or other safety measures. The design of the proposed facility must be modified to conform to the code requirements. In addition, the following items should be noted.

- If there are any "No" checks in Form 6.3, then the separation distance requirements for containers are not satisfied. An option that may be considered is the reduction in separation distance to 10 feet for underground and mounded containers by providing "Redundant and Fail-Safe Product Control Measures." In this case, complete Form 9.4 below to ensure that each requirement of "Redundant and Fail-Safe Product Control Measures" is provided.

- If there are any "No" checks in Form 6.4, then the separation distance requirements for transfer points are not satisfied. In this case, relocate the transfer points so that the separation distances conform to the code requirements or provide the Low Emission Transfer Equipment. Complete Form 9.5 below and ensure that all requirements for Low Emission Transfer Equipment are fulfilled.

Form 9.2

Analysis Summary on Exposure from and to the LP-Gas Facility

A	B	C	D	E
Item #	**CHAPTER Title**	**Section & Title**	**Reference FORM #**	**Number of "Yes" checked**
1	Exposure to and from Other Properties	7.1 Exposure to off-site properties and persons from in-plant propane releases	7.1	
		7.2 Exposure to propane facility from external events.	7.2	

If the entry number in column E (“Yes”), Form 9.2 corresponding to Form 7.1 is greater than zero, consider one or more of the following design alternatives.

1 Consider moving the container or the transfer point to a different location, if possible and space exists, so that the property or the person is beyond the hazard distance.
2 Provide “Redundant and Fail-safe Product Control Measures”. Complete Form 9.4 to ensure compliance.
3 Institute other technical measures such as installing gas and flame detectors (connected to facility shut down systems), sounding alarm outside facility premises, etc.
4 Institute administrative controls such as additional training for personnel, more frequent inspections of hoses and transfer piping, etc.

If the entry number in column E (“Yes”), Form 9.2 corresponding to Form 7.2 is greater than zero, consider one or more of the following design alternatives.

1 Implement procedures to monitor neighboring activity.
2 Install means in the adjacent plant to shut down the LP-Gas plant in case of an emergency in that plant.

Form 9.3
Analysis Summary on Fire Department Evaluations

A	B	C	D	E	F
Item #	**CHAPTER Title**	**Section & Title**	**Reference FORM #**	**Number “zeros” entered in Column C, Lines 6 through 8 of Form 8.1**	**Number of “Yes” checked in Column C of Form 8.4**
1	Fire department capability, adequacy of water supply and Emergency Planning	8.1 Data on the Fire Department	8.1		
2		8.2 Fire response water needs and availability	8.4		

If the entry number in row 1, Column E of Form 9.3 is greater than zero, consider one or more of the following design alternatives.

1 Discuss with the local Fire Department the needs of the LP-Gas facility and the evaluation results on the capability and training inadequacies of the Department.

2 Consider developing a cadre of personnel within the LP-Gas facility to respond to emergencies.

3 Institute container special protection system based on active protection approaches or passive approaches. Complete Form 9.6 and Form 9.7 below.

If the entry number in row 2, Column F of Form 9.3 is equal to zero, consider one or more of the following design alternatives.

1 Provide special protection (other than water spray or monitor systems) to containers, satisfying the requirements of section 6.27.5 of NFPA 58, 2014 edition. Complete Form 9.6 to ensure compliance.

2 Consider implementing the various options indicated in Table 9.1.

Form 9.4
Redundant and Fail-Safe Design for Containers

A	B		C	D	E	F
Item #	**Description**		**Features**	**Proposed for the facility?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	Container sizes for which the appurtenances are provided		Appurtenances and redundant fail-safe equipment are provided for <u>each</u> container of water capacity 2,001 gal through 30,000 gal			6.28.3 and 6.28.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve having internal excess flow valve			6.28.3.1 and 6.28.3.2
			Positive shutoff valve installed as close as possible to the internal valve			6.28.3.4
3	Liquid or vapor inlet		Internal valve having internal excess flow valve or Backflow check valve			6.28.3.5
			Positive Shutoff Valve installed as close as possible to the Internal Valve or the back flow check valve			6.28.3.5
4	Railcar transfer	Flow into or out of railroad tank car	Emergency shutoff valve installed in the transfer hose or the swivel-type piping at the tank car end.			6.19.2.6 (1) and 6.28.4.1
		Flow only into railroad tank car	Emergency shutoff valve or backflow check valve installed in the transfer hose or the swivel-type piping at the tank car end.			6.19.2.6 (2) and 6.28.4.1
5	Cargo tank transfer		Protection provided in accordance with 6.28.4.1			6.28.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (Fire) actuation			6.28.4.2
			Actuated by a hose pull-away due to vehicle motion			6.28.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft of the point of transfer?			6.28.4.3 (A)
			Another remote shutdown station between 25 ft and 100 ft of the transfer point?			6.28.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and all primary valves (Internal and Emergency Valves)			6.28.4.3
			Signs complying with the requirements of 6.28.4.3 (C) provided?			6.28.4.3 (C)

Note: If your facility does not have a rail terminal, write the word NA in both the "Yes" column and the "No" column in item 4 of the form in the railroad tank car row. Similar option is also available if there is no cargo tank vehicle transfer station.

Form 9.5
Evaluation of Low Emission Transfer Equipment

A	B	C		D	E	F
Item #	**Description**	**Features**		**Proposed for the facility?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	Transfer into permanently mounted ASME containers on vehicles	Delivery nozzle and filler valve-max. liquid release after transfer of 4 cm^3 (0.24 in^3).	Fixed maximum liquid level gage not used during transfer operations			6.28.5.3 (A) & (B)
2	Transfer into stationary ASME containers delivery valve and nozzle combination	During product transfer or post transfer uncoupling of the hose, liquid product volume released to the atmosphere	Does not exceed 4 cm^3 (0.24 in^3) from a hose of nominal size 1 in or smaller			6.28.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 in.			6.28.5.4 (B)
3	Transfer into stationary ASME containers maximum filling limit	Do containers less than 2,001 gal (w.c.) have an overfilling prevention device or another approved device?				6.28.5.4 (F)
		Do containers 2,001 gal (w.c.) or greater have a float gage or other non-venting device?				6.28.5.4 (E)
4	Transfer into stationary ASME containers fixed maximum liquid level gage	Not used during routine transfer operations but may be used in calibrating other non-venting liquid level gauges in the container				6.28.5.4 (C) & (D)

Note: If the facility does not have a particular feature described in items 2 or 3, write “NA” in both the “Yes” and “No” columns corresponding to its row .

Form 9.6
Special Protection Measures – Passive Systems

A	B	C	D		E
Item #	**Special Protection Option**	**Question**	**Proposed for the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Container insulation	Insulation provided on each of the containers?			6.27.5.1
		Insulation material complies with the requirements of NFPA 58?			6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?			6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58.			6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?			6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.			6.6.6.1 and 6.27.5.4

Form 9.7
Special Protection Measures – Active Systems

Item #	**Special Protection Option**	**Question**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Water spray systems	Are fixed water spray systems, complying with NFPA 15 requirements, used for each container in the facility?			6.27.6.1
		Do fire responsive devices actuate water spray system automatically?			6.27.6.2
		Can the water spray systems be actuated manually also?			6.27.6.2
2	Monitor nozzle systems	Are the monitor nozzles located and arranged so that the water stream can wet the surfaces of all containers exposed to a fire?			6.27.6.3
		Can the water stream from a monitor nozzle reach and wet the entire surface of, at least, one half of a length from one end of each of the containers it is designed to protect?			6.27.6.3
		Do fixed monitor nozzles comply with NFPA 15 requirements?			6.27.6.1
		Do fire responsive devices actuate the monitor nozzles?			6.27.6.2
		Can the monitor nozzles be actuated manually also?			6.27.6.2

Equivalent Protection to a Water Supply for Industrial and Bulk Facilities

In the case where water supply is not available in or near the LP-Gas facility, or is inadequate or it is prohibitively expensive to connect to a public or private water supply hydrant, alternative methods for providing protection should be considered. In lieu of providing a water supply, several alternatives are indicated in Table 9.1, which can offer an equivalency to a water supply system.

The intent of the controls identified in Table 9.1 is to maintain the entire system as a gas tight entity. These methods include reducing the service life of equipment, increasing the design pressure rating of the system beyond the requirements of NFPA 58, or providing early detection and isolation of the system to ensure product control. This list is not exhaustive and is not ranked in an order of priority.

Table 9.1
Suggested Alternative Methods for Industrial and Bulk Plants That Do Not Pose a Hazard But Lack a Water Supply

Item #	Possible options to implement when adequate water supply is not available
1	Reduce the service life of hoses.
2	Increase frequency of equipment inspection.
3	Establish a service life program for the maintenance of the container pressure relief devices. This could include the installation of a listed multiple port valve and certifying that the relief devices are properly set and maintained every 5 to 10 years.
4	Increase the design strength of the piping and fitting systems.
5	Install emergency shutoff valves in conjunction with container internal valves.
6	Install emergency shutoff valves downstream of transfer pump outlets and upstream of the vapor and liquid valves at the bulkhead.
7	Install pneumatic tubing along the facility boundary to serve as a perimeter fire detection system. This would provide protection of the facility against exposure fires.
8	Provide optical flame detection or linear heat detection, or a gas detection system connected to an isolation valve installed downstream of every liquid and vapor nozzle on the container. This system could also be monitored to send a signal to an alarm company that notifies the fire department of an event.
9	Increase the separation distances of internal facility exposures to the container. These exposures would include a site dumpster, idle or waste pallets and combustibles, and increasing the parking distances between the bobtails and transports in relation to the container.
10	Relocate overhead power lines away from all container and cylinder storage areas to protect against ignition in the event of a line dropping due to wind or power pole impact.
11	Eliminate all combustible vegetation within 30 feet of the LP-Gas container. This can be accomplished using gravel, or paving the site yard.
12	Install tanks using the mounding or burial method.

CHAPTER 10

Fire Safety Analysis Examples

In this chapter, the use of the Fire Safety Analysis described in the previous chapters is illustrated with specific examples. Four different LP-Gas facility scenarios are considered. The assumptions made on the design, location and other features of the facility are indicated and the FSA procedure is illustrated using the fill-in forms discussed in earlier chapters. The four different facilities have been chosen to be a representative (though not all-inclusive) sample of the LP-Gas facility characteristics found in the US.

In the examples below, the form numbers indicated are the same as in the main body of the manual. Also, each example is illustrated schematically with a map showing the characteristics of the facility.

10.1 Illustrative Example # 1

LP-Gas Facility:

Four 1,800-gallon containers are located within an industrial area and within the property boundary of a small rural manufacturing plant. The customer plant is supplied with vapor from the containers. There is no separate vaporizer but the container pressure is used for the vapor service.

Other Facility Information:

1) The containers are located at about 130 ft. to the east of the manufacturing plant, next to a parking area. The parking area extends 150 ft. north and 25 ft. to the east of the container area.
2) A main road exists to the south of the container area at a distance of 70 ft.
3) The vapor line into the building is an underground line and is cathodically protected.
4) The container area is surrounded by commercial grade galvanized highway guardrail with 3 ft. clearance all around within the container area.
5) Liquid filling is through a manifolded, 2-inch line. There is no liquid withdrawal except for the emergency withdrawal connection at the top of each container. A backflow check valve is installed at an unloading bulkhead.
6) Only vapor is withdrawn at the top of the containers. The vapor service line is manifolded and is 1-1/2" underground to the building.
7) The containers do not have any special protection. Also, no redundant & fail-safe system is provided for the containers.
8) There is no property within 250 ft. hazard distance from the containers.
9) There are no public water supply hydrants near the facility. Also, there is no other water source nearby to the manufacturing facility property line; however, water is available from a pond 5 miles from the facility.
10) The nearest fire department is a distance of 3 miles and is staffed with volunteer fire fighters. Generally, no one is present at the fire station at all times; but any fire alarm is communicated to all volunteers through a horn. The next nearest fire department is 15 miles away and also is manned with volunteer fire fighters.

Figure 10.1 shows a schematic plan view of the LP-Gas facility used in Example1.

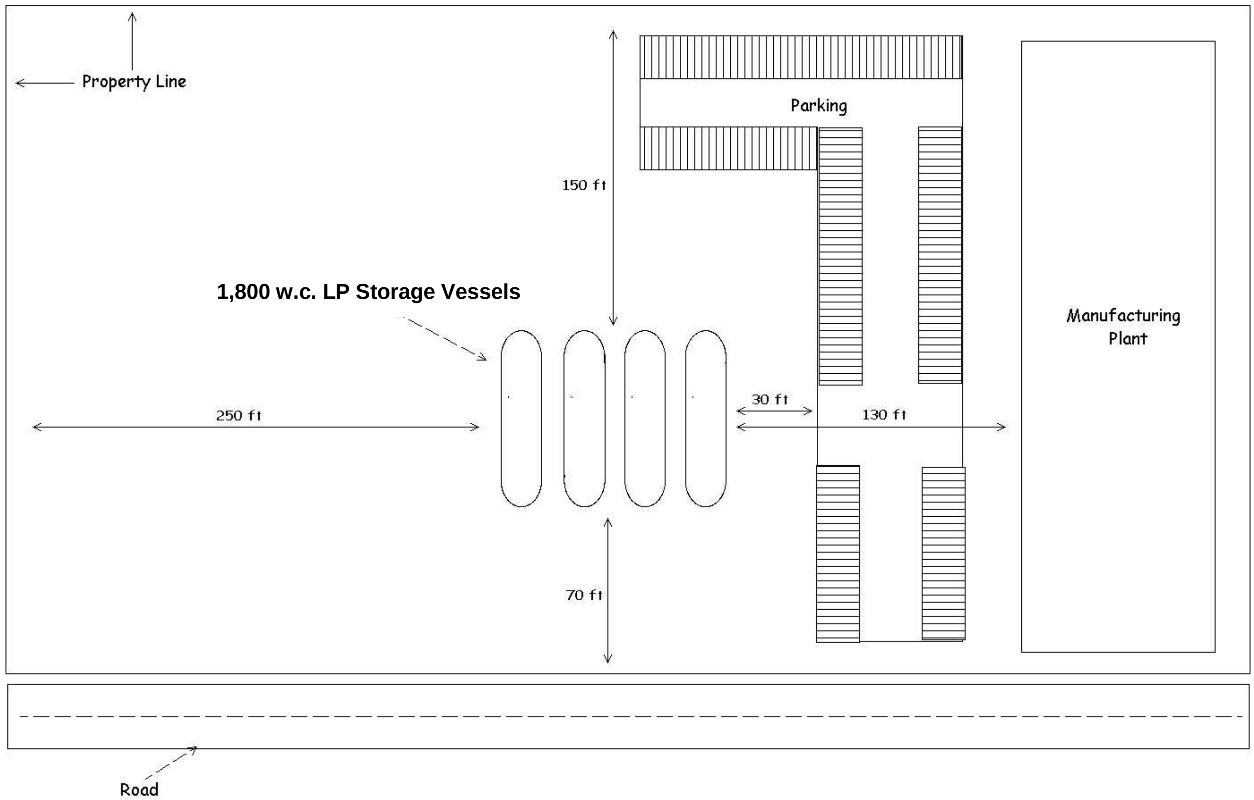


Figure 10.1 Schematic plan view of a LP-Gas facility used in Example 1

Form 4.1

Initial Data on the LP-Gas Facility

A	B	C
Item #	**Information Item**	**Data**
1	Name of the LP-Gas Facility Owner or Operator	**ABC Propane Co., Inc.**
2	Contact Name:	
3	Contact Telephone & Fax Numbers	
4	Contact Email Address	
5	Mailing Address	Street 1:
		Street 2:
		City, State, Zip:

Form 4.2

Facility Storage Capacity [1,2,3]

A	B	C	D
Item #	**Individual Container Water Capacity (w.c.) (gallons)**	**Number of containers**	**Total Water Capacity (w.c.) of each container size (gallons)**
1	500		
	1,000		
	2,000		
	4,000		
	10,000		
	18,000		
	30,000		
	60,000		
	Other: ***1,800***	4	7,200
	Other:		
	Other:		
	Other:		
2	**Aggregate Water Capacity[4]**	**4**	**7,200**

Notes:
(1) Column D = Column B x Column C.
(2) Parked bobtails, transports and tank cars should not be considered for aggregate capacity calculations.
(3) Do not consider containers that are not connected for use.
(4) For the purpose of this manual, “Aggregate Water Capacity” means any group of single ASME storage containers separated from each other by distances less than those stated in the aboveground containers column of Table 6.3.1.1.

Form 4.3
Additional Information on the LP-Gas Facility

☑ Existing Facility; Built to NFPA 58 Edition __1992___ ☐ Proposed Facility

a) Name of the Plant (if applicable) _____**ABC Propane Co., Inc.**_____
b) Type of LP-Gas Plant: ☐ Commercial ☑ Industrial ☐ Bulk Plant

c) Facility is located in ☑ Rural Area ☐ Suburban Area ☐ City Commercial Zone ☐ City Industrial Zone

d) Facility neighbors§: (Check all that apply) ☐ Agri. fields ☐ Commercial Bldgs ☐ Flammable Liquids Storage ☑ Industrial Activity (metal fabrication, cutting and welding, etc) ☐ Manufacturing ☐ Others (explain) ______________________

e) Geographic Location of Plant:
Address: ________________________________
____

f) Landmarks, if any: ________________________________
____

g) LP-Gas liquid supply by: (Check all that apply) ☑ Bobtail ☐ Truck Transport ☐ Rail Tank Car ☐ Pipeline

h) LP-Gas Distribution by: Plant (Check all that apply) ☐ Bobtail ☐ Truck Transport ☑ Vapor Piping ☐ Liquid Piping ☐ Dispensing or Vehicle fueling

i) Number of vehicle entrances: ☑ One ☐ Two ☐ More than two

j) Type of access roads to the plant: ☑ Rural ☐ City or Town ☐ Highway
(One check per line) Entrance 1 ☐ Dirt road ☑ Gravel road ☐ Paved
(One check per line) Entrance 2 ☐ Dirt road ☐ Gravel road ☐ Paved

k) Staff presence ☐ Not staffed ☑ Only during transfer operations ☐ Staffed always (24/7) ☐ Only during business hours ☐ Other (Explain) ____________________________

l) Location and distances to Assembly, Educational or Institutional Occupancies surrounding the facility, if any, within 250 ft from the facility boundary in the direction of the assets.
___Institutional or other occupancies do not lie within 250 ft., of the facility._____
____

m) Is an overview plot plan of the facility attached? ☑ Yes ☐ No

§ All properties either abutting the LP-Gas facility or within 250 feet of the container or transfer point nearest to facility boundary.

Form 5.1
Compliance with Code Requirements for Appurtenances on Containers of 4,000 Gallons Water Capacity or Less

A	B	C	D	E
Container #	**Service Configuration Sub Figure (in Figure 5-1)**	**Number of Product Control Appurtenances**		**NFPA 58 Section Reference (2014 edition)**
		Required by NFPA 58 (applicable edition)	**Installed on the Container**	
1	**5-1A**	**5**	**5**	5.7.4.1 (D), Table 5.7.4.1(D) and 5.7.4.5
2	**5-1A**	**5**	**5**	
3	**5-1A**	**5**	**5**	
4	**5-1A**	**5**	**5**	
5				
6				

Form 5.4
Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid-into-Containers

A	B	C	D	E	F
Item #	Appurtenance (Either No. 1 or No. 2)**	Appurtenance Provided with the Feature	Installed in the facility? Yes	No	NFPA 58 Section Reference (2014 edition)
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	N.A.		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF	N.A.		6.12.6
		Temperature sensitive element (fusible link) installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	N.A.		6.12.6
		Manually operated remote shutoff feature provided for ESV.	N.A.		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	N.A.		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of size 1½ inch in diameter or larger on the other side.	N.A.		6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	N.A.		6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	√		6.12.3
		BCK is designed for this specific application.	√		6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	√		6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
3	Debris Protection++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	√		6.19.2.5
4	Emergency discharge control	Flow through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention	N.A.		6.19.2.6 (3)

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4)

++ Retrofit required for existing facilities by July 1, 2011.

Form 5.6

Requirements for Vapor Transfer Lines 1¼-inch Diameter or Larger

<table>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr>
<tr><th rowspan="2">Item #</th><th rowspan="2">Appurtenance</th><th rowspan="2">Appurtenance Provided with the Feature</th><th colspan="2">Installed in the facility?</th><th rowspan="2">NFPA 58 Section Reference (2014 edition)</th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td rowspan="7">1</td><td rowspan="7">Emergency shutoff valve (ESV) (Ref § 6.12)</td><td>Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.</td><td>√</td><td></td><td>6.12.2</td></tr>
<tr><td>Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F</td><td>√</td><td></td><td>6.12.6</td></tr>
<tr><td>Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.</td><td>√</td><td></td><td>6.12.6</td></tr>
<tr><td>Manually operated remote shutoff feature provided for ESV.</td><td>√</td><td></td><td>6.12.12.1</td></tr>
<tr><td>Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.</td><td>√</td><td></td><td>6.12.12.2</td></tr>
<tr><td>An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.</td><td>√</td><td></td><td>6.12.5
6.19.2.6 (1)</td></tr>
<tr><td>Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.</td><td>√</td><td></td><td>6.12.8</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Backflow check valve (BCK)**</td><td>Installed downstream of the hose or swivel-type connection</td><td>N.A.</td><td></td><td>6.12.3</td></tr>
<tr><td>BCK is designed for this specific application.</td><td>N.A.</td><td></td><td>6.12.4</td></tr>
<tr><td>A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.</td><td>N.A.</td><td></td><td>6.12.5</td></tr>
<tr><td>Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.</td><td>N.A.</td><td></td><td>6.12.8</td></tr>
</table>

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and it shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

Form 6.1
Evaluation of Physical Protection and Other Measures

A	B	C	D	E	F
#	**Item**	**Features**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment	√		6.19.5
2	Vehicle impact protection	Protection against vehicular (traffic) impacts on containers, transfer piping and other appurtenances is designed and provided commensurate with the size of vehicles and type of traffic in the facility. (Example protection systems include but not limited to (1) Guard rails, (2) Steel bollards or crash posts, (3) Raised sidewalks.	√		6.6.1.2, 6.9.3.10 and 6.20.3.2 (2)
3	Protection against corrosion	Provide protection against corrosion where piping is in contact with supports or corrosion causing substances.		√	6.9.3.11 and 6.17.1
Complete only 4A or 4B					
4A	Perimeter Fence	Is an industrial type or chain link fence of at least 6 ft high or equivalent protection provided to enclose (all around) container appurtenances, pumping equipment, loading and unloading and container filling facilities?	√		6.19.4.2
		Are at least two means of emergency egress (gates) from the enclosure provided? **NOTE: Write "N.A." (not applicable) if** (i) The area enclosed is less than 100 ft^2, or (ii) The point of transfer is within 3 ft of the gate, or containers are not filled within the enclosure		√	6.19.4.2 (A)
		Is a clearance of at least 3 feet all around to allow emergency access to the required means of egress provided?	√		6.19.4.2 (B)
	Guard Service	If a guard service is provided, does this service cover the LP-Gas plant and are the guard personnel provided with appropriate LP-Gas related training, per section 4.4 of NFPA 58?	NA		6.19.4.3
4B	Lock-in-Place devices	Are Lock-in-Place devices provided to prevent unauthorized use or operation of any container appurtenance, system valves, or equipment in lieu of the fence requirements above?	NA		6.19.4.2 (C)

Note: Fill only items 1, 2, 3, and 4A or 4B. Indicate with "NA" when not filling the "Yes" or "No" column.
‡ Indicate with "NA" if the facility is not operated at night.

Form 6.2
Assessment of Sources of Ignition and Adjacent Combustible Materials

A	B	C	D	E
#	**Sources of Ignition and Requirements Pertaining to Adjacent Combustible Materials**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
		Yes	**No**	
1	Are combustible materials, weeds and tall grass not closer than 10 ft. from each container?	√		6.4.4.3
2	Is a distance at least 20 ft. provided between containers and tanks containing flammable liquids with flash point less than 200 °F (ex., gasoline, diesel)?	√		6.4.4.6
3	Are electrical equipment and wiring installed per code requirements?	√		6.23.2
4	Is open flame equipment located and used according to code?	√		6.23.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with.?	√		7.2.3.2
6	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided in the facility?	√		6.27.4.2
7	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided on each truck or trailer used to transport propane?	√		9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?	√		7.2.3.2 (B) and 9.4.10

Note: Insert "NA" in both "Yes" and "No" columns of any items that are not applicable.

Form 6.3
Separation Distances from Containers to Buildings, Property Lines that can be Built upon, Inter-container Distances, and Aboveground Flammable or Combustible Storage Tanks

A	B	C	D	E	F	G
#	**Container Size Range in gal (W.C.)**	**Separation between a property line, important building or other property and the <u>nearest</u> container which is**	**Minimum Distance (ft)**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	501 through 2,000	Above Ground	25	√		6.3.1, 6.3.2 and Table 6.3.1.1
		Underground or Mounded	10	NA	NA	
		Between containers	3	√		
2	2,001 through 30,000	Above Ground	50	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	5	NA	NA	
3	30,001 through 70,000	Above Ground	75	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	¼ sum of diameters of adjacent containers	NA	NA	
4	70,001 through 90,000	Above Ground	100	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	¼ sum of diameters of adjacent containers	NA	NA	
5	All sizes greater than 125 gal	Separation distance between a LP-Gas container and an above ground storage tank containing flammable or combustible liquids of flash points below 200 °F.	20	NA	NA	6.4.4.5 and 6.4.4.6

Note: If any of the container sizes indicated in the above form are not present in the facility, enter "NA" in both Yes and No columns.

Form 6.4
Separation Distances between Points of Transfer and other Exposures

A	B	C	D	E	F	G
#	**Type of Exposure within or outside the facility boundary**	**Check if exposure is present**	**Minimum Distance (ft)**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	Buildings, mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls		10	NA	NA	6.5.2 and Table 6.5.2.1
2	Buildings with other than at least 1-hour fire-rated walls		25	NA	NA	
3	Building wall openings or pits at or below the level of the point of transfer		25	NA	NA	
4	Line of adjoining property that can be built upon		25	NA	NA	
5	Outdoor places of public assembly, including school yards, athletic fields, and playgrounds		50	NA	NA	
6	Public ways, including public streets, highways, thoroughfares, and sidewalks: From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers.		10	NA		
	Public ways, including public streets, highways, thoroughfares, and sidewalks: From other points of transfer	√	25	√		
7	Driveways		5	NA	NA	
8	Mainline railroad track centerlines		25	NA	NA	
9	Containers other than those being filled		10	NA	NA	
10	Flammable and Class II combustible liquid dispensers and the fill connections of containers		10	NA	NA	
11	Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers		20	NA	NA	
12	LP-Gas dispensing device located close to a Class I liquid dispensing device.		10	NA	NA	6.25.4.3

NOTE: Place a checkmark in column C against an exposure that is present in or around the facility. Fill columns E or F for only those rows for which there is a checkmark in column C.

Form 6.5
Special Protection Measures –Passive Systems

A	B	C	D		E
#	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Container Insulation	Insulation provided on each of the containers?	N.A.		6.27.5.1
		Insulation material complies with the requirements of NFPA 58?	N.A.		6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?	N.A.		6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58.	N.A.		6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?	N.A.		6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.	N.A.		6.6.6.1 and 6.27.5.4

Form 6.7
Protection Against Vehicular Impact

#	System Protected	Is physical protection provided?		Type of physical protection installed	NFPA 58 Section Reference (2014 Edition)
		Yes	No		
1	Storage containers	√		Steel Highway Guardrail	6.6.1.2 and 6.9.3.10
2	Transfer stations	√		Steel Highway Guardrail	
3	Entryway into plant	N.A.			

Table 7.1
Distances to Various Types of Propane Hazards Under Different Release Models**

Model #	Details of the Propane Release Model Releases from or due to		Vapor Dispersion Distance to LFL (ft)	Explosion Hazard Distance (ft)	Fire Ball Radiation Distance (ft)
1a	Bobtail hose failure. Release of the entire inventory in the hose, quickly.	1” ID x 150 ft hose length	250	110	50
1b		1” ID x 120 ft hose length	230	103	45
1c		1” ID x 75 ft hose length	190	90	40
2a	Release of the inventory in a transfer piping 1" x 30 ft + @ 20 gpm for 10 min., due to failed excess flow valve.		135	120	25
2b	Release of the inventory in a transfer piping 2" x 30 ft + @80 gpm for 10 mins.		230	252	48
2c	Release of the inventory in a transfer piping 2” x 80 ft. @ 70 gpm for 10 mins.		328	235	74
2d	Release of the inventory in a transfer piping 2.5" x 30 ft @80 gpm for 10 mins.		269	252	59
2e	Release of the inventory in a transfer piping 3" x 30 ft + @100 gpm for 10 mins.		312	287	69
2f	Release of the inventory in a transfer piping 3" x 18 ft + @100 gpm for 10 mins.		256	284	55
3	Release from the container pressure relief valve		No ignitable vapor concentration at ground level		
4	Release from a 1” ID x 150 ft transfer piping to a vaporizer and reduced flow from a partially open excess flow valve @ 20 gpm for 10 min.		250	120	50
5	Leak from a corrosion hole in a transfer pipe at a back pressure of 130 psig (corresponding to 80 ºF) for 60 min. Hole size is ¼” ID.		110	120	5
6	Release of the entire inventory in a 2” ID x 20 ft., transfer hose.		195	90	40
6a	Release of the entire inventory in a 2.5 inch dia. transfer hose x 16 ft. length		215	98	45
6b	Release of the entire inventory in a 3-inch dia. transfer hose x 12 ft. length		230	100	46
7a	Transport hose blow down: Hose size 2" ID, 20 ft length release for 3min., from a Transport after the tank is filled.		25	30	<5
7b	Transport hose blow down: Hose size 2.5" ID, 16 ft length release for 3min., from a Transport after the tank is filled.		25	29	<5
7c	Transport hose blow down: Hose size 3" ID, 16 ft length release for 3min., from a Transport after the tank is filled.		31	36	<5

** Results from models described in Appendix B.

Form 7.1
Types of Occupancies[1] Near or Surrounding the LP-Gas Facility

Type of Occupancies	Model # from Table 7.1	Hazard Distance[2] (feet)	Is Occupancy located within the hazard distance from the Facility?	
			Yes	No
Assembly Occupancies (Places of worship, Libraries, Theaters and Auditoriums, Food or Drink Bars, Sports Stadiums, Amusement Parks, Transportation Centers, etc. with 50 or more people).	1A	250		√
Institutional Occupancies (Elderly Persons Home or Nursing Home, Hospitals, Alcohol & Drug Rehabilitation Centers, Prisons)	1A	250		√
Educational Occupancies (Elementary Schools, Day Care facilities, etc).	1A	250		√

NOTES: (1) Different types of occupancies are defined in NFPA 5000

(2) Table 7.1 provides a number of scenarios that can result in propane release, and the resulting area exposed for different ignition mechanisms. Determine the scenarios that are applicable to the facility, for the quantities that can be released, and enter the greatest value from Table 7.1. Use the hose diameters and length that will be used at the facility if they differ from the ones in Table 7.1 and recalculate the hazard distances using a spreadsheet method that is available at npga.org. Some scenarios may not be applicable to an installation because of other mitigation measures implemented, such as a hose management procedure to minimize the possibility of hose failure.

Form 7.2
Exposure to LP-Gas Facility from External Hazards

A	B	C	D
Item #	Type of Neighboring Operation	Hazard exists to the LP-Gas Facility	
		YES	NO
1	Petroleum and other hazardous material storage, wholesale dispensing, etc.	NA	NA
2	Metal cutting, welding, and metal fabrication	NA	NA
3	Industrial Manufacturing that can pose external hazards	NA	NA
4	Ports, rail yards and trans-shipment terminals handling flammable and explosive materials.	NA	NA
5	Other operations that may pose hazards (gasoline and other hazardous material dispensing stations, fertilizer storage, etc).	NA	NA

NOTE: If a particular activity indicated in column B does not exist, fill both "Yes" and "No" columns with "NA."

Form 8.1
Data on the Responding Fire Department

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th></tr>
<tr><th>Item #</th><th colspan="2"><u>Data Item</u></th><th>Data Entry</th></tr>
<tr><td>1</td><td colspan="2">Name of the Fire Department (FD).</td><td>County F.D.</td></tr>
<tr><td>2A</td><td colspan="2">Name of the person in the FD assisting with the data acquisition.</td><td>Don Hayes</td></tr>
<tr><td>2B</td><td colspan="2">Position of the person in the FD assisting with the data acquisition.</td><td>Captain</td></tr>
<tr><td>3A</td><td colspan="2">Date on which FD data was collected.</td><td>3/5/09</td></tr>
<tr><td>3B</td><td colspan="2">Name of the person collecting the data.</td><td>John Egan</td></tr>
<tr><td>4</td><td colspan="2">Number of fire fighters on duty at any time.</td><td>Volunteer Only</td></tr>
<tr><td>5</td><td colspan="2">Average number of fire fighters available for response.</td><td>5</td></tr>
<tr><td>6A</td><td rowspan="2">Number of fire fighters qualified to</td><td>“Fire Fighter I” level.</td><td>5</td></tr>
<tr><td>6B</td><td>“Fire Fighter II” level.</td><td>0</td></tr>
<tr><td>7A</td><td rowspan="3">Number of fire fighters who would:</td><td>Respond on the first alarm to the facility.</td><td>5</td></tr>
<tr><td>7B</td><td>Respond on the first alarm and who are qualified to the operations level requirements of NFPA 472 or <u>similar</u> local requirements</td><td>2</td></tr>
<tr><td>7C</td><td>Respond on the first alarm with specific knowledge and training on the properties of LP-Gas and LP-Gas fires.</td><td>2</td></tr>
<tr><td>8A</td><td rowspan="2">Number of fire apparatus that have the capability to deploy a 125 gpm hose line supplied by onboard water for at least 4 minutes, and, which:</td><td>Are in service in the department.</td><td>1</td></tr>
<tr><td>8B</td><td>Would respond on a first alarm.</td><td>1</td></tr>
</table>

Form 8.2
Response Time data for the Fire Departments

A	B	C	D	E
Company or Department	**Time in Minutes for**			
	Alarm Receipt & Handling	**Turnout**	**Travel**	**Total Time**
Springfield	60 s	4 min.	8 min.	13 min.

Note: Number in Column E = Sum of numbers from Columns B through D.

Form 8.3

Water Flow Rate and Total Water Volume Required to Cool Containers Exposed to a Fire

A	B	C	D	E	F	G	H
Item #	**ASME Container Size (gallons)**	**Total Surface Area of each Container[1] (ft^2)**	**Surface Area of each container to be Cooled (ft^2)**	**Water flow rate required per container (gpm)**	**Number of containers of the size indicated‡**	**Total Water flow rate required (gpm)**	**Total volume of water required for 10 min (gal)**
1	500	86	43	10.8			
	1,000	172	86	21.5			
	2,000	290	145	36.3	4	109	
	4,000	374	187	46.8			
	6,500	570	285	71.3			
	9,200	790	395	98.8			
	12,000	990	495	123.8			
	18,000	1,160	580	145.0			
	30,000	1,610	805	201.3			
	45,000	2,366	1,183	295.8			
	60,000	3,090	1,545	386.3			
	90,000	4,600	2,300	575.0			
	Other Size						
2a	Calculated water flow rate for container protection					109	
2b	Water flow rate rounded up to nearest multiple of 125					125	
3	Water for fire fighter protection, if required					250	
4	Total water flow rate and volume					375	3,750

Note: Column D = (1/2) x Column C; Column E = 0.25 (gpm/ft^2) x Column D ;
Column G = Column F x Column E; Column H = 10 x Column G
Line 2a, Column G and Column H are the sum of numbers in each row above line 2 of each column.
Line 4, Column G and Column H are the sum of numbers in rows 2b and 3.

‡ Consider only 3 containers for water supply evaluations even if the number of containers in a group is more than 3. See Section 8.2.

1 ASME container approximate dimensions

Form 8.4
Evaluation of Water Availability in or Near the LP-Gas Facility

<table>
<tr><th>A</th><th>B</th><th>C</th><th colspan="3">D</th></tr>
<tr><th>Item #</th><th>Water from…</th><th>Available?</th><th colspan="3">Quantitative information</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Public supply or from another piped-in supply through one or more fire hydrants in or near the facility</td><td rowspan="4">☐ Yes ☒ No</td><td>Hydrant data</td><td>Distance from Container(s) on which water will be applied (feet)</td><td>Available water flow rate from all hydrants[1] (gpm)</td></tr>
<tr><td>Hydrant 1</td><td></td><td rowspan="3"></td></tr>
<tr><td>Hydrant 2</td><td></td></tr>
<tr><td>Hydrant 3</td><td></td></tr>
<tr><td>2</td><td>A nearby static water source (stream, pond, lake, etc).</td><td>☐ Yes ☒ No</td><td colspan="3">Distance to water source = _______ Feet
Time to set up relay = _____ min.
Rate of delivery = _______ gpm</td></tr>
<tr><td>3</td><td>Only through mobile water tanker shuttle.</td><td>☒ Yes ☐ No
Pond 5 miles away</td><td colspan="3">Time to set up shuttle = _____ min.
Sustainable flow rate = _______ gpm</td></tr>
</table>

(1) Obtain the available flow rate from the local municipal water authority or the entity that supplies water to the hydrant or conduct a test to determine total available flow rate.

10.2 Illustrative Example # 2

LP-Gas Facility:

An 18,000 gallon container is located at a customer facility. There is a transport unloading station remotely located from the container. The customer (a shipping container warehouse) is supplied with vapor from a vaporizer.

Other Facility Information:

1) The container is located within the customer facility property line.
2) The LP container is 75 ft. from the warehouse/shipping facility wall and also 75 ft. from the vaporizers located to the East of the container.
3) The customer property line nearest to the LP-Gas container is 75 ft. away, along the NE direction.
4) The containers are filled from a truck transport. The transport unloading station is 110 ft. SW of the container. This LP-Gas unloading station is 60 ft. from the western wall of the container shipping facility.
5) There is a 2" dia. liquid line leading from the transport unloading riser and a 1¼ in. dia. Liquid line feeding a motor fuel dispenser, which is located between the warehouse/shipping facility and the storage container.
6) There is a single entrance gate to the customer property on the west side of the property to the main warehouse.
7) The warehouse is in an industrial area.
8) The liquid withdrawal line is manifolded to feed both the motor fuel dispenser and a vaporizer that provides fuel to the warehouse facility.
9) The container does not have any special protection. Also, there are no redundant & fail-safe systems provided for the LP-Gas plant.
10) There is no sensitive property or populations (educational, assembly or institutional) within the hazard distance (250 ft.) from the containers.
11) A single water hydrant is located within the warehouse property line. This hydrant is supplied from the town/municipal water supply system. Water is available from a pond 5 miles from the facility.
12) The nearest fire department is a distance of 3 miles and is manned with career fire fighters at all times. The next nearest fire department is 7.5 miles away and also is manned with career fire fighters.

Figure 10.2 shows a schematic plan view of the LP-Gas facility used in Example 2.

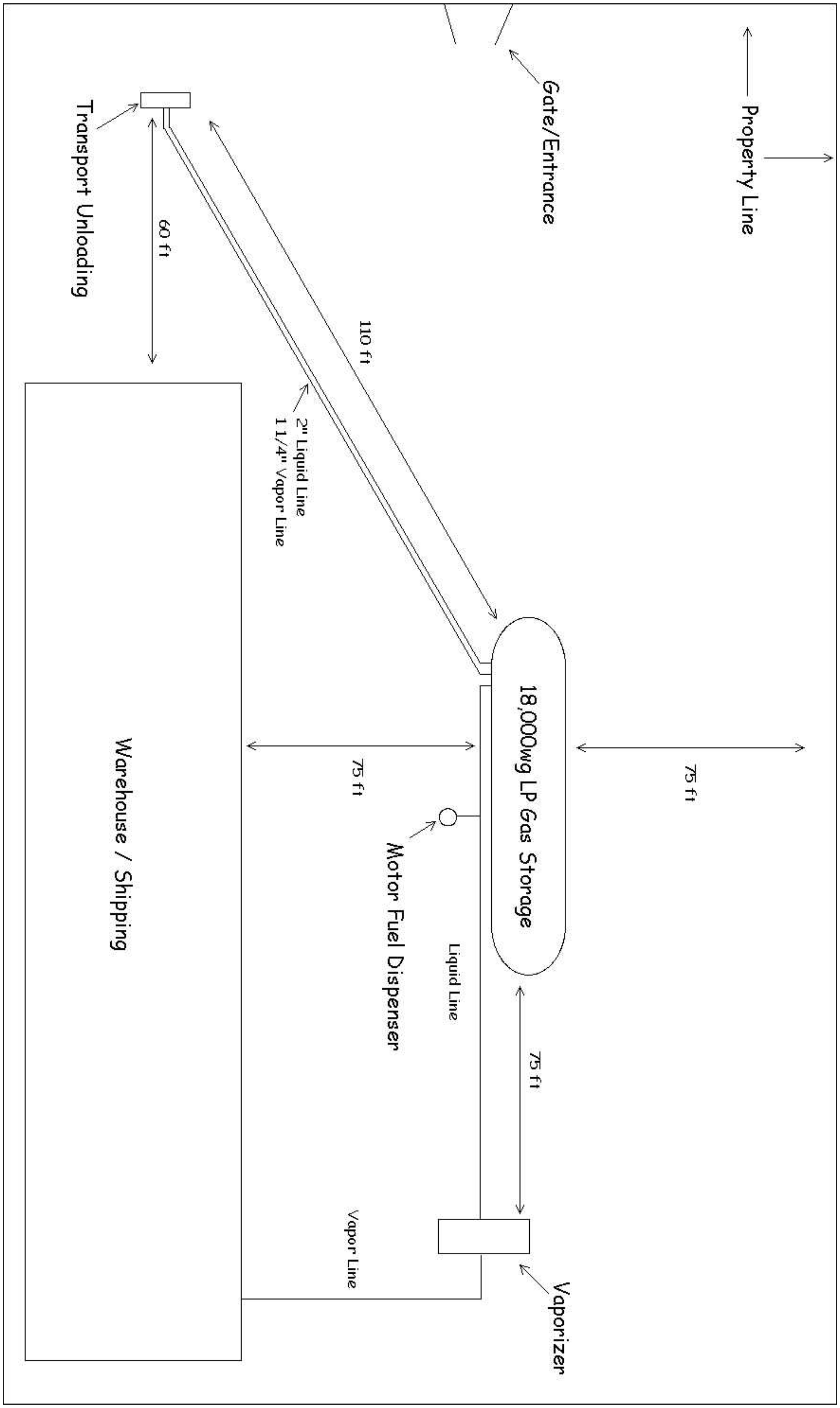


Figure 10.2 Schematic plan view of a LP-Gas facility used in Example 2

Form 4.1
Initial Data on the LP-Gas Facility

A	B	C
Item #	**Information Item**	**Data**
1	Name of the LP-Gas Plant Owner or Operator	**XYZ Propane**
2	Contact Name:	
3	Contact Telephone & Fax Numbers	
4	Contact Email Address	
5	Mailing Address	Street 1:
		Street 2:
		City, State, Zip: Lynchburg, VA

Form 4.2
Facility Storage Capacity [1,2,3]

A	B	C	D
Item #	**Individual Container Water Capacity (w.c.) (gallons)**	**Number of containers**	**Total Water Capacity (w.c.) of each container size (gallons)**
1	500		
	1,000		
	2,000		
	4,000		
	10,000		
	18,000	1	18000
	30,000		
	60,000		
	Other:		
	Other:		
	Other:		
	Other:		
2	**Aggregate Water Capacity[4]**	1	18,000

Notes:
(1) Column D = Column B x Column C.
(2) Parked bobtails, transports and tank cars should not be considered for aggregate capacity calculations.
(3) Do not consider containers that are not connected for use.
(4) For the purpose of this manual, “Aggregate Water Capacity” means any group of single ASME storage containers separated from each other by distances less than those stated in the aboveground containers column of Table 6.3.1.1.

Form 4.3
Additional Information on the LP-Gas Facility

☑ Existing Facility; Built to NFPA 58 Edition __**1995**___ ☐ Proposed Facility

a) Name of the Plant (if applicable) _____XYZ Propane _____

b) Type of LP-Gas Plant: ☐ Commercial ☑ Industrial ☐ Bulk Plant

c) Facility is located in ☐ Rural Area ☑ Suburban Area ☐ City Commercial Zone ☐ City Industrial Zone

d) Facility neighbors§: (Check all that apply) ☐ Agri. fields ☐ Commercial Bldgs ☐ Flammable Liquids Storage ☑ Industrial Activity (metal fabrication, cutting and welding, etc) ☐ Manufacturing ☐ Others (explain) ______________________

e) Geographic Location of Plant:
Address: ________________________________
____

f) Landmarks, if any: ________________________________
____

g) LP-Gas liquid supply by: (Check all that apply) ☐ Bobtail ☑ Truck Transport ☐ Rail Tank Car ☐ Pipeline

h) LP-Gas Distribution by: Plant (Check all that apply) ☐ Bobtail ☐ Truck Transport ☑ Vapor Piping ☐ Liquid Piping ☑ Dispensing or Vehicle fueling

i) Number of vehicle entrances: ☑ One ☐ Two ☐ More than two

j) Type of access roads to the plant: ☐ Rural ☑ City or Town ☐ Highway
(One check per line) Entrance 1 ☐ Dirt road ☐ Gravel road ☑ Paved
(One check per line) Entrance 2 ☐ Dirt road ☐ Gravel road ☐ Paved

k) Staff presence ☐ Not staffed ☑ Only during transfer operations ☐ Staffed always (24/7) ☐ Only during business hours ☐ Other (Explain) ____________________________

l) Location and distances to Assembly, Educational or Institutional Occupancies surrounding the facility, if any, within 250 ft from the facility boundary in the direction of the assets.
___Institutional or other occupancies do not lie within 250 ft., of the facility._____
____

m) Is an overview plot plan of the facility attached? ☑ Yes ☐ No

§ All properties either abutting the LP-Gas facility or within 250 feet of the container or transfer point nearest to facility boundary.

Form 5.3

Compliance with Code Requirements for Appurtenances on Containers Having a Water Capacity Greater Than 4,000 Gallons

A	B	C	D		E	F	G
Container #	**LP-Gas inlet to and outlet from the container****		**Enter Configur-ation Number**		**Total Number of Product Control Appurtenances**		**NFPA 58 Section Reference (2014edition)**
					Required by NFPA 58 (applicable edition)	**Installed on the container**	
1	**Vapor**	Inlet	5-2				5.7.4.2, Table 5.7.4.2 and 5.7.4.4
		Outlet	5-3	5-3-2	3	3	
	Liquid	Inlet	5-6	5-6A-2	4	3	
		Outlet	5-7	5-7B-2	4	4	

** If the container does not provide an opening for the specific function listed, enter 0 (zero) in columns E and F corresponding to that row.

Form 5.4

Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid-into-Containers

A	B	C	D	E	F
Item #	**Appurtenance (Either No. 1 or No. 2)****	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	√		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF	√		6.12.6
		Temperature sensitive element (fusible link) installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	√		6.12.6
		Manually operated remote shutoff feature provided for ESV.	√		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	√		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of size 1½ inch in diameter or larger on the other side.	√		6.12.5 and 6.19.2.6 (1)

		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection		N.A.	6.12.3
		BCK is designed for this specific application.		N.A.	6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.		N.A.	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.		N.A.	6.12.8
3	Debris Protection++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	√		6.19.2.5
4	Emergency discharge control	Flow through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention		N.A.	6.19.2.6 (3)

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

Form 5.5

Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal From Containers

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	√		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	√		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	√		6.12.6
		Manually operated remote shutoff feature provided for ESV.	√		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	√		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	√		6.12.5 and 6.19.2.6 (1)

		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
		Number of ESV's in liquid withdrawal service	1		

Note: If more than one ESV is installed in the facility, use one Form 5.5 for each ESV.

Form 5.6

Requirements for Vapor Transfer Lines 1¼-inch Diameter or Larger

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	√		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F	√		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	√		6.12.6
		Manually operated remote shutoff feature provided for ESV.	√		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	√		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.		N.A.	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	N.A.	N.A.	6.12.3
		BCK is designed for this specific application.	N.A.	N.A.	6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	N.A.	N.A.	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	N.A.	N.A.	6.12.8

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and it shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

Form 6.1
Evaluation of Physical Protection and Other Measures

A	B	C	D	E	F
#	Item	Features	Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment	√		6.19.5
2	Vehicle impact protection	Protection against vehicular (traffic) impacts on containers, transfer piping and other appurtenances is designed and provided commensurate with the size of vehicles and type of traffic in the facility. (Example protection systems include but not limited to (1) Guard rails, (2) Steel bollards or crash posts, (3) Raised sidewalks.	√		6.6.1.2, 6.9.3.10 and 6.20.3.2 (2)
3	Protection against corrosion	Provide protection against corrosion where piping is in contact with supports or corrosion causing substances.		√	6.9.3.11 and 6.17.1
Complete only 4A or 4B					
4A	Perimeter Fence	Is an industrial type or chain link fence of at least 6 ft high or equivalent protection provided to enclose (all around) container appurtenances, pumping equipment, loading and unloading and container filling facilities?	√		6.19.4.2
		Are at least two means of emergency egress (gates) from the enclosure provided? **NOTE: Write "N.A." (not applicable) if** (i) The area enclosed is less than 100 ft^2, or (ii) The point of transfer is within 3 ft of the gate, or containers are not filled within the enclosure		√	6.19.4.2 (A)
		Is a clearance of at least 3 feet all around to allow emergency access to the required means of egress provided?	√		6.19.4.2 (B)
	Guard Service	If a guard service is provided, does this service cover the LP-Gas plant and are the guard personnel provided with appropriate LP-Gas related training, per section 4.4 of NFPA 58?	NA		6.19.4.3
4B	Lock-in-Place devices	Are Lock-in-Place devices provided to prevent unauthorized use or operation of any container appurtenance, system valves, or equipment in lieu of the fence requirements above?	NA		6.19.4.2 (C)

Note: Fill only items 1, 2, 3, and 4A or 4B. Indicate with "NA" when not filling the "Yes" or "No" column.
‡ Indicate with "NA" if the facility is not operated at night.

Form 6.2
Assessment of Sources of Ignition and Adjacent Combustible Materials

A	B	C	D	E
#	Sources of Ignition and Requirements Pertaining to Adjacent Combustible Materials	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
		Yes	No	
1	Are combustible materials, weeds and tall grass not closer than 10 ft. from each container?	√		6.4.4.2
2	Is a distance at least 20 ft. provided between containers and tanks containing flammable liquids with flash point less than 200 ^oF (ex., gasoline, diesel)?	√		6.4.4.5
3	Are electrical equipment and wiring installed per code requirements?	√		6.23.2
4	Is open flame equipment located and used according to code?	√		6.23.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with.?	√		7.2.3.2
6	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided in the facility?	√		6.27.4.2
7	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided on each truck or trailer used to transport propane?	√		9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?	√		7.2.3.2 (B) and 9.4.10

Note: Insert “NA” in both “Yes” and “No” columns of any items that are not applicable.

Form 6.3

Separation Distances from Containers to Buildings, Property Lines that can be Built upon, Inter-container Distances, and Aboveground Flammable or Combustible Storage Tanks

A	B	C	D	E	F	G
#	**Container Size Range in gal (W.C.)**	**Separation between a property line, important building or other property and the <u>nearest</u> container which is**	**Minimum Distance (ft)**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	501 through 2,000	Above Ground	25	NA	NA	6.3.1, 6.3.2 and Table 6.3.1.1
		Underground or Mounded	10	NA	NA	
		Between containers	3	NA	NA	
2	2,001 through 30,000	Above Ground	50	√		
		Underground or Mounded	50	NA	NA	
		Between containers	5	NA	NA	
3	30,001 through 70,000	Above Ground	75	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	¼ sum of diameters of adjacent containers	NA	NA	
4	70,001 through 90,000	Above Ground	100	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	¼ sum of diameters of adjacent containers	NA	NA	
5	All sizes greater than 125 gal	Separation distance between a LP-Gas container and an above ground storage tank containing flammable or combustible liquids of flash points below 200 °F.	20	√		6.4.4.5 and 6.4.4.6

Note: If any of the container sizes indicated in the above form are not present in the facility, enter "NA" in both Yes and No columns

Form 6.4
Separation Distances between Points of Transfer and other Exposures

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr>
<tr><th rowspan="2">#</th><th colspan="2" rowspan="2">Type of Exposure within or outside the facility boundary</th><th rowspan="2">Check if exposure is present</th><th rowspan="2">Minimum Distance (ft)</th><th colspan="2">Is the Facility compliant?</th><th rowspan="2">NFPA 58 Section Reference (2014 Edition)</th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td colspan="2">Buildings, mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls</td><td></td><td>10</td><td>NA</td><td>NA</td><td rowspan="12">6.5.2
and
Table 6.5.2.1</td></tr>
<tr><td>2</td><td colspan="2">Buildings with other than at least 1-hour fire-rated walls</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>3</td><td colspan="2">Building wall openings or pits at or below the level of the point of transfer</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>4</td><td colspan="2">Line of adjoining property that can be built upon</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>5</td><td colspan="2">Outdoor places of public assembly, including school yards, athletic fields, and playgrounds</td><td></td><td>50</td><td>NA</td><td>NA</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Public ways, including public streets, highways, thoroughfares, and sidewalks</td><td>From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers.</td><td></td><td>10</td><td></td><td></td></tr>
<tr><td>From other points of transfer</td><td></td><td>25</td><td></td><td></td></tr>
<tr><td>7</td><td colspan="2">Driveways</td><td></td><td>5</td><td>NA</td><td>NA</td></tr>
<tr><td>8</td><td colspan="2">Mainline railroad track centerlines</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>9</td><td colspan="2">Containers other than those being filled</td><td></td><td>10</td><td>NA</td><td>NA</td></tr>
<tr><td>10</td><td colspan="2">Flammable and Class II combustible liquid dispensers and the fill connections of containers</td><td></td><td>10</td><td>NA</td><td>NA</td></tr>
<tr><td>11</td><td colspan="2">Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers</td><td></td><td>20</td><td></td><td></td></tr>
<tr><td>12</td><td colspan="2">LP-Gas dispensing device located close to a Class I liquid dispensing device.</td><td></td><td>10</td><td>NA</td><td>NA</td><td>6.25.4.3</td></tr>
</table>

NOTE: Place a checkmark in column C against an exposure that is present in or around the facility. Fill columns E or F for only those rows for which there is a checkmark in column C..

Form 6.7
Protection Against Vehicular Impact

<table>
<tr><th rowspan="2">#</th><th rowspan="2">System Protected</th><th colspan="2">Is physical protection provided?</th><th rowspan="2">Type of physical protection installed</th><th rowspan="2">NFPA 58 Section Reference (2014 Edition)</th><th></th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td>Storage containers</td><td></td><td>√</td><td colspan="2"></td><td>6.6.1.2
and
6.9.3.10</td></tr>
<tr><td>2</td><td>Transfer stations</td><td>√</td><td></td><td>Steel posts</td><td></td><td></td></tr>
<tr><td>3</td><td>Entryway into plant</td><td></td><td>√</td><td></td><td></td><td></td></tr>
</table>

Table 7.1
Distances to Various Types of Propane Hazards Under Different Release Models**

Model #	Details of the Propane Release Model Releases from or due to		Vapor Dispersion Distance to LFL (ft)	Explosion Hazard Distance (ft)	Fire Ball Radiation Distance (ft)
1a	Bobtail hose failure. Release of the entire inventory in the hose, quickly.	1” ID x 150 ft hose length	250	110	50
1b		1” ID x 120 ft hose length	230	103	45
1c		1” ID x 75 ft hose length	190	90	40
2a	Release of the inventory in a transfer piping 1" x 30 ft + @ 20 gpm for 10 min., due to failed excess flow valve.		135	120	25
2b	Release of the inventory in a transfer piping 2" x 30 ft + @80 gpm for 10 mins.		230	252	48
2c	Release of the inventory in a transfer piping 2” x 80 ft. @ 70 gpm for 10 mins.		328	235	74
2d	Release of the inventory in a transfer piping 2.5" x 30 ft @80 gpm for 10 mins.		269	252	59
2e	Release of the inventory in a transfer piping 3" x 30 ft + @100 gpm for 10 mins.		312	287	69
2f	Release of the inventory in a transfer piping 3" x 18 ft + @100 gpm for 10 mins.		256	284	55
3	Release from the container pressure relief valve		No ignitable vapor concentration at ground level		
4	Release from a 1” ID x 150 ft transfer piping to a vaporizer and reduced flow from a partially open excess flow valve @ 20 gpm for 10 min.		250	120	50
5	Leak from a corrosion hole in a transfer pipe at a back pressure of 130 psig (corresponding to 80 ºF) for 60 min. Hole size is ¼” ID.		110	120	5
6	Release of the entire inventory in a 2” ID x 20 ft., transfer hose.		195	90	40
6a	Release of the entire inventory in a 2.5 inch dia. transfer hose x 16 ft. length		215	98	45
6b	Release of the entire inventory in a 3-inch dia. transfer hose x 12 ft. length		230	100	46
7a	Transport hose blow down: Hose size 2" ID, 20 ft length release for 3min., from a Transport after the tank is filled.		25	30	<5
7b	Transport hose blow down: Hose size 2.5" ID, 16 ft length release for 3min., from a Transport after the tank is filled.		25	29	<5
7c	Transport hose blow down: Hose size 3" ID, 16 ft length release for 3min., from a Transport after the tank is filled.		31	36	<5

** Results from models described in Appendix B.

Form 7.1
Types of Occupancies[1] Near or Surrounding the LP-Gas Facility

Type of Occupancies	Model # from Table 7.1	Hazard Distance[2] (feet)	Is Occupancy located within the hazard distance from the Facility?	
			Yes	No
Assembly Occupancies (Places of worship, Libraries, Theaters and Auditoriums, Food or Drink Bars, Sports Stadiums, Amusement Parks, Transportation Centers, etc. with 50 or more people).	6B	230		√
Institutional Occupancies (Elderly Persons Home or Nursing Home, Hospitals, Alcohol & Drug Rehabilitation Centers, Prisons)	6B	230		√
Educational Occupancies (Elementary Schools, Day Care facilities, etc).	6B	230		√

NOTES: (1) Different types of occupancies are defined in NFPA 5000

(2) Table 7.1 provides a number of scenarios that can result in propane release, and the resulting area exposed for different ignition mechanisms. Determine the scenarios that are applicable to the facility, for the quantities that can be released, and enter the greatest value from Table 7.1. Use the hose diameters and length that will be used at the facility if they differ from the ones in Table 7.1 and recalculate the hazard distances using a spreadsheet method that is available at npga.org. Some scenarios may not be applicable to an installation because of other mitigation measures implemented, such as a hose management procedure to minimize the possibility of hose failure.

Form 7.2
Exposure to LP-Gas Facility from External Hazards

A	B	C	D
Item #	**Type of Neighboring Operation**	**Hazard exists to the LP-Gas Facility**	
		YES	**NO**
1	Petroleum and other hazardous material storage, wholesale dispensing, etc.		√
2	Metal cutting, welding, and metal fabrication		√
3	Industrial Manufacturing that can pose external hazards		√
4	Ports, rail yards and trans-shipment terminals handling flammable and explosive materials.		√
5	Other operations that may pose hazards (gasoline and other hazardous material dispensing stations, fertilizer storage, etc).		√

NOTE: If a particular activity indicated in column B does not exist, fill both “Yes” and “No” columns with “NA.”

Form 8.1
Data on the Responding Fire Department

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th></tr>
<tr><th>Item #</th><th colspan="2"><u>Data Item</u></th><th>Data Entry</th></tr>
<tr><td>1</td><td colspan="2">Name of the Fire Department (FD).</td><td>Suburban</td></tr>
<tr><td>2A</td><td colspan="2">Name of the person in the FD assisting with the data acquisition.</td><td>Don Miller</td></tr>
<tr><td>2B</td><td colspan="2">Position of the person in the FD assisting with the data acquisition.</td><td>Lieutenant</td></tr>
<tr><td>3A</td><td colspan="2">Date on which FD data was collected.</td><td>10/3/08</td></tr>
<tr><td>3B</td><td colspan="2">Name of the person collecting the data.</td><td>Bill Holmes</td></tr>
<tr><td>4</td><td colspan="2">Number of fire fighters on duty at any time.</td><td>10</td></tr>
<tr><td>5</td><td colspan="2">Average number of fire fighters available for response.</td><td>7</td></tr>
<tr><td>6A</td><td rowspan="2">Number of fire fighters qualified to</td><td>“Fire Fighter I” level.</td><td>3</td></tr>
<tr><td>6B</td><td>“Fire Fighter II” level.</td><td>4</td></tr>
<tr><td>7A</td><td rowspan="3">Number of fire fighters who would:</td><td>Respond on the first alarm to the facility.</td><td>5</td></tr>
<tr><td>7B</td><td>Respond on the first alarm and who are qualified to the operations level requirements of NFPA 472 or <u>similar</u> local requirements</td><td>3</td></tr>
<tr><td>7C</td><td>Respond on the first alarm with specific knowledge and training on the properties of LP-Gas and LP-Gas fires.</td><td>5</td></tr>
<tr><td>8A</td><td rowspan="2">Number of fire apparatus that have the capability to deploy a 125 gpm hose line supplied by onboard water for at least 4 minutes, and, which:</td><td>Are in service in the department.</td><td>2</td></tr>
<tr><td>8B</td><td>Would respond on a first alarm.</td><td>1</td></tr>
</table>

Form 8.2

Response Time Data for the Fire Departments

A	B	C	D	E
Company or Department	**Time in Minutes for**			
	Alarm Receipt & Handling	**Turnout**	**Travel**	**Total Time**
Suburban	60 s	3 min.	3 min.	7 min.

Note: Number in Column E = Sum of numbers from Columns B through D.

Form 8.3

Water Flow Rate and Total Water Volume Required to Cool Containers Exposed to a Fire

A	B	C	D	E	F	G	H
Item #	ASME Container Size (gallons)	Total Surface Area of each Container[1] (ft^2)	Surface Area of each container to be Cooled (ft^2)	Water flow rate required per container (gpm)	Number of containers of the size indicated ǂ	Total Water flow rate required (gpm)	Total volume of water required for 10 min (gal)
1	500	86	43	10.8			
	1,000	172	86	21.5			
	2,000	290	145	36.3			
	4,000	374	187	46.8			
	6,500	570	285	71.3			
	9,200	790	395	98.8			
	12,000	990	495	123.8			
	18,000	1,160	580	145.0	1	145	
	30,000	1,610	805	201.3			
	45,000	2,366	1,183	295.8			
	60,000	3,090	1,545	386.3			
	90,000	4,600	2,300	575.0			
	Other Size						
2a	Calculated water flow rate for container protection					145	
2b	Water flow rate rounded up to nearest multiple of 125					125	
3	Water for fire fighter protection, if required					250	
4	Total water flow rate and volume					500	5,000

Note: Column D = (1/2) x Column C Column E = 0.25 (gpm/ft^2) x Column D ;
Column G = Column F x Column E Column H = 10 x Column G
Line 2a, Column G and Column H are the sum of numbers in each row above line 2 of each column.
Line 4, Column G and Column H are the sum of numbers in rows 2b and 3.

ǂ Consider only 3 containers for water supply evaluations even if the number of containers in a group is more than 3. See Section 8.2.

1 ASME container approximate dimensions

Form 8.4
Evaluation of Water Availability in or Near the LP-Gas Facility

<table>
<tr><th>A</th><th>B</th><th>C</th><th colspan="3">D</th></tr>
<tr><th>Item #</th><th>Water from…</th><th>Available?</th><th colspan="3">Quantitative information</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Public supply or from another piped-in supply through one or more fire hydrants in or near the facility</td><td rowspan="4">X Yes ☐ No</td><td>Hydrant data</td><td>Distance from Container(s) on which water will be applied (feet)</td><td>Available water flow rate from all hydrants(1) (gpm)</td></tr>
<tr><td>Hydrant 1</td><td>50</td><td rowspan="3">1,000</td></tr>
<tr><td>Hydrant 2</td><td></td></tr>
<tr><td>Hydrant 3</td><td></td></tr>
<tr><td>2</td><td>A nearby static water source (stream, pond, lake, etc).</td><td>X Yes ☐ No</td><td colspan="3">Distance to water source = __5 Miles
Time to set up relay = _____ min.
Rate of delivery = ______ gpm</td></tr>
<tr><td>3</td><td>Only through mobile water tanker shuttle.</td><td>☐ Yes X No</td><td colspan="3">Time to set up shuttle = _____ min.
Sustainable flow rate = ______ gpm</td></tr>
</table>

(1) Obtain the available flow rate from the local municipal water authority or the entity that supplies water to the hydrant or conduct a test to determine total available flow rate.

10.3 Illustrative Example # 3

LP-Gas Facility:

A single 18,000 gallon container is located in a small urban bulk plant. The plant has a transport unloading station as well as bobtail loading stations. In addition, the plant also houses a cylinder filling operation within its facility boundary.

Other Facility Information:

1) The bulk plant is located in a high-density population area of the town. A nursing home is located within 250 ft. of the facility. There is also a shopping mall entrance within 250 ft. of the container.
2) A cylinder filling dock is 50 ft. from the container.
3) The container is filled from truck transport. The transport unloading station is 50 ft. NW of the container. The liquid line is 2" dia. for the transport unloading riser and 1-1/2 in. diameter for the bobtail loading station. The vapor lines are 1-1/4 in. diameter.
4) There is a single entrance gate to the bulk plant on the west side of the property.
5) The liquid withdrawal line is manifolded to feed multiple bobtail filling stations and the cylinder filling dock.
6) The container does not have any special protection. Also, no redundant & fail-safe system is provided for the LP-Gas plant. The plant is built to conform to NFPA 58, 1992 edition and fulfills all appurtenance requirements of that standard.
7) A single water hydrant is located within the bulk plant. This hydrant is supplied from the town/municipal water supply system.
8) The nearest fire department is at a distance of 3 miles and is staffed with career fire fighters at all times.

Figure 10.3 shows a schematic plan view of the LP-Gas facility used in Example 3.

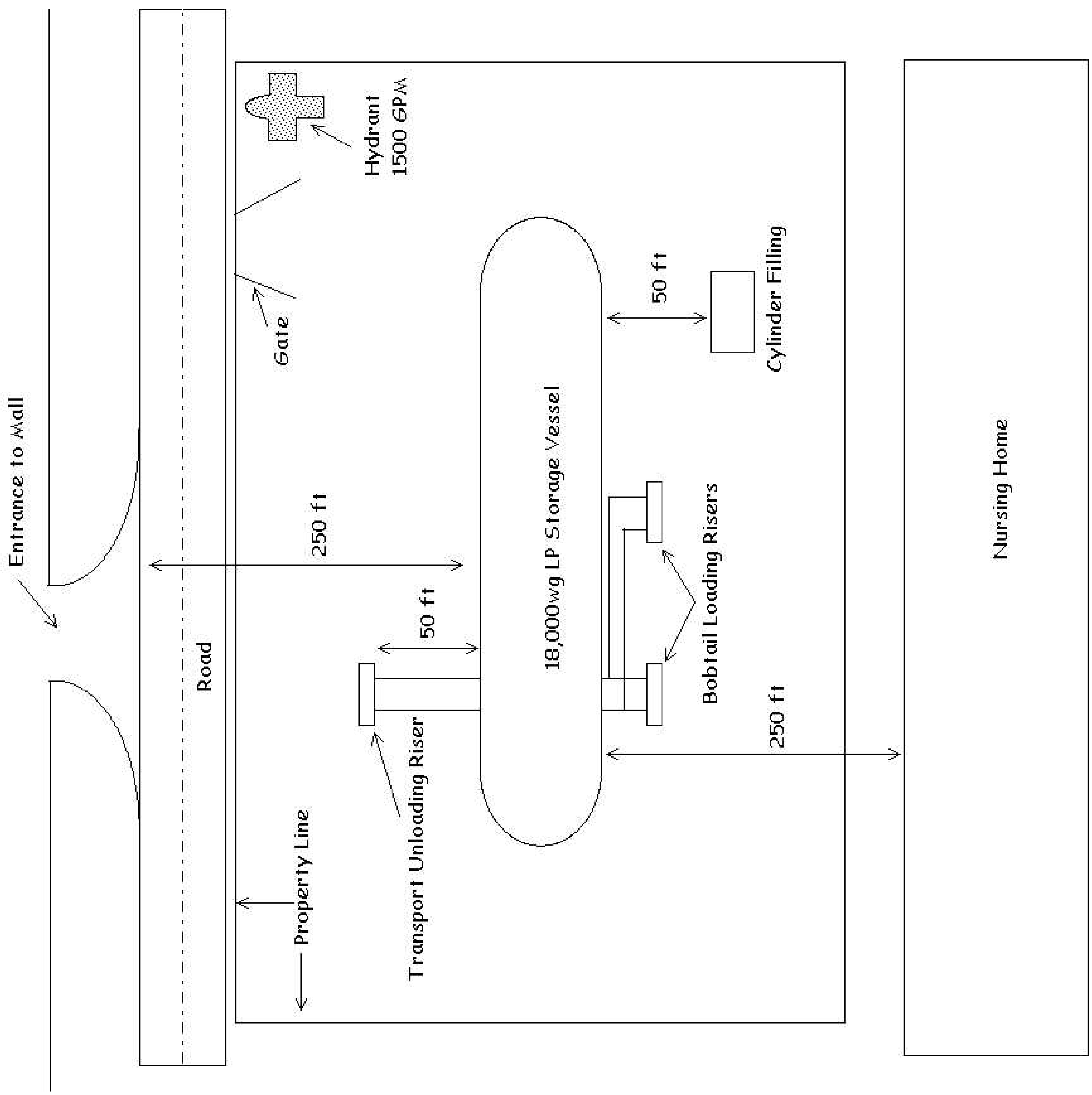


Figure 10.3 Schematic plan view of a LP-Gas facility used in Example 3

Form 4.1
Initial Data on the LP-Gas Facility

A	B	C	
Item #	Information Item	Data	
1	Name of the LP-Gas Plant Owner or Operator	LMN Propane	
2	Contact Name:		
3	Contact Telephone & Fax Numbers		
4	Contact Email Address		
5	Mailing Address	Street 1:	
		Street 2:	
		City, State, Zip:	Westfield, NJ

Form 4.2
Facility Storage Capacity

A	B	C	D
#	Individual Container Water Capacity (wc) (gallons)	Number of containers	Total Water Capacity (wc) of each container size (gallons)
1	500		
	1,000		
	2,000		
	4,000		
	10,000		
	18,000	1	18000
	30,000		
	60,000		
	Other:		
	Other:		
	Other:		
	Other:		
2	**Aggregate Water Capacity**	1	18000

Notes:
(1) Column D = Column B x Column C.
(2) Parked bobtails, transports and tank cars should not be considered for aggregate capacity calculations.
(3) Do not consider containers that are not connected for use.
(4) For the purpose of this manual, "Aggregate Water Capacity" means any group of single ASME storage containers separated from each other by distances less than those stated in the aboveground containers column of Table 6.3.1.1.

Form 4.3
Additional Information on the LP-Gas Facility

☑ Existing Facility; Built to NFPA 58 Edition __**1992**___ ☐ Proposed Facility

a) Name of the Plant (if applicable) _____LMN Plant _____

b) Type of LP-Gas Plant: ☐ Commercial ☑ Industrial ☐ Bulk Plant

c) Facility is located in ☐ Rural Area ☐ Suburban Area ☑ City Commercial Zone ☐ City Industrial Zone

d) Facility neighbors[§]: ☐ Agri. fields ☐ Commercial Bldgs ☐ Flammable Liquids Storage
(Check all that apply) ☑ Industrial Activity (metal fabrication, cutting and welding, etc)
☐ Manufacturing ☐ Others (explain) ______________________

e) Geographic Location of Plant:
Address: ________________________________
____

f) Landmarks, if any: ________________________________
____

g) LP-Gas liquid supply by: ☐ Bobtail ☑ Truck Transport ☐ Rail Tank Car
(Check all that apply) ☐ Pipeline

h) LP-Gas Distribution by: ☑ Bobtail ☐ Truck Transport ☑ Vapor Piping
Plant (Check all that apply) ☐ Liquid Piping ☑ Dispensing or Vehicle fueling

i) Number of vehicle entrances: ☑ One ☐ Two ☐ More than two

j) Type of access roads to the plant: ☐ Rural ☑ City or Town ☐ Highway
(One check per line) Entrance 1 ☐ Dirt road ☐ Gravel road ☑ Paved
(One check per line) Entrance 2 ☐ Dirt road ☐ Gravel road ☐ Paved

k) Staff presence ☐ Not staffed ☑ Only during transfer operations
☐ Staffed always (24/7) ☐ Only during business hours
☐ Other (Explain) ____________________________

l) Location and distances to Assembly, Educational or Institutional Occupancies surrounding the facility, if any, within 250 ft from the facility boundary in the direction of the assets.
___Institutional or other occupancies do exist within 250 ft., of the facility._____

m) Is an overview plot plan of the facility attached? ☑ Yes ☐ No

§ All properties either abutting the LP-Gas facility or within 250 feet of the container or transfer point nearest to facility boundary.

Form 5.3

Compliance with Code Requirements for Appurtenances on Containers Having a Water Capacity Greater Than 4,000 Gallons

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th><th colspan="2">D</th><th>E</th><th>F</th><th>G</th></tr>
<tr><th rowspan="2">Container #</th><th rowspan="2" colspan="3">LP-Gas inlet to and outlet from the container**</th><th rowspan="2" colspan="2">Enter Configur-ation Number</th><th colspan="2">Total Number of Product Control Appurtenances</th><th rowspan="2">NFPA 58 Section Reference (2014 edition)</th></tr>
<tr><th>Required by NFPA 58 (applicable edition)</th><th>Installed on the container</th></tr>
<tr><td rowspan="4">1</td><td rowspan="2" colspan="2">Vapor</td><td>Inlet</td><td>5-2</td><td>5-2-1</td><td>3</td><td>3</td><td>5.7.4.2, Table 5.7.4.2 and 5.7.4.4</td></tr>
<tr><td>Outlet</td><td>5-3</td><td>5-3-2</td><td>3</td><td>3</td><td></td></tr>
<tr><td rowspan="2" colspan="2">Liquid</td><td>Inlet</td><td>5-6</td><td>5-6A-2</td><td>4</td><td>4</td><td></td></tr>
<tr><td>Outlet</td><td>5-7</td><td>5-7B-2</td><td>4</td><td>4</td><td></td></tr>
<tr><td colspan="8"></td><td></td></tr>
</table>

** If the container does not provide an opening for the specific function listed, enter 0 (zero) in columns E and F corresponding to that row

Form 5.4

Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid-into-Containers

<table>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr>
<tr><th rowspan="2">Ite m #</th><th rowspan="2">Appurtenance (Either No. 1 or No. 2)**</th><th rowspan="2">Appurtenance Provided with the Feature</th><th colspan="2">Installed in the facility?</th><th rowspan="2">NFPA 58 Section Reference (2014 edition)</th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">Emergency shutoff valve (ESV)

(Ref § 6.12)</td><td>Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.</td><td>N.A.</td><td>N.A.</td><td>6.12.2</td></tr>
<tr><td>Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF</td><td>N.A.</td><td>N.A.</td><td>6.12.6</td></tr>
<tr><td>Temperature sensitive element (fusible link) installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.</td><td>N.A.</td><td>N.A.</td><td>6.12.6</td></tr>
<tr><td>Manually operated remote shutoff feature provided for ESV.</td><td>N.A.</td><td>N.A.</td><td>6.12.12.1</td></tr>
<tr><td>Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.</td><td>N.A.</td><td>N.A.</td><td>6.12.12.2</td></tr>
<tr><td>An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of size 1½ inch in diameter or larger on the other side.</td><td>N.A.</td><td>N.A.</td><td>6.12.5 and 6.19.2.6 (1)</td></tr>
</table>

		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	N.A.	N.A.	6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	√		6.12.3
		BCK is designed for this specific application.	√		6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	√		6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
3	Debris Protection++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	√		6.19.2.5
4	Emergency Discharge Control	Flow through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention	N.A.	N.A.	6.19.2.6 (3)

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

Form 5.5
Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal From Containers

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	√		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	√		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	√		6.12.6
		Manually operated remote shutoff feature provided for ESV.	√		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	√		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	√		6.12.5 and 6.19.2.6 (1)

		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
		Number of ESV's in liquid withdrawal service	2		

Note: If more than one ESV is installed in the facility, use one Form 5.5 for each ESV.

Form 5.6

Requirements for Vapor Transfer Lines 1¼-inch Diameter or Larger

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	√		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F		√	6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.		√	6.12.6
		Manually operated remote shutoff feature provided for ESV.	√		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	√		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	N.A.	N.A.	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	N.A.	N.A.	6.12.3
		BCK is designed for this specific application.	N.A.	N.A.	6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	N.A.	N.A.	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	N.A.	N.A.	6.12.8

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and it shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

Form 6.1
Evaluation of Physical Protection and Other Measures

A	B	C	D	E	F
#	Item	Features	Installed in the facility? Yes	No	NFPA 58 Section Reference (2014 Edition)
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment	√		6.19.5
2	Vehicle impact protection	Protection against vehicular (traffic) impacts on containers, transfer piping and other appurtenances is designed and provided commensurate with the size of vehicles and type of traffic in the facility. (Example protection systems include but not limited to (1) Guard rails, (2) Steel bollards or crash posts, (3) Raised sidewalks.	√		6.6.1.2, 6.9.3.10 and 6.20.3.2 (2)
3	Protection against corrosion	Provide protection against corrosion where piping is in contact with supports or corrosion causing substances.		√	6.9.3.11 and 6.17.1
Complete only 4A or 4B					
4A	Perimeter Fence	Is an industrial type or chain link fence of at least 6 ft high or equivalent protection provided to enclose (all around) container appurtenances, pumping equipment, loading and unloading and container filling facilities?	√		6.19.4.2
4A	Perimeter Fence	Are at least two means of emergency egress (gates) from the enclosure provided? **NOTE: Write "N.A." (not applicable) if** (i) The area enclosed is less than 100 ft^2, or (ii) The point of transfer is within 3 ft of the gate, or containers are not filled within the enclosure	√		6.19.4.2 (A)
4A	Perimeter Fence	Is a clearance of at least 3 feet all around to allow emergency access to the required means of egress provided?	√		6.19.4.2 (B)
4A	Guard Service	If a guard service is provided, does this service cover the LP-Gas plant and are the guard personnel provided with appropriate LP-Gas related training, per section 4.4 of NFPA 58?	NA		6.19.4.3
4B	Lock-in-Place devices	Are Lock-in-Place devices provided to prevent unauthorized use or operation of any container appurtenance, system valves, or equipment in lieu of the fence requirements above?	NA		6.19.4.2 (C)

Note: Fill only items 1, 2, 3, and 4A or 4B. Indicate with "NA" when not filling the "Yes" or "No" column.
‡ Indicate with "NA" if the facility is not operated at night.

Form 6.2
Assessment of Sources of Ignition and Adjacent Combustible Materials

A	B	C	D	E
#	Sources of Ignition and Requirements Pertaining to Adjacent Combustible Materials	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
		Yes	No	
1	Are combustible materials, weeds and tall grass not closer than 10 ft. from each container?	√		6.4.4.3
2	Is a distance at least 20 ft. provided between containers and tanks containing flammable liquids with flash point less than 200 °F (ex., gasoline, diesel)?	√		6.4.4.6
3	Are electrical equipment and wiring installed per code requirements?	√		6.23.2
4	Is open flame equipment located and used according to code?	√		6.23.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with.?	√		7.2.3.2
6	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided in the facility?	√		6.27.4.2
7	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided on each truck or trailer used to transport propane?	√		9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?	√		7.2.3.2 (B) and 9.4.10

Note: Insert "NA" in both "Yes" and "No" columns of any items that are not applicable.

Form 6.3

Separation Distances from Containers to Buildings, Property Lines that can be Built upon, Inter-container Distances, and Aboveground Flammable or Combustible Storage Tanks

A	B	C	D	E	F	G
#	**Container Size Range in gal (W.C.)**	**Separation between a property line, important building or other property and the <u>nearest</u> container which is**	**Minimum Distance (ft)**	**Is the Facility compliant?** Yes	No	**NFPA 58 Section Reference (2014 Edition)**
1	501 through 2,000	Above Ground	25	NA	NA	6.3.1, 6.3.2 and Table 6.3.1.1
		Underground or Mounded	10	NA	NA	
		Between containers	3	NA	NA	
2	2,001 through 30,000	Above Ground	50	√		
		Underground or Mounded	50	NA	NA	
		Between containers	5	NA	NA	
3	30,001 through 70,000	Above Ground	75	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	¼ sum of diameters of adjacent containers	NA	NA	
4	70,001 through 90,000	Above Ground	100	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	¼ sum of diameters of adjacent containers	NA	NA	
5	All sizes greater than 125 gal	Separation distance between a LP-Gas container and an above ground storage tank containing flammable or combustible liquids of flash points below 200 ºF.	20	N.A.	N.A.	6.4.4.5 and 6.4.4.6

Note: If any of the container sizes indicated in the above form are not present in the facility, enter "NA" in both Yes and No columns.

Form 6.4
Separation Distances between Points of Transfer and other Exposures

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr>
<tr><th rowspan="2">#</th><th rowspan="2" colspan="2">Type of Exposure within or outside the facility boundary</th><th rowspan="2">Check if exposure is present</th><th rowspan="2">Minimum Distance (ft)</th><th colspan="2">Is the Facility compliant?</th><th rowspan="2">NFPA 58 Section Reference (2014 Edition)</th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td colspan="2">Buildings, mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls</td><td></td><td>10</td><td>NA</td><td>NA</td><td rowspan="12">6.5.2
and
Table 6.5.2.1</td></tr>
<tr><td>2</td><td colspan="2">Buildings with other than at least 1-hour fire-rated walls</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>3</td><td colspan="2">Building wall openings or pits at or below the level of the point of transfer</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>4</td><td colspan="2">Line of adjoining property that can be built upon</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>5</td><td colspan="2">Outdoor places of public assembly, including school yards, athletic fields, and playgrounds</td><td>√</td><td>50</td><td></td><td>√</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Public ways, including public streets, highways, thoroughfares, and sidewalks</td><td>From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers.</td><td>√</td><td>10</td><td>√</td><td></td></tr>
<tr><td>From other points of transfer</td><td>√</td><td>25</td><td>√</td><td></td></tr>
<tr><td>7</td><td colspan="2">Driveways</td><td></td><td>5</td><td>NA</td><td>NA</td></tr>
<tr><td>8</td><td colspan="2">Mainline railroad track centerlines</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>9</td><td colspan="2">Containers other than those being filled</td><td></td><td>10</td><td>NA</td><td>NA</td></tr>
<tr><td>10</td><td colspan="2">Flammable and Class II combustible liquid dispensers and the fill connections of containers</td><td></td><td>10</td><td>NA</td><td>NA</td></tr>
<tr><td>11</td><td colspan="2">Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers</td><td></td><td>20</td><td>NA</td><td>NA</td></tr>
<tr><td>12</td><td colspan="2">LP-Gas dispensing device located close to a Class I liquid dispensing device.</td><td></td><td>10</td><td>NA</td><td>NA</td><td>6.25.4.3</td></tr>
</table>

NOTE: Place a checkmark in column C against an exposure that is present in or around the facility. Fill columns E or F for only those rows for which there is a checkmark in column C.

Form 6.5
Special Protection Measures –Passive Systems

A	B	C	D		E
#	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Container Insulation	Insulation provided on each of the containers?	NA	NA	6.27.5.1
		Insulation material complies with the requirements of NFPA 58?	NA	NA	6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?	NA	NA	6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58.	NA	NA	6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?	NA	NA	6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.	NA	NA	6.6.6.1 and 6.27.5.4

Form 6.7
Protection Against Vehicular Impact

#	System Protected	Is physical protection provided?		Type of physical protection installed	NFPA 58 Section Reference (2014 Edition)
		Yes	No		
1	Storage containers	√		Chain link fence	6.6.1.2 and 6.9.3.10
2	Transfer stations	√		Concrete bollards	
3	Entry way into the plant	√		Locked steel gate	

Table 7.1
Distances to Various Types of Propane Hazards Under Different Release Models**

Model #	Details of the Propane Release Model Releases from or due to		Vapor Dispersion Distance to LFL (ft)	Explosion Hazard Distance (ft)	Fire Ball Radiation Distance (ft)
1a	Bobtail hose failure. Release of the entire inventory in the hose, quickly.	1” ID x 150 ft hose length	250	110	50
1b		1” ID x 120 ft hose length	230	103	45
1c		1” ID x 75 ft hose length	190	90	40
2a	Release of the inventory in a transfer piping 1" x 30 ft + @ 20 gpm for 10 min., due to failed excess flow valve.		135	120	25
2b	Release of the inventory in a transfer piping 2" x 30 ft + @80 gpm for 10 mins.		230	252	48
2c	Release of the inventory in a transfer piping 2” x 80 ft. @ 70 gpm for 10 mins.		328	235	74
2d	Release of the inventory in a transfer piping 2.5" x 30 ft @80 gpm for 10 mins.		269	252	59
2e	Release of the inventory in a transfer piping 3" x 30 ft + @100 gpm for 10 mins.		312	287	69
2f	Release of the inventory in a transfer piping 3" x 18 ft + @100 gpm for 10 mins.		256	284	55
3	Release from the container pressure relief valve		No ignitable vapor concentration at ground level		
4	Release from a 1” ID x 150 ft transfer piping to a vaporizer and reduced flow from a partially open excess flow valve @ 20 gpm for 10 min.		250	120	50
5	Leak from a corrosion hole in a transfer pipe at a back pressure of 130 psig (corresponding to 80 ºF) for 60 min. Hole size is ¼” ID.		110	120	5
6	Release of the entire inventory in a 2” ID x 20 ft., transfer hose.		195	90	40
6a	Release of the entire inventory in a 2.5 inch dia. transfer hose x 16 ft. length		215	98	45
6b	Release of the entire inventory in a 3-inch dia. transfer hose x 12 ft. length		230	100	46
7a	Transport hose blow down: Hose size 2" ID, 20 ft length release for 3min., from a Transport after the tank is filled.		25	30	<5
7b	Transport hose blow down: Hose size 2.5" ID, 16 ft length release for 3min., from a Transport after the tank is filled.		25	29	<5
7c	Transport hose blow down: Hose size 3" ID, 16 ft length release for 3min., from a Transport after the tank is filled.		31	36	<5

** Results from models described in Appendix B.

Form 7.1
Types of Occupancies[(1)] Near or Surrounding the LP-Gas Facility

Type of Occupancies	Model # from Table 7.1	Hazard Distance[(2)] (feet)	Is Occupancy located within the hazard distance from the Facility?	
			Yes	No
Assembly Occupancies (Places of worship, Libraries, Theaters and Auditoriums, Food or Drink Bars, Sports Stadiums, Amusement Parks, Transportation Centers, etc. with 50 or more people).	6B	230		√
Institutional Occupancies (Elderly Persons Home or Nursing Home, Hospitals, Alcohol & Drug Rehabilitation Centers, Prisons)	6B	230		√
Educational Occupancies (Elementary Schools, Day Care facilities, etc).	6B	230		√

NOTES: (1) Different types of occupancies are defined in NFPA 5000

(2) Table 7.1 provides a number of scenarios that can result in propane release, and the resulting area exposed for different ignition mechanisms. Determine the scenarios that are applicable to the facility, for the quantities that can be released, and enter the greatest value from Table 7.1. Use the hose diameters and length that will be used at the facility if they differ from the ones in Table 7.1 and recalculate the hazard distances using a spreadsheet method that is available at npga.org. Some scenarios may not be applicable to an installation because of other mitigation measures implemented, such as a hose management procedure to minimize the possibility of hose failure.

Form 7.2
Exposure to LP-Gas Facility from External Hazards

A	B	C	D
Item #	Type of Neighboring Operation	Hazard exists to the LP-Gas Facility	
		YES	NO
1	Petroleum and other hazardous material storage, wholesale dispensing, etc.		√
2	Metal cutting, welding, and metal fabrication		√
3	Industrial Manufacturing that can pose external hazards		√
4	Ports, rail yards and trans-shipment terminals handling flammable and explosive materials.		√
5	Other operations that may pose hazards (gasoline and other hazardous material dispensing stations, fertilizer storage, etc).		√

NOTE: If a particular activity indicated in column B does not exist, fill both “Yes” and “No” columns with “NA.”

Form 8.1
Data on the Responding Fire Department

A	B		C
Item #	**Data Item**		**Data Entry**
1	Name of the Fire Department (FD).		Urban F.D.
2A	Name of the person in the FD assisting with the data acquisition.		Jack
2B	Position of the person in the FD assisting with the data acquisition.		Captain
3A	Date on which FD data was collected.		4/28/07
3B	Name of the person collecting the data.		Bill
4	Number of fire fighters on duty at any time.		12
5	Average number of fire fighters available for response.		8
6A	Number of fire fighters qualified to	"Fire Fighter I" level.	4
6B		"Fire Fighter II" level.	8
7A	Number of fire fighters who would:	Respond on the first alarm to the facility.	6
7B		Respond on the first alarm and who are qualified to the operations level requirements of NFPA 472 or similar local requirements	4
7C		Respond on the first alarm with specific knowledge and training on the properties of LP-Gas and LP-Gas fires.	6
8A	Number of fire apparatus that have the capability to deploy a 125 gpm hose line supplied by onboard water for at least 4 minutes, and which:	Are in service in the department.	6
8B		Would respond on a first alarm.	4

Form 8.2
Response Time data for the Fire Departments

A	B	C	D	E
Company or Department	**Time in Minutes for**			
	Alarm Receipt & Handling	**Turnout**	**Travel**	**Total Time**
Urban	60s	2 min.	5	8 min.

Note: Number in Column E = Sum of numbers from Columns B through D.

Form 8.3

Water Flow Rate and Total Water Volume Required to Cool Containers Exposed to a Fire

A	B	C	D	E	F	G	H
Item #	**ASME Container Size (gallons)**	**Total Surface Area of each Container[1] (ft^2)**	**Surface Area of each container to be Cooled (ft^2)**	**Water flow rate required per container (gpm)**	**Number of containers of the size indicated ǂ**	**Total Water flow rate required (gpm)**	**Total volume of water required for 10 min (gal)**
1	500	86	43	10.8			
	1,000	172	86	21.5			
	2,000	290	145	36.3			
	4,000	374	187	46.8			
	6,500	570	285	71.3			
	9,200	790	395	98.8			
	12,000	990	495	123.8			
	18,000	1,160	580	145.0	1	145	
	30,000	1,610	805	201.3			
	45,000	2,366	1,183	295.8			
	60,000	3,090	1,545	386.3			
	90,000	4,600	2,300	575.0			
	Other Size						
2a	Calculated water flow rate for container protection					145	
2b	Water flow rate rounded up to nearest multiple of 125					250	
3	Water for fire fighter protection, if required					250	
4	Total water flow rate and volume					500	5,000

Note: Column D = (1/2) x Column C — Column E = 0.25 (gpm/ft^2) x Column D ;
Column G = Column F x Column E — Column H = 10 x Column G
Line 2a, Column G and Column H are the sum of numbers in each row above line 2 of each column.
Line 4, Column G and Column H are the sum of numbers in rows 2b and 3.

ǂ Consider only 3 containers for water supply evaluations even if the number of containers in a group is more than 3. See Section 8.2.

1 ASME container approximate dimensions

Form 8.4
Evaluation of Water Availability in or Near the LP-Gas Facility

<table>
<tr><th>A</th><th>B</th><th>C</th><th colspan="3">D</th></tr>
<tr><th>Item #</th><th>Water from…</th><th>Available?</th><th colspan="3">Quantitative information</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Public supply or from another piped-in supply through one or more fire hydrants in or near the facility</td><td rowspan="4">X Yes ☐ No</td><td>Hydrant data</td><td>Distance from Container(s) on which water will be applied (feet)</td><td>Available water flow rate from all hydrants(1) (gpm)</td></tr>
<tr><td>Hydrant 1</td><td>100</td><td rowspan="3">1,500</td></tr>
<tr><td>Hydrant 2</td><td></td></tr>
<tr><td>Hydrant 3</td><td></td></tr>
<tr><td>2</td><td>A nearby static water source (stream, pond, lake, etc).</td><td>☐ Yes X No</td><td colspan="3">Distance to water source = _______ Feet
Time to set up relay = _____ min.
Rate of delivery = _______ gpm</td></tr>
<tr><td>3</td><td>Only through mobile water tanker shuttle.</td><td>☐ Yes X No</td><td colspan="3">Time to set up shuttle = _____ min.
Sustainable flow rate = _______ gpm</td></tr>
</table>

(1) **Obtain the available flow rate from the local municipal water authority or the entity that supplies water to the hydrant or conduct a test to determine total available flow rate**

10.4 Illustrative Example # 4

LP-Gas Facility:

A new LP-Gas facility is proposed with four 30,000 gallon containers and is to be located in an industrial bulk plant. The facility is to be designed with a railroad unloading terminal and transport unloading stations. The LPG delivery to customers will be by bobtails. Several bobtail loading ports are proposed in the facility. The facility is in an industrial park.

Other Facility Information:

1) This bulk plant is proposed to be located in an area where there are properties close to the facility. Also, there is population surrounding the facility, which may be within the hazard distance. A movie theater complex exists within 200 ft. of the facility.
2) Two gates through which the transports enter and leave the facility are proposed.
3) Transport unloading risers are 2 inches in diameter. Vapor equalization lines are 1-1/4 inches diameter.
4) Liquid outlet lines (2 inch diameter) are manifolded to feed multiple bobtail loading stations.
5) The containers do not have any special protection. However, a redundant & fail-safe system is to be provided in the LP-Gas plant. The plant is to be built to conform to the 2014 edition of NFPA 58 and will fulfill all appurtenance requirements.
6) Two water hydrants are located within the bulk plant. These hydrants are supplied from the town/municipal water supply system.
7) The nearest fire department is located a distance of 1 mile from the facility and is staffed with career fire fighters at all times.

Figure 10.4 shows a schematic plan view of the LP-Gas facility used in Example 4.

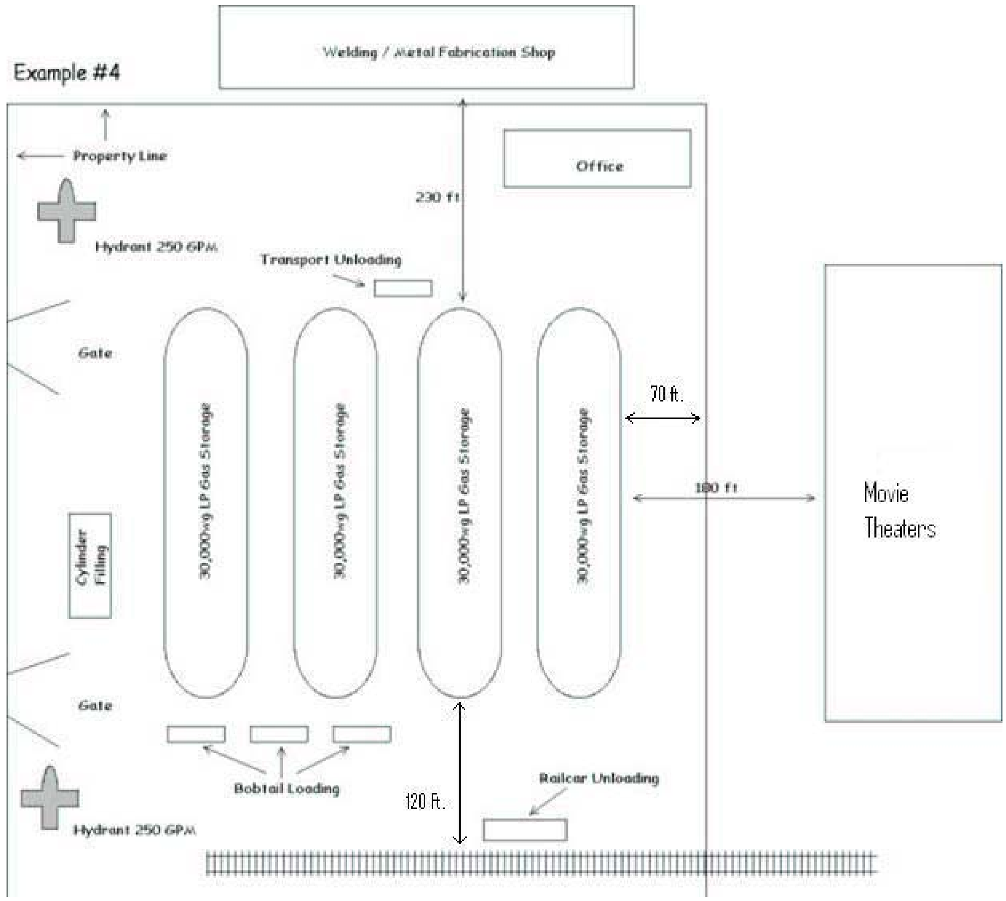


Figure 10.4 Schematic plan view of a LP-Gas facility used in Example 4

Form 4.1
Initial Data on the LP-Gas Facility

A	B	C	
Item #	Information Item	Data	
1	Name of the LP-Gas Plant Owner or Operator	**PQR Propane**	
2	Contact Name:		
3	Contact Telephone & Fax Numbers		
4	Contact Email Address		
5	Mailing Address	Street 1:	
		Street 2:	
		City, State, Zip:	Central City

Form 4.2
Facility Storage Capacity [1,2,3]

A	B	C	D
Item #	Individual Container Water Capacity (w.c.) (gallons)	Number of containers	Total Water Capacity (w.c.) of each container size (gallons)
1	500		
	1,000		
	2,000		
	4,000		
	10,000		
	18,000		
	30,000	4	120,000
	60,000		
	Other:		
	Other:		
	Other:		
	Other:		
2	**Aggregate Water Capacity[4]**		**120,000**

Notes:
(1) Column D = Column B x Column C.
(2) Parked bobtails, transports and tank cars should not be considered for aggregate capacity calculations.
(3) Do not consider containers that are not connected for use.
(4) For the purpose of this manual, "Aggregate Water Capacity" means any group of single ASME storage containers separated from each other by distances less than those stated in the aboveground containers column of Table 6.3.1.1.

Form 4.3
Additional Information on the LP-Gas Facility

☐ Existing Facility; Built to NFPA 58 Edition _____ ☑ Proposed Facility (**2014 Edition)**

a) Name of the Plant (if applicable) _____PQR Propane _____
b) Type of LP-Gas Plant: ☐ Commercial ☐ Industrial ☑ Bulk Plant

c) Facility is located in ☐ Rural Area ☐ Suburban Area ☐ City Commercial Zone ☑ City Industrial Zone

d) Facility neighbors§: (Check all that apply) ☐ Agri. fields ☐ Commercial Bldgs ☐ Flammable Liquids Storage ☐ Industrial Activity (metal fabrication, cutting and welding, etc) ☑ Manufacturing ☐ Others (explain) ______________________

e) Geographic Location of Plant:
Address: ________________________________
____

f) Landmarks, if any: ________________________________
____

g) LP-Gas liquid supply by: (Check all that apply) ☐ Bobtail ☑ Truck Transport ☑ Rail Tank Car ☐ Pipeline

h) LP-Gas Distribution by: Plant (Check all that apply) ☑ Bobtail ☐ Truck Transport ☐ Vapor Piping ☐ Liquid Piping ☐ Dispensing or Vehicle fueling

i) Number of vehicle entrances: ☐ One ☑ Two ☐ More than two

j) Type of access roads to the plant: ☐ Rural ☑ City or Town ☐ Highway
(One check per line) Entrance 1 ☐ Dirt road ☐ Gravel road ☑ Paved
(One check per line) Entrance 2 ☐ Dirt road ☐ Gravel road ☑ Paved

k) Staff presence ☐ Not staffed ☐ Only during transfer operations ☐ Staffed always (24/7) ☑ Only during business hours ☐ Other (Explain) ____________________________

l) Location and distances to Assembly, Educational or Institutional Occupancies surrounding the facility, if any, within 250 ft from the facility boundary in the direction of the assets.
___An Assembly occupancy is present within 200 ft., of the facility._____
____

m) Is an overview plot plan of the facility attached? ☑ Yes ☐ No

§ All properties either abutting the LP-Gas facility or within 250 feet of the container or transfer point nearest to facility boundary.

Form 5.3

Compliance with Code Requirements for Appurtenances on Containers Having a Water Capacity Greater Than 4,000 Gallons

A	B	C	D		E	F	G
Container #	LP-Gas inlet to and outlet from the container**		Enter Configur-ation Number		Total Number of Product Control Appurtenances		NFPA 58 Section Reference (2014 edition)
					Required by NFPA 58 (applicable edition)	Installed on the container	
1	Vapor	Inlet	5-2	5-2-3	2	2	5.7.4.2, Table 5.7.4.2 and 5.7.4.4
		Outlet	5-3	5-3-2	2	2	
	Liquid	Inlet	5-6	5-6A-2	2	2	
		Outlet	5-7	5-7A-1	2	2	

** If the container does not provide an opening for the specific function listed, enter 0 (zero) in columns E and F corresponding to that row.

Form 5.4

Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid-into-Containers

A	B	C	D	E	F
Item #	Appurtenance (Either No. 1 or No. 2)**	Appurtenance Provided with the Feature	Installed in the facility?		NFPA 58 Section Reference (2014 edition)
			Yes	No	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	√		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F	√		6.12.6
		Temperature sensitive element (fusible link) installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	√		6.12.6
		Manually operated remote shutoff feature provided for ESV.	√		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	√		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of size 1½ inch in diameter or larger on the other side.	√		6.12.5 and 6.19.2.6 (1)

		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	N.A.		6.12.3
		BCK is designed for this specific application.	N.A.		6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	N.A.		6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	N.A.		6.12.8
3	Debris Protection++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	√		6.19.2.5
4	Emergency Discharge Control	Flow through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention	N.A.		6.19.2.6 (3)

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

Form 5.5
Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal From Containers

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	√		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	√		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	√		6.12.6
		Manually operated remote shutoff feature provided for ESV.	√		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	√		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	√		6.12.5 and 6.19.2.6 (1)

		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
		Number of ESV's in liquid withdrawal service	2		

Note: If more than one ESV is installed in the facility, use one Form 5.5 for each ESV.

Form 5.6
Requirements for Vapor Transfer Lines 1¼-inch Diameter or Larger

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	√		6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F	√		6.12.6
		Temperature sensitive element installed within 5 ft from the nearest end of the hose or swivel type piping connected to liquid transfer line.	√		6.12.6
		Manually operated remote shutoff feature provided for ESV.	√		6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	√		6.12.12.2
		An ESV is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	√		6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection	√		6.12.3
		BCK is designed for this specific application.	√		6.12.4
		A BCK is installed on each leg of a multi leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	√		6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	√		6.12.8

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and it shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

Form 5.7
Evaluation of Redundant Fail-Safe Design

A	B		C	D	E	F
Item #	Description		Features	Installed in the facility? Yes	No	NFPA 58 Section Reference (2014 edition)
1	Container sizes for which the appurtenances are provided		Appurtenances and redundant fail-safe equipment are provided for <u>each</u> container of water capacity 2,001 gal. through 30,000 gal.	√		6.28.3 and 6.28.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve having internal excess-flow valve	√		6.28.3.1 and 6.28.3.2
			Positive shutoff valve installed as close as practical to the internal valve	√		6.28.3.4
3	Liquid or vapor inlet		Internal valve having internal excess-flow valve or backflow check valve	√		6.28.3.5
			Positive shutoff valve installed as close as possible to the internal valve or the back flow check valve	√		6.28.3.5
4	Railcar transfer	Flow into or out of railroad tank car	Approved emergency shutoff valves installed in the transfer hose or the swivel-type piping at the tank car end	√		6.19.2.6 (1) and 6.28.4
		Flow only into railroad tank car	Approved emergency shutoff valve or back-flow check valve installed in the transfer hose or the swivel-type piping at the tank car end	√		6.19.2.6 (2) and 6.28.4
5	Cargo tank transfer		Protection provided in accordance with 6.12	N.A.		6.28.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (Fire) actuation	√		6.28.4.2
			Actuated by a hose pull-away due to vehicle motion	√		6.28.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft of the point of transfer	√		6.28.4.3 (A)
			Another remote shutdown station between 25 ft and 100 ft of the transfer point	√		6.28.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and all primary valves (Internal and Emergency Valves)	√		6.28.4.3
			Signs complying with the requirements of 6.26.4.3 (C) provided	√		6.28.4.3 (C)

Note: If the facility does not have a rail terminal, write the word NA in both the "Yes" column and the "No" column in item 4 of this Form in the railroad tank car row. Similar option is also available if there is no cargo tank vehicle transfer station.

Form 6.1
Evaluation of Physical Protection and Other Measures

A	B	C	D	E	F
#	Item	Features	Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment	√		6.19.5
2	Vehicle impact protection	Protection against vehicular (traffic) impacts on containers, transfer piping and other appurtenances is designed and provided commensurate with the size of vehicles and type of traffic in the facility. (Example protection systems include but not limited to (1) Guard rails, (2) Steel bollards or crash posts, (3) Raised sidewalks.	√		6.6.1.2, 6.9.3.10 and 6.20.3.2 (2)
3	Protection against corrosion	Provide protection against corrosion where piping is in contact with supports or corrosion causing substances.	√		6.9.3.11 and 6.17.1
Complete only 4A or 4B					
4A	Perimeter Fence	Is an industrial type or chain link fence of at least 6 ft high or equivalent protection provided to enclose (all around) container appurtenances, pumping equipment, loading and unloading and container filling facilities?	√		6.19.4.2
		Are at least two means of emergency egress (gates) from the enclosure provided? **NOTE: Write "N.A." (not applicable) if** (i) The area enclosed is less than 100 ft^2, or (ii) The point of transfer is within 3 ft of the gate, or containers are not filled within the enclosure	√		6.19.4.2 (A)
		Is a clearance of at least 3 feet all around to allow emergency access to the required means of egress provided?	√		6.19.4.2 (B)
	Guard Service	If a guard service is provided, does this service cover the LP-Gas plant and are the guard personnel provided with appropriate LP-Gas related training, per section 4.4 of NFPA 58?	NA		6.19.4.3
4B	Lock-in-Place devices	Are Lock-in-Place devices provided to prevent unauthorized use or operation of any container appurtenance, system valves, or equipment in lieu of the fence requirements above?	NA		6.19.4.2 (C)

Note: Fill only items 1, 2, 3, and 4A or 4B. Indicate with "NA" when not filling the "Yes" or "No" column.
‡ Indicate with "NA" if the facility is not operated at night.

Form 6.2
Assessment of Sources of Ignition and Adjacent Combustible Materials

A	B	C	D	E
#	**Sources of Ignition and Requirements Pertaining to Adjacent Combustible Materials**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
		Yes	**No**	
1	Are combustible materials, weeds and tall grass not closer than 10 ft. from each container?	√		6.4.4.2
2	Is a distance at least 20 ft. provided between containers and tanks containing flammable liquids with flash point less than 200 °F (ex., gasoline, diesel)?	√		6.4.4.6
3	Are electrical equipment and wiring installed per code requirements?	√		6.23.2
4	Is open flame equipment located and used according to code?	√		6.23.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with.?	√		7.2.3.2
6	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided in the facility?	√		6.27.4.2
7	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 Lbs. and having a B:C rating provided on each truck or trailer used to transport propane?	√		9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?	√		7.2.3.2 (B) and 9.4.10

Note: Insert "NA" in both "Yes" and "No" columns of any items that are not applicable.

Form 6.3

Separation Distances from Containers to Buildings, Property Lines that can be Built upon, Inter-container Distances, and Aboveground Flammable or Combustible Storage Tanks

A	B	C	D	E	F	G
#	**Container Size Range in gal (W.C.)**	**Separation between a property line, important building or other property and the nearest container which is**	**Minimum Distance (ft)**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	501 through 2,000	Above Ground	25	NA	NA	6.3.1, 6.3.2 and Table 6.3.1.1
		Underground or Mounded	10	NA	NA	
		Between containers	3	NA	NA	
2	2,001 through 30,000	Above Ground	50	√		
		Underground or Mounded	50	NA	NA	
		Between containers	5	√		
3	30,001 through 70,000	Above Ground	75	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	¼ sum of diameters of adjacent containers	NA	NA	
4	70,001 through 90,000	Above Ground	100	NA	NA	
		Underground or Mounded	50	NA	NA	
		Between containers	¼ sum of diameters of adjacent containers	NA	NA	
5	All sizes greater than 125 gal	Separation distance between a LP-Gas container and an above ground storage tank containing flammable or combustible liquids of flash points below 200 ºF.	20	N.A.	N.A.	6.4.4.5 and 6.4.4.6

Note: If any of the container sizes indicated in the above form are not present in the facility, enter "NA" in both Yes and No columns.

Form 6.4
Separation Distances between Points of Transfer and other Exposures

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr>
<tr><th rowspan="2">#</th><th colspan="2" rowspan="2">Type of Exposure within or outside the facility boundary</th><th rowspan="2">Check if exposure is present</th><th rowspan="2">Minimum Distance (ft)</th><th colspan="2">Is the Facility compliant?</th><th rowspan="2">NFPA 58 Section Reference (2014 Edition)</th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td colspan="2">Buildings, mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls</td><td></td><td>10</td><td>NA</td><td>NA</td><td rowspan="12">6.5.2
and
Table 6.5.2.1</td></tr>
<tr><td>2</td><td colspan="2">Buildings with other than at least 1-hour fire-rated walls</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>3</td><td colspan="2">Building wall openings or pits at or below the level of the point of transfer</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>4</td><td colspan="2">Line of adjoining property that can be built upon</td><td></td><td>25</td><td>NA</td><td>NA</td></tr>
<tr><td>5</td><td colspan="2">Outdoor places of public assembly, including school yards, athletic fields, and playgrounds</td><td>√</td><td>50</td><td>√</td><td></td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Public ways, including public streets, highways, thoroughfares, and sidewalks</td><td>From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers.</td><td>√</td><td>10</td><td>√</td><td></td></tr>
<tr><td>From other points of transfer</td><td>√</td><td>25</td><td>√</td><td></td></tr>
<tr><td>7</td><td colspan="2">Driveways</td><td></td><td>5</td><td>NA</td><td>NA</td></tr>
<tr><td>8</td><td colspan="2">Mainline railroad track centerlines</td><td></td><td>25</td><td>√</td><td></td></tr>
<tr><td>9</td><td colspan="2">Containers other than those being filled</td><td></td><td>10</td><td>NA</td><td>NA</td></tr>
<tr><td>10</td><td colspan="2">Flammable and Class II combustible liquid dispensers and the fill connections of containers</td><td></td><td>10</td><td>NA</td><td>NA</td></tr>
<tr><td>11</td><td colspan="2">Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers</td><td></td><td>20</td><td>NA</td><td>NA</td></tr>
<tr><td>12</td><td colspan="2">LP-Gas dispensing device located close to a Class I liquid dispensing device.</td><td></td><td>10</td><td>NA</td><td>NA</td><td>6.25.4.3</td></tr>
</table>

NOTE: Place a checkmark in column C against an exposure that is present in or around the facility. Fill columns E or F for only those rows for which there is a checkmark in column C.

Form 6.5
Special Protection Measures –Passive Systems

A	B	C	D		E
#	**Special Protection Option**	**Question**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Container Insulation	Insulation provided on each of the containers?	NA		6.27.5.1
		Insulation material complies with the requirements of NFPA 58?	NA		6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?	NA		6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58.	NA		6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?	NA		6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.	NA		6.6.6.1 and 6.27.5.4

Form 6.7
Protection Against Vehicular Impact

#	**System Protected**	**Is physical protection provided?**		**Type of physical protection installed**	**NFPA 58 Section Reference (2014 Edition)**	
		Yes	**No**			
1	Storage containers	√		Highway Barriers		6.6.1.2 and 6.9.3.10
2	Transfer stations	√		Concrete Bollards		
3	Entry way into the plant	√		Steel Reinforced Gate		

Table 7.1
Distances to Various Types of Propane Hazards Under Different Release Models**

Model #	Details of the Propane Release Model Releases from or due to		Vapor Dispersion Distance to LFL (ft)	Explosion Hazard Distance (ft)	Fire Ball Radiation Distance (ft)
1a	Bobtail hose failure. Release of the entire inventory in the hose, quickly.	1” ID x 150 ft hose length	250	110	50
1b		1” ID x 120 ft hose length	230	103	45
1c		1” ID x 75 ft hose length	190	90	40
2a	Release of the inventory in a transfer piping 1" x 30 ft + @ 20 gpm for 10 min., due to failed excess flow valve.		135	120	25
2b	Release of the inventory in a transfer piping 2" x 30 ft + @80 gpm for 10 mins.		230	252	48
2c	Release of the inventory in a transfer piping 2” x 80 ft. @ 70 gpm for 10 mins.		328	235	74
2d	Release of the inventory in a transfer piping 2.5" x 30 ft @80 gpm for 10 mins.		269	252	59
2e	Release of the inventory in a transfer piping 3" x 30 ft + @100 gpm for 10 mins.		312	287	69
2f	Release of the inventory in a transfer piping 3" x 18 ft + @100 gpm for 10 mins.		256	284	55
3	Release from the container pressure relief valve		No ignitable vapor concentration at ground level		
4	Release from a 1” ID x 150 ft transfer piping to a vaporizer and reduced flow from a partially open excess flow valve @ 20 gpm for 10 min.		250	120	50
5	Leak from a corrosion hole in a transfer pipe at a back pressure of 130 psig (corresponding to 80 ºF) for 60 min. Hole size is ¼” ID.		110	120	5
6	Release of the entire inventory in a 2” ID x 20 ft., transfer hose.		195	90	40
6a	Release of the entire inventory in a 2.5 inch dia. transfer hose x 16 ft. length		215	98	45
6b	Release of the entire inventory in a 3-inch dia. transfer hose x 12 ft. length		230	100	46
7a	Transport hose blow down: Hose size 2" ID, 20 ft length release for 3min., from a Transport after the tank is filled.		25	30	<5
7b	Transport hose blow down: Hose size 2.5" ID, 16 ft length release for 3min., from a Transport after the tank is filled.		25	29	<5
7c	Transport hose blow down: Hose size 3" ID, 16 ft length release for 3min., from a Transport after the tank is filled.		31	36	<5

** Results from models described in Appendix B.

Form 7.1
Types of Occupancies[1] Near or Surrounding the LP-Gas Facility

Type of Occupancies	Model # from Table 7.1	Hazard Distance[2] (feet)	Is Occupancy located within the hazard distance from the Facility? Yes	No
Assembly Occupancies (Places of worship, Libraries, Theaters and Auditoriums, Food or Drink Bars, Sports Stadiums, Amusement Parks, Transportation Centers, etc. with 50 or more people).	6B	230	√	
Institutional Occupancies (Elderly Persons Home or Nursing Home, Hospitals, Alcohol & Drug Rehabilitation Centers, Prisons)	6B	230		√
Educational Occupancies (Elementary Schools, Day Care facilities, etc).	6B	230		√

NOTES: (1) Different types of occupancies are defined in NFPA 5000

(2) Table 7.1 provides a number of scenarios that can result in propane release, and the resulting area exposed for different ignition mechanisms. Determine the scenarios that are applicable to the facility, for the quantities that can be released, and enter the greatest value from Table 7.1. Use the hose diameters and length that will be used at the facility if they differ from the ones in Table 7.1 and recalculate the hazard distances using a spreadsheet method that is available at npga.org. Some scenarios may not be applicable to an installation because of other mitigation measures implemented, such as a hose management procedure to minimize the possibility of hose failure.

Form 7.2
Exposure to LP-Gas Facility from External Hazards

A	B	C	D
Item #	Type of Neighboring Operation	Hazard exists to the LP-Gas Facility	
		YES	NO
1	Petroleum and other hazardous material storage, wholesale dispensing, etc.		√
2	Metal cutting, welding, and metal fabrication	√	
3	Industrial Manufacturing that can pose external hazards		√
4	Ports, rail yards and trans-shipment terminals handling flammable and explosive materials.		√
5	Other operations that may pose hazards (gasoline and other hazardous material dispensing stations, fertilizer storage, etc).		√

NOTE: If a particular activity indicated in column B does not exist, fill both "Yes" and "No" columns with "NA."

Form 8.1
Data on the Responding Fire Department

A	B		C
Item #	**Data Item**		**Data Entry**
1	Name of the Fire Department (FD).		City F.D.
2A	Name of the person in the FD assisting with the data acquisition.		Charles Holt
2B	Position of the person in the FD assisting with the data acquisition.		Chief
3A	Date on which FD data was collected.		5/23/09
3B	Name of the person collecting the data.		Roger Mills
4	Number of fire fighters on duty at any time.		10
5	Average number of fire fighters available for response.		8
6A	Number of fire fighters qualified to	"Fire Fighter I" level.	4
6B		"Fire Fighter II" level.	6
7A	Number of fire fighters who would:	Respond on the first alarm to the facility.	8
7B		Respond on the first alarm and who are qualified to the operations level requirements of NFPA 472 or <u>similar</u> local requirements	8
7C		Respond on the first alarm with specific knowledge and training on the properties of LP-Gas and LP-Gas fires.	8
8A	Number of fire apparatus that have the capability to deploy a 125 gpm hose line supplied by onboard water for at least 4 minutes, and, which:	Are in service in the department.	3
8B		Would respond on a first alarm.	2

Form 8.2
Response Time data for the Fire Departments

A	B	C	D	E
Company or Department	**Time in Minutes for**			
	Alarm Receipt & Handling	**Turnout**	**Travel**	**Total Time**
City F.D.	60s	2 min.	90s	4.5 min.

Note: Number in Column E = Sum of numbers from Columns B through D.

Form 8.3

Water Flow Rate and Total Water Volume Required to Cool Containers Exposed to a Fire

A	B	C	D	E	F	G	H
Item #	**ASME Container Size (gallons)**	**Total Surface Area of each Container[1] (ft^2)**	**Surface Area of each container to be Cooled (ft^2)**	**Water flow rate required per container (gpm)**	**Number of containers of the size indicatedǂ**	**Total Water flow rate required (gpm)**	**Total volume of water required for 10 min (gal)**
1	500	86	43	10.8			
	1,000	172	86	21.5			
	2,000	290	145	36.3			
	4,000	374	187	46.8			
	6,500	570	285	71.3			
	9,200	790	395	98.8			
	12,000	990	495	123.8			
	18,000	1,160	580	145.0			
	30,000	1,610	805	201.3	4	604	
	45,000	2,366	1,183	295.8			
	60,000	3,090	1,545	386.3			
	90,000	4,600	2,300	575.0			
	Other Size						
2a	Calculated water flow rate for container protection					604	
2b	Water flow rate rounded up to nearest multiple of 125					625	
3	Water for fire fighter protection, if required					250	
4	Total water flow rate and volume					875	8,750

Note: Column D = (1/2) x Column C; Column E = 0.25 (gpm/ft^2) x Column D ;
Column G = Column F x Column E; Column H = 10 x Column G
Line 2a, Column G and Column H are the sum of numbers in each row above line 2 of each column.
Line 4, Column G and Column H are the sum of numbers in rows 2b and 3.

ǂ Consider only 3 containers for water supply evaluations even if the number of containers in a group is more than 3. See Section 8.2.

1 ASME container approximate dimensions

Form 8.4
Evaluation of Water Availability in or Near the LP-Gas Facility

<table>
<tr><th>A</th><th>B</th><th>C</th><th colspan="3">D</th></tr>
<tr><th>Item #</th><th>Water from…</th><th>Available?</th><th colspan="3">Quantitative information</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Public supply or from another piped-in supply through one or more fire hydrants in or near the facility</td><td rowspan="4">☒ Yes ☐ No</td><td>Hydrant data</td><td>Distance from Container(s) on which water will be applied (feet)</td><td>Available water flow rate from all hydrants(1) (gpm)</td></tr>
<tr><td>Hydrant 1</td><td>75</td><td rowspan="3">500</td></tr>
<tr><td>Hydrant 2</td><td>90</td></tr>
<tr><td>Hydrant 3</td><td></td></tr>
<tr><td>2</td><td>A nearby static water source (stream, pond, lake, etc).</td><td>☐ Yes ☒ No</td><td colspan="3">Distance to water source = _______ Feet
Time to set up relay = _____ min.
Rate of delivery = ______ gpm</td></tr>
<tr><td>3</td><td>Only through mobile water tanker shuttle.</td><td>☐ Yes ☒ No</td><td colspan="3">Time to set up shuttle = _____ min.
Sustainable flow rate = ______ gpm</td></tr>
</table>

(1) Obtain the available flow rate from the local municipal water authority or the entity that supplies water to the hydrant or conduct a test to determine total available flow rate.

<u>Evaluation Summary for the Proposed LP-Gas Facility</u>

Form 9.2
Analysis Summary on Exposure from and to the LP-Gas Facility

A	B	C	D	E
Item #	**CHAPTER Title**	**Section & Title**	**Reference FORM #**	**Number of "Yes" checked**
1	Exposure to and from Other Properties	7.1 Exposure to off-site properties and persons from in-plant propane releases	7.1	1
		7.2 Exposure to propane facility from external events.	7.2	1

If the entry number in column E ("Yes"), Form 9.2 corresponding to Form 7.1 is greater than zero, consider one or more of the following design alternatives.

1 Consider moving the container or the transfer point to a different location, if possible and space exists, so that the property or the person is beyond the hazard distance.
2 Provide "Redundant and Fail-safe Product Control Measures". Complete Form 9.4 to ensure compliance.
3 Institute other technical measures such as installing gas and flame detectors (connected to facility shut down systems), sounding alarm outside facility premises, etc.
4 Institute administrative controls such as additional training for personnel, more frequent inspections of hoses and transfer piping, etc.

If the entry number in column E ("Yes"), Form 9.2 corresponding to Form 7.2 is greater than zero, consider one or more of the following design alternatives.

1 Implement procedures to monitor neighboring activity.
2 Install means in the adjacent plant to shut down the LP-Gas plant in case of an emergency in that plant.

Form 9.3
Analysis Summary on Fire Department Evaluations

A	B	C	D	E	F
Item #	**CHAPTER Title**	**Section & Title**	**Reference FORM #**	**Number "zeros" entered in Column C, Lines 6 through 8 of Form 8.1**	**Number of "Yes" checked in Column C of Form 8.4**
1	Fire department capability, adequacy of water supply and Emergency Planning	8.1 Data on the Fire Department	8.1	0	
2		8.2 Fire response water needs and availability	8.4		1

If the entry number in row 1, Column E of Form 9.3 is greater than zero, consider one or more of the following design alternatives.

1 Discuss with the local Fire Department the needs of the LP-Gas facility and the evaluation results on the capability and training inadequacies of the Department.

2 Consider developing a cadre of personnel within the LP-Gas facility to respond to emergencies.

3 Institute container special protection system based on active protection approaches or passive approaches. Complete Form 9.6 and Form 9.7 below.

If the entry number in row 2, Column F of Form 9.3 is equal to zero, consider one or more of the following design alternatives.

1 Provide special protection (other than water spray or monitor systems) to containers, satisfying the requirements of section 6.27.5 of NFPA 58, 2014 edition. Complete Form 9.6 to ensure compliance.

Consider implementing the various options indicated in Table 9.1.

Form 9.6
Special Protection Measures –Passive Systems

A	B	C	D		E
Item #	**Special Protection Option**	**Question**	**Proposed for the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Container insulation	Insulation provided on each of the containers?		√	6.27.5.1
		Insulation material complies with the requirements of section 6.25.5.1 of NFPA 58?		√	6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?		√	6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58.		√	6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?		√	6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.		√	6.6.6.1 and 6.27.5.4

Since this is a newly proposed LPG-Gas plant, the information developed in this Fire Safety Analysis must be communicated to local responders for inclusion in their emergency planning.

Interactive Appendix A
Fill-in Forms
(2014 Edition of NFPA 58)

This Appendix contains a set of forms copied from the different chapters in this manual. The form number corresponds to the respective forms in chapters 4 through 9; the first number digit represents the chapter number. Where the forms refer to a figure, it is understood that they refer to the figures shown in the main body of the manual.

How to Use the Forms in this Section

This document contains tables with fill-in blanks, or form fields, in which you enter information. These tables are made of cells, and the ones in which you may enter information contain gray shading.

The following types of form fields are included in this Appendix:

> **Regular Text:** Accepts text, numbers, symbols, or spaces.
>
> **Number:** Allows a number only. If you enter a letter into this field, it will change to a zero after you leave the field.
>
> **Calculation:** Uses a formula to calculate numbers, such as the sum of two columns, which automatically appears in another column. Users cannot fill in or change this field, even though it contains gray shading. **Users must click in another number field to activate the calculations.**
>
> **Checkbox:** Shows the selection state of an item. When the box is empty, or unchecked, click it to make an X appear. When the box is checked and contains an X, click the box to remove it. Examples: Unchecked: ☐ Checked: ☑

The form fields are already set up to accept only a certain type of input (numbers only or numbers and letters) and contain the formulas needed for automatically performing calculations. Users are not permitted to use the other fields in the forms (for example, change Item #s or values already in the form).

Form 4.1
Initial Data on the LP-Gas Facility

A	B	C	
Item #	**Information Item**	**Data**	
1	Name of the LP-Gas Facility Owner or Operator		
2	Contact Name		
3	Contact Telephone & Fax Numbers		
4	Contact Email Address		
5	Mailing Address	Street 1:	
		Street 2:	
		City, State, Zip:	

Form 4.2
Facility Storage Capacity [1,2,3,5]

A	B	C	D
Item #	**Individual Container Water Capacity (w.c.) (gallons)**	**Number of containers**	**Total Water Capacity (w.c.) of each container size (gallons)**
1	500		
	1,000		
	2,000		
	4,000		
	10,000		
	18,000		
	30,000		
	60,000		
	Other:		
	Other:		
	Other:		
	Other:		
2	**Aggregate Water Capacity[4]**		0

Notes:

(1) Column D = Column B x Column C.

(2) Parked bobtails, transports and tank cars should not be considered for aggregate capacity calculations.

(3) Do not consider containers that are not connected for use.

(4) For the purpose of this manual, "Aggregate Water Capacity" means any group of single ASME storage containers separated from each other by distances less than those stated in the aboveground containers column of Table 6.3.1.

(5) This form contains formulas that will automatically calculate results based on the values entered in the related cells. To activate the calculations, click in another number field, such as one in Column C.

If the aggregate water capacity (w.c.) of the LP-Gas facility is less than or equal to 4,000 gallons, no further assessment is required.

YOU CAN STOP HERE.

Form 4.3
Additional Information on the LP-Gas Facility

☐ Existing Facility; Built to NFPA 58 Edition ____________________ ☐ Proposed Facility

a) Name of the Facility (if applicable): ____

b) Type of LP-Gas Facility: ☐ Commercial ☐ Industrial ☐ Bulk Plant

c) Facility is located in: ☐ City Industrial Zone ☐ Suburban Area ☐ Rural Area
☐ City Commercial Zone

d) Facility neighbors[§]: ☐ Agri Fields ☐ Commercial Bldgs. ☐ Flammable Liquids Storage
(Check all that apply) ☐ Industrial Activity (metal fabrication, cutting and welding, etc.)
☐ Manufacturing ☐ Others (explain) ____________________

e) Geographic Location of Facility/Address: ____________________________________
____

f) Landmarks, if any: ____
____

g) LP-Gas liquid supply by: ☐ Bobtail ☐ Truck Transport ☐ Rail Tank Car
(Check all that apply) ☐ Pipeline

h) LP-Gas Distribution by: ☐ Liquid Piping ☐ Truck Transport ☐ Vapor Piping Plant
(Check all that apply): ☐ Bobtail ☐ Dispensing or Vehicle Liquid Fueling

i) Number of Vehicle Entrances: ☐ One ☐ Two ☐ More than two

j) Type of Access Roads to the Facility: ☐ Rural ☐ City or Town ☐ Highway
(One check per line) Entrance 1: ☐ Dirt road ☐ Gravel road ☐ Paved
(One check per line) Entrance 2: ☐ Dirt road ☐ Gravel road ☐ Paved

k) Staff presence: ☐ Not staffed ☐ Only during transfer operations
☐ Staffed always (24/7) ☐ Only during business hours
☐ Other (Explain) ____

l) Location and distances to Assembly, Educational or Institutional Occupancies surrounding the facility, if any, within 250 feet from the facility boundary in the direction of the assets:

____
____

m) Overview plot plan of the facility attached? ☐ Yes ☐ No

§ All properties either abutting the LP-Gas facility or within 250 feet of the container or transfer point nearest to facility boundary.

Form 5.1

Compliance with Code Requirements for Appurtenances on Containers of 4,000 Gallons Water Capacity or Less

<table>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th></tr>
<tr><th rowspan="2">Container #</th><th rowspan="2">Service Configuration Subfigure (in Figure 5-1)</th><th colspan="2">Number of Product Control Appurtenances</th><th rowspan="2">NFPA 58 Section Reference (2014 edition)</th></tr>
<tr><th>Required by NFPA 58 (applicable edition)</th><th>Installed on the Container</th></tr>
<tr><td>1</td><td></td><td></td><td></td><td rowspan="6">5.7.4.1,
Table 5.7.4.1 (B)
and
5.7.4.4</td></tr>
<tr><td>2</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td><td></td></tr>
<tr><td>6</td><td></td><td></td><td></td></tr>
<tr><td>7</td><td></td><td></td><td></td><td></td></tr>
</table>

If, in Form 5.1, any one of the numbers in column D is less than the number in Column C of the corresponding row, then these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

Form 5.2
Compliance with Code Requirements for Appurtenances on Containers Having a Water Capacity Greater Than 4,000 Gallons

A	B	C	D		E	F	G
Container #	**LP-Gas inlet to and outlet from the container****		**Enter Configuration Number**		**Total Number of Product Control Appurtenances**		**NFPA 58 Section Reference (2014 edition)**
					Required by NFPA 58 (applicable edition)	**Installed on the container**	
1	**Vapor**	Inlet	5-2				5.7.4.2, Table 5.7.4.2 and 5.7.4.3
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				
2	**Vapor**	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				
3	**Vapor**	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				
4	**Vapor**	Inlet	5-2				
		Outlet	5-3				
	Liquid	Inlet	5-6				
		Outlet	5-7				

** If the container does not provide an opening for the specific function listed, enter 0 (zero) in columns E and F corresponding to that row.

If in Form 5.2 any one of the numbers in column F is less than the number in Column E of the corresponding row, these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

Form 5.3

Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid-into-Containers

A	B	C	D	E	F
Item #	Appurtenance (Either No. 1 or No. 2)**	Appurtenance Provided with the Feature	Installed in the facility? Yes	No	NFPA 58 Section Reference (2014 edition)
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	☐	☐	6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF.	☐	☐	6.12.6
		Temperature-sensitive element (fusible link) installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	☐	☐	6.12.6
		Manually operated remote shutoff feature provided for ESV.	☐	☐	6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	☐	☐	6.12.12.2
		An ESV is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel-type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☐	☐	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☐	☐	6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection.	☐	☐	6.12.3
		BCK is designed for this specific application.	☐	☐	6.12.4
		A BCK is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☐	☐	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☐	☐	6.12.8
3	Debris protection ++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	☐	☐	6.19.2.5
4	Emergency discharge control	Flow-through facility hose used to transfer LP-Gas from non-metered cargo tank vehicle into containers will stop within 20 seconds of a complete hose separation without human intervention.	☐	☐	6.19.2.6 (3)

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

++ Retrofit required for existing facilities by July 1, 2011.

Form 5.4
Requirements for Transfer Lines of 1½-inch Diameter or Larger, Liquid Withdrawal from Containers

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	☐	☐	6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF.	☐	☐	6.12.6
		Temperature-sensitive element installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	☐	☐	6.12.6
		Manually operated remote shutoff feature provided for ESV.	☐	☐	6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	☐	☐	6.12.12.2
		An ESV is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel-type connection on one side and to a header of 1½ inch in diameter or larger on the other side.	☐	☐	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☐	☐	6.12.8
		Number of ESV's in liquid withdrawal service			

Note: If more than one ESV is installed in the facility, use one Form 5.4 for each ESV.

Form 5.5
Requirements for Vapor Transfer Lines 1¼-inch Diameter or Larger

A	B	C	D	E	F
Item #	**Appurtenance**	**Appurtenance Provided with the Feature**	**Installed in the facility?**		**NFPA 58 Section Reference (2014 edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.12)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	☐	☐	6.12.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF.	☐	☐	6.12.6
		Temperature-sensitive element installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	☐	☐	6.12.6
		Manually operated remote shutoff feature provided for ESV.	☐	☐	6.12.12.1
		Manual shutoff device provided at a remote location, not less than 25 ft., and not more than 100 ft. from the ESV in the path of egress.	☐	☐	6.12.12.2
		An ESV is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel-type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	☐	☐	6.12.5 and 6.19.2.6 (1)
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☐	☐	6.12.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection.	☐	☐	6.12.3
		BCK is designed for this specific application.	☐	☐	6.12.4
		A BCK is installed on each leg of a multi-leg piping each of which is connected to a hose or a swivel-type connection on one side and to a header of 1-1/4 inch in diameter or larger on the other side.	☐	☐	6.12.5
		Breakaway protection is provided such that in any pull-away break will occur on the hose or swivel-type connection side while retaining intact the valves and piping on the plant side.	☐	☐	6.12.8

** In lieu of an emergency shutoff valve, the backflow check valve (BCK) is only permitted when flow is only into the container and it shall have a metal-to-metal seat or a primary resilient seat with metal backup, not hinged with a combustible material (6.12.3, 6.12.4).

If a check mark is made in the "No" column of any one of Form 5.3, Form 5.4 or Form 5.5, then these items must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

If the LP-Gas facility is designed using ALTERNATE PROVISIONS for the installation of ASME CONTAINERS, then continue the analysis below. Otherwise skip Section 5.3 and go to Chapter 6.

Form 5.6
Evaluation of Redundant Fail-Safe Design

A	B		C	D	E	F
Item #	**Description**		**Features**	**Installed in the facility?** **Yes**	**No**	**NFPA 58 Section Reference (2014 edition)**
1	Container sizes for which the appurtenances are provided		Appurtenances and redundant fail-safe equipment are provided for <u>each</u> container of water capacity 2,001 gal. through 30,000 gal.	☐	☐	6.28.3 and 6.28.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve having internal excess-flow valve	☐	☐	6.28.3.1 and 6.28.3.2
			Positive shutoff valve installed as close as practical to the internal valve	☐	☐	6.28.3.4
3	Liquid or vapor inlet		Internal valve having internal excess-flow valve or backflow check valve (BCK)	☐	☐	6.28.3.5
			Positive shutoff valve installed as close as possible to the internal valve or the backflow check valve (BCK)	☐	☐	6.28.3.5
4	Railcar transfer	Flow into or out of railroad tank car	Approved emergency shutoff valves installed in the transfer hose or the swivel-type piping at the tank car end	☐	☐	6.19.2.6 (1) and 6.28.4
		Flow only into railroad tank car	Approved emergency shutoff valve or back-flow check valve (BCK) installed in the transfer hose or the swivel-type piping at the tank car end	☐	☐	6.19.2.6 (2) and 6.28.4
5	Cargo tank transfer		Protection provided in accordance with 6.12	☐	☐	6.28.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (fire) actuation	☐	☐	6.28.4.2
			Actuated by a hose pull-away due to vehicle motion	☐	☐	6.28.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft. of the point of transfer	☐	☐	6.28.4.3 (A)
			Another remote shutdown station between 25 ft. and 100 ft. of the transfer point	☐	☐	6.28.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and shut down all primary valves (internal & emergency valves).	☐	☐	6.28.4.3
			Signs complying with the requirements of 6.28.4.3 (C) provided	☐	☐	6.28.4.3 (C)

Note: If the facility does not have a rail terminal, write “NA” in both the “Yes” column and the “No” column in item 4 of this Form in the railroad tank car row. Similar option is also available if there is no cargo tank vehicle transfer station.

If the LP-Gas facility is provided with LOW EMISSION TRANSFER EQUIPMENT, then continue the analysis below. Otherwise skip section 5.3.2 and go to Chapter 6.

Form 5.7

Evaluation of Low Emission Transfer Equipment

A	B	C		D	E	F
Item #	**Description**	**Features**		**Installed in the facility?** Yes	No	**NFPA 58 Section Reference (2014 Edition)**
1	Transfer into permanently mounted ASME containers on vehicles	Delivery nozzle and filler valve - Max. liquid release after transfer of 4 cm^3 (0.24 in^3)	Fixed maximum liquid level gauge not used during transfer operations	☐	☐	6.28.5.3 (A) and (B)
2	Transfer into stationary ASME containers delivery valve and nozzle combination	During product transfer or post transfer uncoupling of the hose, liquid product volume released to the atmosphere	Does not exceed 4 cm^3 (0.24 in^3) from a hose of nominal size 1 inch or smaller	☐	☐	6.28.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 inch	☐	☐	6.28.5.4 (B)
3	Transfer into stationary ASME containers maximum filling limit	Do containers of less than 2,001 gal (w.c.) have an overfilling prevention device or another approved device?		☐	☐	6.28.5.4 (F)
		Do containers 2,001 gal (w.c.) or greater have a float gauge or other non-venting device?		☐	☐	6.28.5.4 (E)
4	Transfer into stationary ASME containers fixed maximum liquid level gauge	Not used during routine transfer operations but used to calibrate other non-venting liquid level gauges in the container		☐	☐	6.28.5.4 (C) and (D)

Note: 1) If the facility does not have a particular feature described in items 2 or 3, write "NA" in both the "Yes" and "No" columns corresponding to its row.

If separation distance reductions are intended, check marks made in the "No" column of either Form 5.6 or Form 5.7 must be addressed and brought into compliance with the specific edition of NFPA 58 that the facility was constructed to.

Form 6.1
Evaluation of Physical Protection and Other Measures

A	B	C	D	E	F
#	Item	Features	Installed in the facility?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment	☐	☐	6.19.5
2	Vehicle impact protection	Protection against vehicular (traffic) impacts on containers, transfer piping and other appurtenances is designed and provided commensurate with the size of vehicles and type of traffic in the facility. Example protection systems include but not limited to (1) Guard rails, (2) Steel bollards or crash posts, (3) Raised sidewalks.	☐	☐	6.6.1.2 and 6.9.3.10
3	Protection against corrosion	Provide protection against corrosion where piping is in contact with supports or corrosion-causing substances.	☐	☐	6.9.3.11, 6.9.3.14 and 6.17
Complete only 4A or 4B					
4A	Perimeter Fence	Is an industrial type or chain link fence of at least 6 ft. high or equivalent protection provided to enclose (all around) container appurtenances, pumping equipment, loading and unloading and container filling facilities?	☐	☐	6.19.4.2
		Are at least two means of emergency accesses (gates) from the enclosure provided? **NOTE: Write "NA" (not applicable) if:** (i) The area enclosed is less than 100 ft^2, or (ii) The point of transfer is within 3 ft. of the gate, or containers are not filled within the enclosure	☐	☐	6.19.4.2 (A)
		Is a clearance of at least 3 ft. all around to allow emergency access to the required means of egress provided?	☐	☐	6.19.4.2 (B)
	Guard Service	If a guard service is provided, does this service cover the LP-Gas plant and are the guard personnel provided with appropriate LP-Gas related training, per section 4.4 of NFPA 58?	☐	☐	6.19.4.3
4B	Lock-in-Place devices	Are Lock-in-Place devices provided to prevent unauthorized use or operation of any container appurtenance, system valves, or equipment in lieu of the fence requirements above?	☐	☐	6.19.4.2 (C)

Note: Fill only items 1, 2, 3, and 4A or 4B. Indicate with "NA" when not filling the "Yes" or "No" column.
‡ Indicate with "NA" if the facility is not operated at night.

Form 6.2
Assessment of Sources of Ignition and Adjacent Combustible Materials

A	B	C	D	E
#	**Sources of Ignition and Requirements Pertaining to Adjacent Combustible Materials**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
		Yes	**No**	
1	Are combustible materials not closer than 10 ft. from each container?	☐	☐	6.4.4.3
2	Is a distance at least 20 ft. provided between containers and tanks containing flammable liquids with flash point less than 200 ^{o}F (e.g., gasoline, diesel)?	☐	☐	6.4.4.6
3	Are electrical equipment and wiring installed per Code requirements?	☐	☐	6.23.2
4	Is open flame equipment located and used according to Code?	☐	☐	6.23.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with?	☐	☐	7.2.3.2
6	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 lbs. and having a B:C rating provided in the facility?	☐	☐	6.27.4.2
7	Is an approved, portable, dry chemical fire extinguisher of minimum capacity 18 lbs. and having a B:C rating provided on each truck or trailer used to transport portable containers?	☐	☐	9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?	☐	☐	7.2.3.2 (B) and 9.4.10

Note: Insert "NA" in both "Yes" and "No" columns of any items that are not applicable.

Form 6.3

Separation Distances from Containers to Buildings, Property Lines that can be Built upon, Inter-container Distances, and Aboveground Flammable or Combustible Storage Tanks

A	B	C	D	E	F	G
#	**Container Size Range in gal (W.C.)**	**Separation between a property line, important building or other property and the <u>nearest</u> container which is**	**Minimum Distance (ft.)**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
				Yes	**No**	
1	501 through 2,000	Above Ground	25	☐	☐	6.3.1, 6.3.2 and Table 6.3.1.1
		Underground or Mounded	10	☐	☐	
		Between containers	3	☐	☐	
2	2,001 through 30,000	Above Ground	50	☐	☐	
		Underground or Mounded	50	☐	☐	
		Between containers	5	☐	☐	
3	30,001 through 70,000	Above Ground	75	☐	☐	
		Underground or Mounded	50	☐	☐	
		Between containers	¼ sum of diameters of adjacent containers	☐	☐	
4	70,001 through 90,000	Above Ground	100	☐	☐	
		Underground or Mounded	50	☐	☐	
		Between containers	¼ sum of diameters of adjacent containers	☐	☐	
5	All sizes greater than 125 gal	Separation distance between a LP-Gas container and an above ground storage tank containing flammable or combustible liquids of flash points below 200 ºF.	20	☐	☐	6.4.4.6 and 6.4.4.7

Note: If any of the container sizes indicated in the above form are not present in the facility, enter "NA" in both Yes and No columns.

If the LP-Gas plant is provided with every one of the redundant and fail-safe product control-design equipment indicated in Form 5.6, then the minimum distance in column D of Form 6.3 can be reduced to 10 feet for underground and mounded containers of water capacity 2,001 gal to 30,000 gal.

Form 6.4
Separation Distances between Points of Transfer and other Exposures

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr>
<tr><th rowspan="2">#</th><th colspan="2" rowspan="2">Type of Exposure within or outside the facility boundary</th><th rowspan="2">Check if exposure is present</th><th rowspan="2">Minimum Distance (ft)</th><th colspan="2">Is the Facility compliant?</th><th rowspan="2">NFPA 58 Section Reference (2014 Edition)</th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td colspan="2">Buildings, mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls</td><td>☐</td><td>10</td><td>☐</td><td>☐</td><td rowspan="12">6.5.2 and Table 6.5.2.1</td></tr>
<tr><td>2</td><td colspan="2">Buildings with other than at least 1-hour fire-rated walls</td><td>☐</td><td>25</td><td>☐</td><td>☐</td></tr>
<tr><td>3</td><td colspan="2">Building wall openings or pits at or below the level of the point of transfer</td><td>☐</td><td>25</td><td>☐</td><td>☐</td></tr>
<tr><td>4</td><td colspan="2">Line of adjoining property that can be built upon</td><td>☐</td><td>25</td><td>☐</td><td>☐</td></tr>
<tr><td>5</td><td colspan="2">Outdoor places of public assembly, including school yards, athletic fields, and playgrounds</td><td>☐</td><td>50</td><td>☐</td><td>☐</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Public ways, including public streets, highways, thoroughfares, and sidewalks</td><td>From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers</td><td>☐</td><td>10</td><td>☐</td><td>☐</td></tr>
<tr><td>From other points of transfer</td><td>☐</td><td>25</td><td>☐</td><td>☐</td></tr>
<tr><td>7</td><td colspan="2">Driveways</td><td>☐</td><td>5</td><td>☐</td><td>☐</td></tr>
<tr><td>8</td><td colspan="2">Mainline railroad track centerlines</td><td>☐</td><td>25</td><td>☐</td><td>☐</td></tr>
<tr><td>9</td><td colspan="2">Containers other than those being filled</td><td>☐</td><td>10</td><td>☐</td><td>☐</td></tr>
<tr><td>10</td><td colspan="2">Flammable and Class II combustible liquid dispensers and the fill connections of non-stationary containers</td><td>☐</td><td>10</td><td>☐</td><td>☐</td></tr>
<tr><td>11</td><td colspan="2">Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers</td><td>☐</td><td>20</td><td>☐</td><td>☐</td></tr>
<tr><td>12</td><td colspan="2">LP-Gas dispensing device located close to a Class I liquid dispensing device</td><td>☐</td><td>10</td><td>☐</td><td>☐</td><td>6.25.4.3</td></tr>
</table>

NOTE: Place a check mark in column C against an exposure that is present in or around the facility. Fill columns E or F for only those rows for which there is a check mark in column C.

If the facility contains low emission transfer equipment (i.e., all equipment identified in Form 5.7 are installed and are in working order), then the minimum separation distances in column D of Form 6.4 can be reduced to one half of the indicated values.

If the containers in the LP-Gas facility are provided with SPECIAL PROTECTION MEASURES, then continue the analysis below. Otherwise skip Forms 6.5 and 6.6 and go to Form 6.7. Also see Chapter 9.

Form 6.5
Special Protection Measures – Passive Systems

A	B	C	D		E
#	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Container Insulation	Insulation provided on each of the containers?	☐	☐	6.27.5.1
		Insulation material complies with the requirements of NFPA 58?	☐	☐	6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?	☐	☐	6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58?	☐	☐	6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?	☐	☐	6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.	☐	☐	6.6.6.1 and 6.27.5.4

Form 6.6
Special Protection Measures – Active Systems

#	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2014 Edition)
			Yes	No	
1	Water spray systems	Are fixed water spray systems, complying with NFPA 15[1] requirements, used for each container in the facility?	☐	☐	6.27.6.1
		Do fire responsive devices actuate water spray system automatically?	☐	☐	6.27.6.2
		Can the water spray systems be actuated manually also?	☐	☐	6.27.6.2
2	Monitor nozzle systems	Are the monitor nozzles located and arranged so that the water stream can wet the surfaces of all containers exposed to a fire?	☐	☐	6.27.6.3
		Can the water stream from a monitor nozzle reach and wet the entire surface of, at least, one half of a length from one end of each of the containers it is designed to protect?	☐	☐	6.27.6.3
		Do fixed monitor nozzles comply with NFPA 15[1] requirements?	☐	☐	6.27.6.1
		Do fire responsive devices actuate the monitor nozzles?	☐	☐	6.27.6.2
		Can the monitor nozzles be actuated manually also?	☐	☐	6.27.6.2

1. See discussion in Section 8.2.
2. Refer to Chapter 8 for a discussion on NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection.*

Form 6.7
Protection Against Vehicular Impact

#	System Protected	Is physical protection provided?		Type of physical protection installed	NFPA 58 Section Reference (2014 Edition)
		Yes	No		
1	Storage containers	☐	☐		6.6.1.2, 6.6.6.1(B), 6.6.6.1(C), 6.9.3.10 and 6.25.3.13
2	Transfer stations	☐	☐		
3	Entryway into plant	☐	☐		

Table 7.1
Distances to Various Types of Propane Hazards Under Different Release Models**

Model #	Details of the Propane Release Model Releases from or due to		Vapor Dispersion Distance to LFL (ft.)	Explosion Hazard Distance (ft.)	Fire Ball Radiation Distance (ft.)
1a	Bobtail hose failure. Release of the entire inventory in the hose, quickly.	1" ID x 150 ft. hose length	250	110	50
1b		1" ID x 120 ft. hose length	230	103	45
1c		1" ID x 75 ft. hose length	190	90	40
2a	Release of the inventory in a transfer piping 1" x 30 ft. + @ 20 gpm for 10 minutes, due to failed excess flow valve.		135	120	25
2b	Release of the inventory in a transfer piping 2" x 30 ft. + @ 80 gpm for 10 minutes.		230	252	48
2c	Release of the inventory in a transfer piping 2" x 80 ft. + @ 70 gpm for 10 minutes.		328	235	74
2d	Release of the inventory in a transfer piping 2.5" x 30 ft. + @ 80 gpm for 10 minutes.		269	252	59
2e	Release of the inventory in a transfer piping 3" x 30 ft. + @ 100 gpm for 10 mins.		312	287	69
2f	Release of the inventory in a transfer piping 3" x 18 ft. + @ 100 gpm for 10 minutes.		256	284	55
2g	Release of the inventory in a transfer piping 3" x 80 ft. + @ 100 gpm for 10 minutes.		455	284	106
2h	Release of the inventory in a transfer piping 4" x 30 ft. + @ 200 gpm for 10 minutes.		407	410	89
3	Release from the container pressure relief valve.		No ignitable vapor concentration at ground level.		
4	Release from a 1" ID x 150 ft. transfer piping to a vaporizer and reduced flow from a partially open excess flow valve @ 20 gpm for 10 minutes.		250	120	50
5	Leak from a corrosion hole in a transfer pipe at a back pressure of 130 psig (corresponding to 80ºF) for 60 minutes. Hole size is ¼" ID.		110	120	5
6a	Release of the entire inventory in a 2" ID x 20 ft. transfer hose.		195	90	40
6b	Release of the entire inventory in a 2.5" ID x 16 ft. transfer hose.		215	98	45
6c	Release of the entire inventory in a 3" ID x 12 ft. transfer hose.		230	100	46
6d	Release of the entire inventory in a 1.25" ID x 20 ft. transfer hose.		138	66	27
7a	Transport hose blow down: Hose size 2" ID, 20 ft. length release for 3 minutes, from a transport after the tank is filled.		25	30	<5
7b	Transport hose blow down: Hose size 2.5" ID, 16 ft. length release for 3 minutes, from a transport after the tank is filled.		25	29	<5
7c	Transport hose blow down: Hose size 3" ID, 16 ft. length release for 3 minutes, from a transport after the tank is filled.		31	36	<5

** Results from models described in Appendix B.

Form 7.1
Types of Occupancies[1] Near or Surrounding the LP-Gas Facility

Type of Occupancies	Model # from Table 7.1	Hazard Distance[2] (feet)	Is Occupancy located within the hazard distance from the Facility?	
			Yes	**No**
Assembly Occupancies (Places of worship, Libraries, Theaters and Auditoriums, Food or Drink Bars, Sports Stadiums, Amusement Parks, Transportation Centers, etc., with 50 or more people).			☐	☐
Institutional Occupancies (Elderly Persons' Homes or Nursing Homes, Hospitals, Alcohol & Drug Rehabilitation Centers, Prisons).			☐	☐
Educational Occupancies (Elementary Schools, Day Care facilities, etc.).			☐	☐

NOTES: (1) Different types of occupancies are defined in NFPA 5000.

(2) Table 7.1 provides a number of scenarios that can result in propane release, and the resulting area exposed, for different ignition mechanisms. Determine the scenarios that are applicable to the facility, for the quantities that can be released, and enter the greatest value from Table 7.1. Use the hose diameters and length that will be used at the facility if they differ from the ones in Table 7.1 and recalculate the hazard distances using a spreadsheet method that is available at npga.org. Some scenarios may not be applicable to an installation because of other mitigation measures implemented, such as a hose management procedure to minimize the possibility of hose failure.

Form 7.2
Exposure to LP-Gas Facility from External Hazards

A	B	C	D
Item #	Type of Neighboring Operation	Hazard exists to the LP-Gas Facility	
		Yes	No
1	Petroleum and other hazardous material storage, wholesale dispensing, etc.	☐	☐
2	Metal cutting, welding, and metal fabrication	☐	☐
3	Industrial manufacturing that can pose external hazards	☐	☐
4	Ports, rail yards and trans-shipment terminals handling flammable and explosive materials	☐	☐
5	Other operations that may pose hazards (gasoline and other hazardous material dispensing stations, fertilizer storage, etc.)	☐	☐

Note: If a particular activity indicated in column B does not exist, fill both “Yes” and “No” columns with “NA.”

Where a “Yes” has been checked in either Form 7.1 or Form 7.2:

1. **For an existing facility, communicate this information to local emergency responders for inclusion in their emergency planning.**
2. **For a proposed facility, implement the actions indicated in Chapter 9.**

Form 8.1

Data on the Responding Fire Department

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th></tr>
<tr><th>Item #</th><th colspan="2">Data Item</th><th>Data Entry</th></tr>
<tr><td>1</td><td colspan="2">Name of the Fire Department (FD).</td><td></td></tr>
<tr><td>2A</td><td colspan="2">Name of the person in the FD assisting with the data acquisition.</td><td></td></tr>
<tr><td>2B</td><td colspan="2">Position of the person in the FD assisting with the data acquisition.</td><td></td></tr>
<tr><td>3A</td><td colspan="2">Date on which FD data was collected.</td><td></td></tr>
<tr><td>3B</td><td colspan="2">Name of the person collecting the data.</td><td></td></tr>
<tr><td>4</td><td colspan="2">Number of firefighters on duty at any time.</td><td></td></tr>
<tr><td>5</td><td colspan="2">Average number of firefighters available for response.</td><td></td></tr>
<tr><td>6A</td><td rowspan="2">Number of firefighters qualified to:</td><td>“Firefighter I” level.</td><td></td></tr>
<tr><td>6B</td><td>“Firefighter II” level.</td><td></td></tr>
<tr><td>7A</td><td rowspan="3">Number of firefighters who would:</td><td>Respond on the first alarm to the facility.</td><td></td></tr>
<tr><td>7B</td><td>Respond on the first alarm and who are qualified to the operations level requirements of NFPA 472 or similar local requirements.</td><td></td></tr>
<tr><td>7C</td><td>Respond on the first alarm with specific knowledge and training on the properties of LP-Gas and LP-Gas fires.</td><td></td></tr>
<tr><td>8A</td><td rowspan="2">Number of fire apparatus that have the capability to deploy a 125 gpm hose line supplied by onboard water for at least 4 minutes, and, which:</td><td>Are in service in the department.</td><td></td></tr>
<tr><td>8B</td><td>Would respond on a first alarm.</td><td></td></tr>
</table>

Form 8.2
Response Time Data for the Fire Departments

A	B	C	D	E
Company or Department	**Time in Minutes for**			
	Alarm Receipt & Handling	**Turnout**	**Travel**	**Total Time**

Note: Number in Column E = Sum of numbers from Columns B through D.

Form 8.3

Water Flow Rate and Total Water Volume Required to Cool Containers Exposed to a Fire

A	B	C	D	E	F	G	H
Item #	ASME Container Size (gallons)	Total Surface Area of each Container[1] (ft²)	Surface Area of each container to be Cooled (ft2)	Water flow rate required per container (gpm)	Number of containers of the size indicated‡	Total Water flow rate required (gpm)	Total volume of water required for 10 min (gal)
1	500	86	43	10.8		0.0	
	1,000	172	86	21.5		0.0	
	2,000	290	145	36.3		0.0	
	4,000	374	187	46.8		0.0	
	6,500	570	285	71.3		0.0	
	9,200	790	395	98.8		0.0	
	12,000	990	495	123.8		0.0	
	18,000	1,160	580	145		0.0	
	30,000	1,610	805	201.3		0.0	
	45,000	2,366	1,183	295.8		0.0	
	60,000	3,090	1,545	386.3		0.0	
	90,000	4,600	2,300	575		0.0	
	Other Size		0	0.0		0.0	
2a	Calculated water flow rate for container protection					0.0	
2b	Water flow rate rounded up to nearest multiple of 125					0	
3	Water for firefighter protection, if required ☐					0	
4	Total water flow rate and volume					0.0	0.0

Note: Column D = (1/2) x Column C   Column E = 0.25 (gpm/ft²) x Column D;
Column G = Column F x Column E   Column H = 10 x Column G
Line 2a, Column G and Column H are the sum of numbers in each row above line 2 of each column.
Line 4, Column G and Column H are the sum of numbers in rows 2b and 3.

‡ Consider only three containers for water supply evaluations even if the number of containers in a group is more than three. See Section 8.2.

1 ASME container approximate dimensions.

The total water requirement for the facility is indicated in item 4, column G (water flow rate) and column H (total water volume or quantity) of Form 8.3. If multiple groups of containers are present in the facility, repeat the calculations in Form 8.3 for each group of containers. The total water requirement for the facility is the largest value for any single group of containers.

Form 8.4
Evaluation of Water Availability in or Near the LP-Gas Facility

<table>
<tr><th>A</th><th>B</th><th>C</th><th colspan="3">D</th></tr>
<tr><th>Item #</th><th>Water from…</th><th>Available?</th><th colspan="3">Quantitative information</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Public supply or from another piped-in supply through one or more fire hydrants in or near the facility.</td><td rowspan="4">☐ Yes ☐ No</td><td>Hydrant data</td><td>Distance from Container(s) on which water will be applied (feet)</td><td>Available water flow rate from all hydrants[1] (gpm)</td></tr>
<tr><td>Hydrant 1</td><td></td><td rowspan="3"></td></tr>
<tr><td>Hydrant 2</td><td></td></tr>
<tr><td>Hydrant 3</td><td></td></tr>
<tr><td>2</td><td>A nearby static water source (stream, pond, lake, etc.).</td><td>☐ Yes ☐ No</td><td colspan="3">Distance to water source = _____ feet
Time to set up relay = _____ minutes
Rate of delivery = _____ gpm</td></tr>
<tr><td>3</td><td>Only through mobile water tanker shuttle.</td><td>☐ Yes ☐ No</td><td colspan="3">Time to set up shuttle = _____ minutes
Sustainable flow rate = _____ gpm</td></tr>
</table>

1 Obtain the available flow rate from the local municipal water authority or the entity that supplies water to the hydrant or conduct a test to determine total available flow rate.

1. **For an existing facility, communicate this information to local responders for inclusion in their emergency planning.**
2. **For a proposed new facility, refer to Chapter 9.**

Form 9.1
Analysis Summary on Product Control and Local Conditions of Hazard

A	B	C	D	E
Item #	**Chapter Title**	**Section & Title**	**Reference Form #**	**Number of "No" checked**
1	Product Control Measures in Containers & Transfer Piping	5.1 Product Control in Containers	5.1 or 5.2§	0
		5.2 Product Control in Transfer Piping	5.3	0
			5.4	0
			5.5	0
			5.6	0
			5.7	0
2	Analysis of Local Conditions of Hazard	6.1 Physical Protection Measures	6.1	0
		6.2 Ignition Source Control	6.2	0
		6.3.1 Separation distances; Container and outside exposures	6.3	0
		6.3.2 Separation distances; Transfer points and outside exposures	6.4	0
		6.4 Special Protection Measures	6.5	0
			6.6	0

§ The number of "No" for Forms from Chapter 5 is the difference between the required number of appurtenances according to NFPA 58-2011, and a lesser number found to be actually installed on the container or the transfer piping.

If, in any row of column E ("No") of Form 9.1, the entry number is greater than zero, the proposed LP-Gas facility is not in compliance with the requirements of NFPA 58-2014 for product control appurtenances or other safety measures. The design of the proposed facility must be modified to conform to the code requirements. In addition, the following items should be noted.

- **If there are any "No" checks in Form 6.3, then the separation distance requirements for containers are not satisfied. An option that may be considered is the reduction in separation distance to 10 feet for underground and mounded containers by providing "Redundant and Fail-Safe Product Control Measures." In this case, complete Form 9.4 below to ensure that each requirement of "Redundant and Fail-Safe Product Control Measures" is provided.**

- **If there are any "No" checks in Form 6.4, then the separation distance requirements for transfer points are not satisfied. In this case, relocate the transfer points so that the separation distances conform to the code requirements or provide the Low Emission Transfer Equipment. Complete Form 9.5 below and ensure that all requirements for Low Emission Transfer Equipment are fulfilled.**

Form 9.2
Analysis Summary on Exposure from and to the LP-Gas Facility

A	B	C	D	E
Item #	**Chapter Title**	**Section & Title**	**Reference Form #**	**Number of “Yes” checked**
1	Exposure to and from Other Properties	7.1 Exposure to off-site properties and persons from in-plant propane releases	7.1	0
		7.2 Exposure to propane facility from external events	7.2	0

If the entry number in column E (“Yes”), Form 9.2 corresponding to Form 7.1 is greater than zero, consider one or more of the following design alternatives:

1. **Consider moving the container or the transfer point to a different location, if possible and space exists, so that the property or the person is beyond the hazard distance.**
2. **Provide “Redundant and Fail-safe Product Control Measures.” Complete Form 9.4 to ensure compliance.**
3. **Institute other technical measures such as installing gas and flame detectors (connected to facility shutdown systems), sounding alarm outside facility premises, etc.**
4. **Institute administrative controls such as additional training for personnel, more frequent inspections of hoses and transfer piping, etc.**

If the entry number in column E (“Yes”), Form 9.2 corresponding to Form 7.2 is greater than zero, consider one or more of the following design alternatives:

1. **Implement procedures to monitor neighboring activity.**
2. **Install means in the adjacent plant to shut down the LP-Gas plant in case of an emergency in that plant.**

Form 9.3
Analysis Summary on Fire Department Evaluations

A	B	C	D	E	F
Item #	**Chapter Title**	**Section & Title**	**Reference Form #**	**Number "zeros" entered in Column C, Lines 6 through 8 of Form 8.1**	**Number of "Yes" checked in Column C of Form 8.4**
1	Fire department capability, adequacy of water supply and Emergency Planning	8.1 Data on the Fire Department	8.1	0	
2		8.2 Fire response water needs and availability	8.4		0

If the entry number in row 1, Column E of Form 9.3 is greater than zero, consider one or more of the following design alternatives:

1. **Discuss with the local Fire Department the needs of the LP-Gas facility and the evaluation results on the capability and training inadequacies of the Department.**
2. **Consider developing a cadre of personnel within the LP-Gas facility to respond to emergencies.**
3. **Institute container special protection system based on active protection approaches or passive approaches. Complete Form 9.6 and Form 9.7 below.**

If the entry number in row 2, Column F of Form 9.3 is equal to zero, consider one or more of the following design alternatives:

1. **Provide special protection (other than water spray or monitor systems) to containers, satisfying the requirements of section 6.27.5 of NFPA 58, 2014 edition. Complete Form 9.6 to ensure compliance.**
2. **Consider implementing the various options indicated in Table 9.1.**

Form 9.4

Redundant and Fail-Safe Design for Containers

<table>
<tr><th>A</th><th colspan="2">B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr>
<tr><th rowspan="2">Item #</th><th colspan="2" rowspan="2">Description</th><th rowspan="2">Features</th><th colspan="2">Proposed for the facility?</th><th rowspan="2">NFPA 58 Section Reference (2014 Edition)</th></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td colspan="2">Container sizes for which the appurtenances are provided</td><td>Appurtenances, redundant fail-safe equipment and low emission transfer lines are provided for <u>each</u> container of water capacity 2,001 gal to 30,000 gal.</td><td>☐</td><td>☐</td><td>6.28.3 and 6.28.4</td></tr>
<tr><td rowspan="2">2</td><td colspan="2" rowspan="2">Liquid or vapor withdrawal (1-1/4 in. or larger)</td><td>Internal valve with internal excess-flow valve.</td><td>☐</td><td>☐</td><td>6.28.3.1 and 6.28.3.2</td></tr>
<tr><td>Positive shutoff valve installed as close as possible to the internal valve.</td><td>☐</td><td>☐</td><td>6.28.3.4</td></tr>
<tr><td rowspan="2">3</td><td colspan="2" rowspan="2">Liquid or vapor inlet</td><td>Internal valve with internal excess flow valve or backflow check valve (BCK).</td><td>☐</td><td>☐</td><td>6.28.3.5</td></tr>
<tr><td>Positive shutoff valve installed as close as possible to the internal valve or the backflow check valve (BCK).</td><td>☐</td><td>☐</td><td>6.28.3.5</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Railcar transfer</td><td>Flow into or out of railroad tank car</td><td>Emergency shutoff valve installed in the transfer hose or the swivel-type piping at the tank car end.</td><td>☐</td><td>☐</td><td>6.19.2.6 (1) and 6.28.4.1</td></tr>
<tr><td>Flow only into railroad tank car</td><td>Emergency shutoff valve or backflow check valve (BCK) installed in the transfer hose or the swivel-type piping at the tank car end.</td><td>☐</td><td>☐</td><td>6.19.2.6 (2) and 6.28.4.1</td></tr>
<tr><td>5</td><td colspan="2">Cargo tank transfer</td><td>Protection provided in accordance with 6.28.4.1.</td><td>☐</td><td>☐</td><td>6.28.4.1</td></tr>
<tr><td rowspan="2">6</td><td colspan="2" rowspan="2">Automatic closure of all primary valves (IV & ESV) in an emergency</td><td>By thermal (fire) actuation.</td><td>☐</td><td>☐</td><td>6.28.4.2</td></tr>
<tr><td>Actuated by a hose pull-away due to vehicle motion.</td><td>☐</td><td>☐</td><td>6.28.4.2</td></tr>
<tr><td rowspan="4">7</td><td colspan="2" rowspan="4">Manually operated remote shutdown of IV and ESV</td><td>Remote shutdown station within 15 ft. of the point of transfer?</td><td>☐</td><td>☐</td><td>6.28.4.3 (A)</td></tr>
<tr><td>Another remote shutdown station between 25 ft. and 100 ft. of the transfer point?</td><td>☐</td><td>☐</td><td>6.28.4.3 (B)</td></tr>
<tr><td>Shutdown stations will shut down electrical power supply to the transfer equipment and all primary valves (Internal and Emergency Valves).</td><td>☐</td><td>☐</td><td>6.28.4.3</td></tr>
<tr><td>Signs complying with the requirements of 6.28.4.3 (C) provided?</td><td>☐</td><td>☐</td><td>6.28.4.3 (C)</td></tr>
</table>

Note: If your facility does not have a rail terminal, write “NA” in both the “Yes” column and the “No” column in item 4 of the form in the railroad tank car row. Similar option is also available if there is no cargo tank vehicle transfer station.

Form 9.5
Evaluation of Low Emission Transfer Equipment

A	B	C		D	E	F
Item #	**Description**	**Features**		**Proposed for the facility?** **Yes**	**No**	**NFPA 58 Section Reference (2014 Edition)**
1	Transfer into permanently mounted ASME containers on vehicles	Delivery nozzle and filler valve - Max. liquid release after transfer of 4 cm^3 (0.24 in^3)	Fixed maximum liquid level gauge not used during transfer operations	☐	☐	6.28.5.3 (A) and (B)
2	Transfer into stationary ASME containers delivery valve and nozzle combination	During product transfer or post transfer uncoupling of the hose, liquid product volume released to the atmosphere	Does not exceed 4 cm^3 (0.24 in^3) from a hose of nominal size 1 inch or smaller	☐	☐	6.28.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 inch	☐	☐	6.28.5.4 (B)
3	Transfer into stationary ASME containers maximum filling limit	Do containers less than 2,001 gal (w.c.) have an overfilling prevention device or another approved device?		☐	☐	6.28.5.4 (F)
		Do containers greater than 2,000 gal (w.c.) have a float gauge or other non-venting device?		☐	☐	6.28.5.4 (E)
4	Transfer into stationary ASME containers fixed maximum liquid level gauge	Not used during routine transfer operations but may be used in calibrating other non-venting liquid level gauges in the container		☐	☐	6.28.5.4 (C) and (D)

Note: If the facility does not have a particular feature described in items 2 or 3, write “NA” in both the “Yes” and “No” columns corresponding to its row.

Form 9.6
Special Protection Measures – Passive Systems

A	B	C	D		E
Item #	**Special Protection Option**	**Question**	**Proposed for the facility?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Container insulation	Insulation provided on each of the containers?	☐	☐	6.27.5.1
		Insulation material complies with the requirements of NFPA 58?	☐	☐	6.27.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?	☐	☐	6.27.5.3
		Mounding complies with each requirement under section 6.6.6.3 of NFPA 58?	☐	☐	6.6.6.3 and 6.27.5.3
3	Burying of containers	Each container in the facility is buried?	☐	☐	6.27.5.4
		Buried containers comply with each requirement under section 6.6.6.1 of NFPA 58.	☐	☐	6.6.6.1 and 6.27.5.4

Form 9.7
Special Protection Measures – Active Systems

Item #	**Special Protection Option**	**Question**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2014 Edition)**
			Yes	**No**	
1	Water spray systems	Are fixed water spray systems, complying with NFPA 15 requirements, used for each container in the facility?	☐	☐	6.27.6.1
		Do fire responsive devices actuate water spray system automatically?	☐	☐	6.27.6.2
		Can the water spray systems be actuated manually also?	☐	☐	6.27.6.2
2	Monitor nozzle systems	Are the monitor nozzles located and arranged so that the water stream can wet the surfaces of all containers exposed to a fire?	☐	☐	6.27.6.3
		Can the water stream from a monitor nozzle reach and wet the entire surface of, at least, one half of a length from one end of each of the containers it is designed to protect?	☐	☐	6.27.6.3
		Do fixed monitor nozzles comply with NFPA 15 requirements?	☐	☐	6.27.6.1
		Do fire responsive devices actuate the monitor nozzles?	☐	☐	6.27.6.2
		Can the monitor nozzles be actuated manually also?	☐	☐	6.27.6.2

Equivalent Protection to a Water Supply for Industrial and Bulk Facilities

In the case where water supply is not available in or near the LP-Gas facility, or is inadequate, or it is prohibitively expensive to connect to a public or private water supply hydrant, alternative methods for providing protection should be considered. In lieu of providing a water supply, several alternatives are indicated in Table 9.1, which can offer an equivalency to a water supply system.

The intent of the controls identified in Table 9.1 is to maintain the entire system as a gas-tight entity. These methods include reducing the service life of equipment, increasing the design pressure rating of the system beyond the requirements of NFPA 58, or providing early detection and isolation of the system to ensure product control. This list is not exhaustive and is not ranked in an order of priority.

Table 9.1

Suggested Alternative Methods for Industrial and Bulk Plants That Do Not Pose a Hazard But Lack a Water Supply

Item #	Possible options to implement when adequate water supply is not available
1	Reduce the service life of hoses.
2	Increase frequency of equipment inspection.
3	Establish a service life program for the maintenance of the container pressure relief devices. This could include the installation of a listed multiple port valve and certifying that the relief devices are properly set and maintained every 5 to 10 years.
4	Increase the design strength of the piping and fitting systems.
5	Install emergency shutoff valves in conjunction with container internal valves.
6	Install emergency shutoff valves downstream of transfer pump outlets and upstream of the vapor and liquid valves at the bulkhead.
7	Install pneumatic tubing along the facility boundary to serve as a perimeter fire detection system. This would provide protection of the facility against exposure fires.
8	Provide optical flame detection or linear heat detection, or a gas detection system connected to an isolation valve installed downstream of every liquid and vapor nozzle on the container. This system could also be monitored to send a signal to an alarm company that notifies the fire department of an event.
9	Increase the separation distances of internal facility exposures to the container. These exposures would include a site dumpster, idle or waste pallets and combustibles, and increasing the parking distances between the bobtails and transports in relation to the container.
10	Relocate overhead power lines away from all container and cylinder storage areas to protect against ignition in the event of a line dropping due to wind or power pole impact.
11	Eliminate all combustible vegetation within 30 feet of the LP-Gas container. This can be accomplished using gravel, or paving the site yard.
12	Install tanks using the mounding or burial method.

Take Comfort In Blossman Propane Gas, Appliance & Service

HAZARDOUS MATERIAL SHIPPING PAPER

UN 1075
Liquefied Petroleum Gas
2.1 (Flammable Gas)
Product: (Non-Corrosive)
Volume: No. Of CYL. GROSS WEIGHT

EMERGENCY CONTACT: CHEMTREC 800-424-9300

POTENTIAL HAZARDS

FIRE OR EXPLOSION

EXTREMELY FLAMMABLE. Will be easily ignited by heat, sparks, or flames. Will form explosive mixtures with air. Vapors from liquefied gas are initially heavier than air and spread along ground.
CAUTION: Hydrogen (UN1049), Deuterium (UN1957), and Methane (UN1971) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)
Vapors may travel to source of ignition and flash back. Cylinders exposed to fire may vent and release flammable gas through pressure relief devices. Containers may explode when heated. Ruptured cylinders may rocket.

HEALTH

Vapors may cause dizziness or asphyxiation without warning. Some may be irritating if inhaled at high concentrations. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Fire may produce irritating and/or toxic gases.

PUBLIC SAFETY

CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the Inside back cover. As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks). Keep out of low areas.

PROTECTIVE CLOTHING

Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide protection. Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

EVACUATION

Large Spill - Consider initial downwind evacuation for at least 800 meters (1 /2 mile).
Fire - If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

EMERGENCY RESPONSE

FIRE

DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
CAUTION: Hydrogen (UN1049} and Deuterium (UN1957) burn with an invisible flame.
Small Fires - Dry chemical or CO_2
Large Fires - Water spray or fog. • Move containers from fire area if you can do It without risk.
Fire Involving Tanks
Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Do not direct water at source of leak or safety devices; Icing may occur. Withdraw Immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. If possible, turn leaking containers so that gas escapes rather than liquid. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water to runoff to contact spilled material. Do not direct water at spill or source of leak. Prevent spreading of vapors through sewers, ventilation systems and confined areas. Isolate area until gas has dispersed.
CAUTION: When In contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

FIRST AID

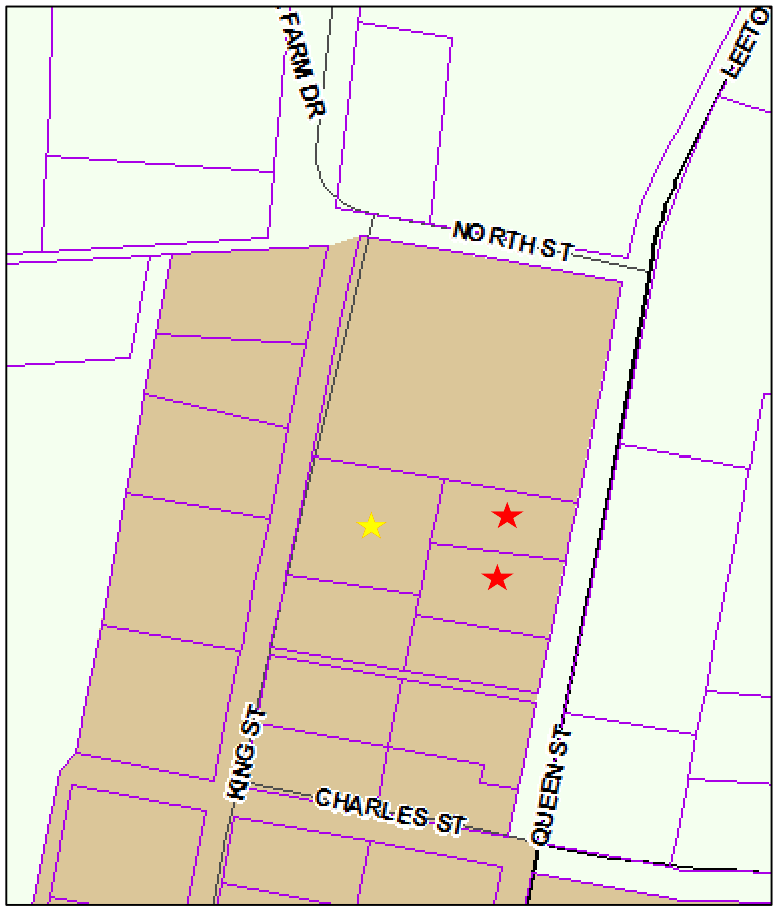
Move victim to fresh air. Call 911 or emergency medical service. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. Clothing frozen to the skin should be thawed before being removed. In case of contact with liquefied gas, thaw frosted parts with lukewarm water. In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. Keep victim warm and quiet. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Staff Report
Jefferson County Board of Zoning Appeals Meeting
November 9, 2017

Middleway United Methodist Church Variance Request (#ZV17-17)

Item #4 Variance request from Appendix B to reduce the side and rear yard setbacks from 50’ to 6’ to replace an existing 8’ x 16’ accessory structure with a 12’ x 20’ accessory structure.

<table>
<tr><td>Applicant:</td><td>Robert Brown, Trustee</td></tr>
<tr><td>Owner:</td><td>Middleway United Methodist Church</td></tr>
<tr><td>Developer:</td><td>N/A</td></tr>
<tr><td>Consultant:</td><td>N/A</td></tr>
<tr><td>Property Location:</td><td>7435 Queen Street, Kearneysville, WV 25430</td></tr>
<tr><td>Legal Description & Zoning District:</td><td>District: Middleway (07); Map: 22A; Parcel: 43 & 44
Size: ~ .78 acres (combined); Zone: Village



Parsonage</td></tr>
<tr><td>Surrounding Properties:</td><td>Zoning Map Designation:
North: Village *South:* Village
East: Rural *West:* Village</td></tr>
<tr><td>History:</td><td>07/18/02: BZA approved a side & rear setback reduction from 50’ to 6’ for an 8’ x 16’ shed (#ZV02-23).</td></tr>
<tr><td>Waivers/Variances:</td><td>None</td></tr>
<tr><td>Approved Activity:</td><td>Church (nonconforming site)</td></tr>
</table>

Staff Report
Jefferson County Board of Zoning Appeals Meeting
November 9, 2017

Middleway United Methodist Church Variance Request (#ZV17-17)

STAFF EVALUATION OF REQUEST

Summary of Request and Purpose of Ordinance Requirements

The applicant is requesting a variance from Appendix B: Nonresidential Site Development Standards Table to reduce both the side and rear yard setbacks from 50' to 6' to construct a 12' x 20' accessory structure to be located on an existing church parcel. The proposed structure would replace an existing 8' x 16' accessory structure that previously received approval from the Board on July 18, 2002 to reduce the side and rear yard setbacks from 50' to 6'. As the proposed structure is larger than the one previously considered by the Board, a new variance application is required.

The purpose of side and rear yard setback requirements is to reduce the impact that a land use might have on an adjacent property; to allow adequate space between a structure and a property line so that maintenance of the structure is feasible; to maintain adequate separation between structures for fire prevention purposes; and to allow room for utility easements.

Unique characteristics of property

The subject property is located in the Historic Village of Middleway and consists of Parcel 43 (church) and Parcel 44 (paved parking lot). The combined lot size is approximately 34,200 square feet in size.

Impact on adjacent properties

There does not appear to be any negative impact on the adjacent property owners as the proposed structure is intended to replace an existing structure of similar use.

Middleway United Methodist Church Variance Request (#ZV17-17)

Feasibility of complying with the ordinance by other means

It is not feasible to comply with the required 50’ setback as the current lot size and location of the existing church and parking lot limit the buildable area.

A site plan will not be required due to the proposed size of the structure.

Conditions of Approval

Should the Board choose to approve this request, possible conditions of approval include:

1. The variance to reduce the side and rear setback requirements from 50’ to 6’ to replace an existing storage building applies to the proposed accessory structure only.

SECTION OF ORDINANCE TO BE CONSIDERED:

Appendix B: Nonresidential Site Development Standards Table

Zoning District	Development Type[Θ]	Min Lot Area (MLA)	Min Lot Width	Max Building Height[*]	Impervious Surface Limit	Building Setbacks			Parking/ Drive Aisle Setbacks			Buffers (Sec. 4.11) (Screened / Unscreened) Adjacent Use: A Residential district, or any lot with a residence, school, church, or institution of human care (Distance per Sec. 4.6)			Commercial Use		Industrial Use	
						Front	Side	Rear	Front	Side	Rear	Distance Front Side Rear	Front	Side & Rear	Front	Side & Rear	Front	Side & Rear
Industrial – Commercial (IC)[**]	Commercial sites 1.5 acres and smaller	N/A	N/A	75	80%	25			15	4	4	75	Street Trees	Narrow Buffer Detail No. M-54	N/A	10(S)	N/A	10(S)
	Commercial sites greater than 1.5 acres	N/A	N/A	75	80%	25			15	10	10	75	Street Trees	Medium Buffer Detail No M-53	N/A	10(S)	N/A	10(S)
	Industrial	3 ac[***]	N/A	75	90%	50 or 25 if adjacent to Industrial Use			25 or 20 if adjacent to Industrial Use			200	Street Trees	Wide Buffer Detail No. M-52	25(S)	20(S)	N/A	20(S)
Residential-Light Industrial-Commercial (RLIC)	Commercial or Industrial	N/A	N/A	75	80%	See IC District												
Rural (R)	Churches	2 acres	200	45	N/A	25	50	50	See IC District for commercial sites			N/A	50(U) or 15 (S)		N/A	10(S)	N/A	10(S)
	Schools, Grades K-12	K-4: 10 ac+ 5-8: 20 ac+ 9-12: 30 ac+	500	45	N/A	100						N/A	N/A		N/A	N/A	N/A	N/A
	Hospitals	10 ac	500	45	N/A	100						N/A	N/A		N/A	N/A	N/A	N/A
	Other Rural principal permitted uses	40,000	100	45	N/A	40	50	50				N/A	See I–C District for commercial or industrial use; Otherwise, N/A					
	Commercial or Industrial[**]	See IC District																
Village (V)	Commercial[¥]	N/A	N/A	35	N/A	25	10	40	See IC District									
	Industrial[**]	See IC District		35	See IC District													
Residential Growth (RG)	Commercial or Industrial[**]	See IC District		35	See IC District													
Neighborhood Commercial (NC)	Commercial	N/A	N/A	35	70%	15 min 25 max	10[£]	10[◊]	See I-C District			25	See IC District					
General Commercial (GC)	Commercial	N/A	N/A	75	80%	20	10	25	See IC District									
Highway Commercial (HC)	Commercial	N/A	N/A	75	80%	25	25	25										
Light Industrial (LI)	Commercial or Industrial	N/A	N/A	75	80%	25	25	25										
Major Industrial (MI)	Commercial	N/A	N/A	75	90%	25	10	50										
	Industrial	3 ac[***]	N/A	75	90%	25	50	50										
Office/Commercial Mixed Use (OC)	Commercial	N/A	N/A	75	80%	15 min 25 max	10[£]	10[◊]										
Planned Neighborhood Development (PND)	Commercial	3 acres	See GC District Note: Planning Commission may amend development standards for developments in the PND District (see Article 5).															

Footnote from Appendix B: Development Type[Θ]

Θ Churches in any district: (1) are treated as a commercial use on a lot of greater than 1.5 acres in determining buffer requirements and parking/drive aisle setbacks; (2) building setbacks are 25' (front) and 50' (side/rear); and (3) distance requirements do not apply.

JEFFERSON COUNTY, WEST VIRGINIA
Department of Engineering, Planning, and Zoning
Office of Planning and Zoning
116 East Washington Street, P.O. Box 338
Charles Town, WV 25414
www.jeffersoncountywv.org

File Number: ZV17-17
Staff Initials: AB
Meeting Date: Nov 9th
Fees Paid ($100 or $150): $100.00

Email: zoning@jeffersoncountywv.org **Phone: (304) 728-3228**

Zoning Variance Request

Variances from the Zoning and Land Development Ordinance must comply with Article 8A-7-11 of the WV State Code. A variance is a deviation from the minimum standards of the ordinance and shall not involve permitting land uses that are otherwise prohibited in the zoning district, nor shall it involve changing the zoning classification of a parcel of land.

Property Owner Information

Name: Middleway United Methodist Church
Mailing Address: P. O. Box 580 Kearneysville WV 25430
Phone Number: 304 728 4770 Email: mumc@frontiernet.net

Applicant Contact Information

Name: Robert Brown
Mailing Address: 2826 S. Childs Road Kearneysville WV 25430
Phone Number: 304 582 5735 Email: bbrown721@comcast.net

Applicant Registered Engineer(s), Surveyor(s), or Consultant(s)

Name:
Mailing Address:
Phone Number: Email:

Physical Property Details

Physical Address: 1435 Queen Street
City: Middleway State: WV Zip Code: 25430
Tax District: 7 Map No: 22A Parcel No: 43
Parcel Size: Deed Book: 6 Page No: 39

Zoning District (please check one)

- [ ] Residential Growth (RG)
- [ ] Industrial Commercial (IC)
- [ ] Rural (R)
- [ ] Residential-Light Industrial-Commercial (R-LI-C)
- [x] Village (V)
- [ ] Neighborhood Commercial (NC)
- [ ] General Commercial (GC)
- [ ] Highway Commercial (HC)
- [ ] Light Industrial (LI)
- [ ] Major Industrial (MI)
- [ ] Planned Neighborhood Development (PND)
- [ ] Office/Commercial Mixed-Use (OC)

RECEIVED
OCT 10 2017
JEFFERSON COUNTY
PLANNING, ZONING AND ENGINEERING

Place Received Date Stamp Here

On a separate sheet of paper, provide a sketch showing the shape and location of the lot indicating all roads, rights of way, and easements. Show the location of the intended construction or land use indicating building setbacks (i.e. the distance of the structure from all property lines), size, and height. Identify all existing buildings, structures, or land uses on the property. The sketch should show the full extent of the property. Sign and date the sketch.

Is there a Code Enforcement action pending in relation to this property? ☑ **Yes** ☐ **No**

Reference the section of the Zoning Ordinance pertaining to this request: ~~Sec 9.5A~~ APPENDIX B (AB)

Briefly describe the nature of the variance request:

Remove an old storage building 8'x16' and replace with another storage building which is 12'x ~~20~~" place it on the same place where existing building sits.

If this request is for a setback variance, please check one of the following:

Front Setback ☒ **Side Setback** ☑ **Rear Setback** ☑ **Reduction From** 50' **to** 6'

Please explain why granting the variance will NOT adversely affect the public health, safety or welfare, or the rights of adjacent property owners or residents:

There should not be any affect since there is already a storage building on same site and it is at the rear of both properties

In what way does this request arise from special conditions or attributes which pertain to the property for which a variance is sought and which were not created by the person seeking the variance?

The church which is over 100 years old has limited storage space. Due to growth the church needs additional storage.

How will granting this variance eliminate an unnecessary hardship and permit a reasonable use of the land?

The site preparation will not cost as much to put here as to put on another site.

How will granting this variance allow the intent of the Zoning Ordinance to be observed and substantial justice to be done?

AN 8' x 16' foot building shed Already sits on the site of new building wanted. The larger building will be beneficial for proximity to the Church building for storage of items used for church

Original signature is required. If additional signatures are necessary, please attach a separate piece of paper.

By signing this application, I give permission for the Office of Planning and Zoning staff to walk onto the subject property, if necessary, in order to take photos for the Board of Zoning Appeals staff reports. The information given is correct to the best of my knowledge.

Robert I Brown 10/9/2017

Signature of Property Owner Date

Trustee DB: 1, PG: 711

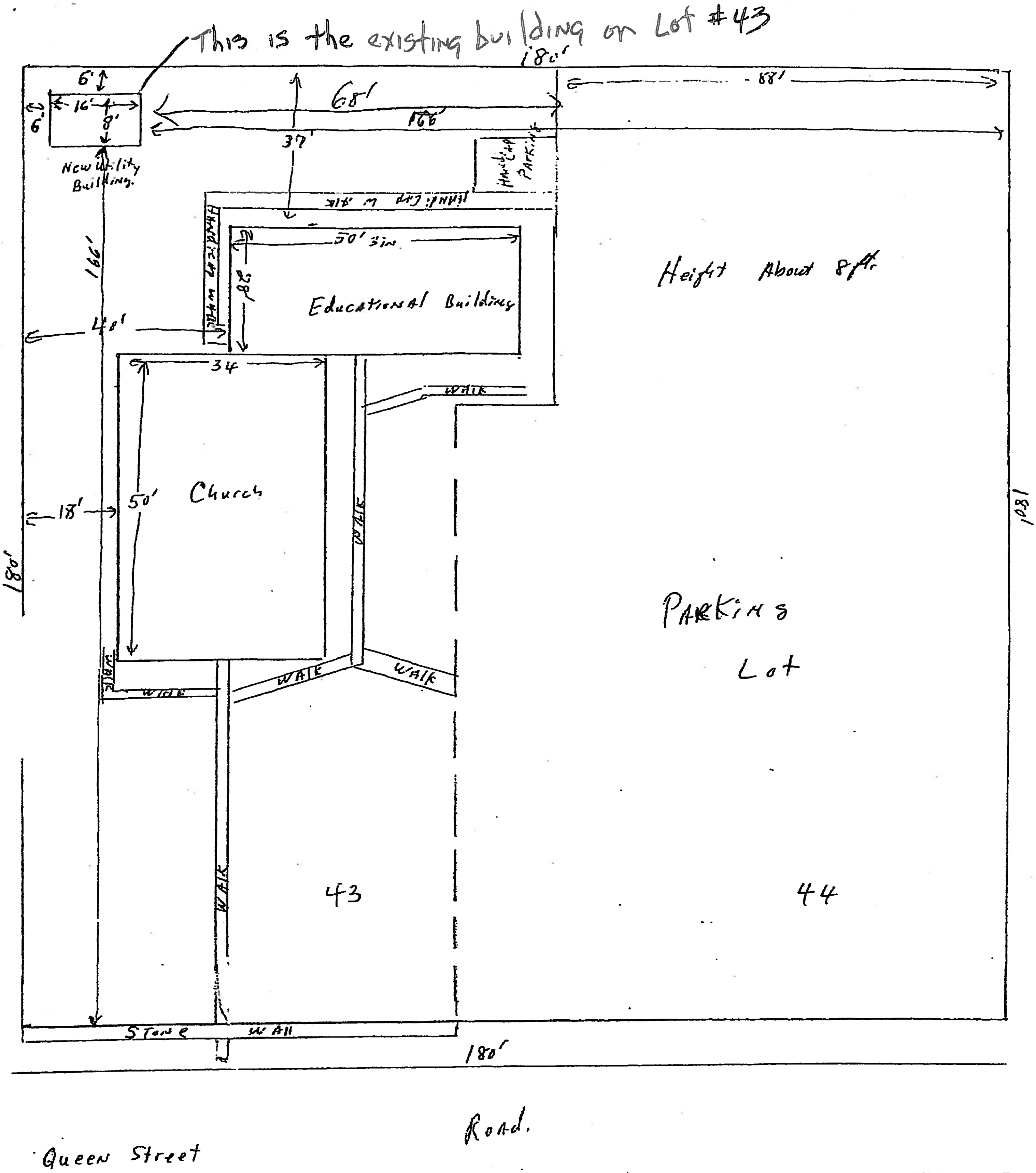
Signature of Property Owner Date

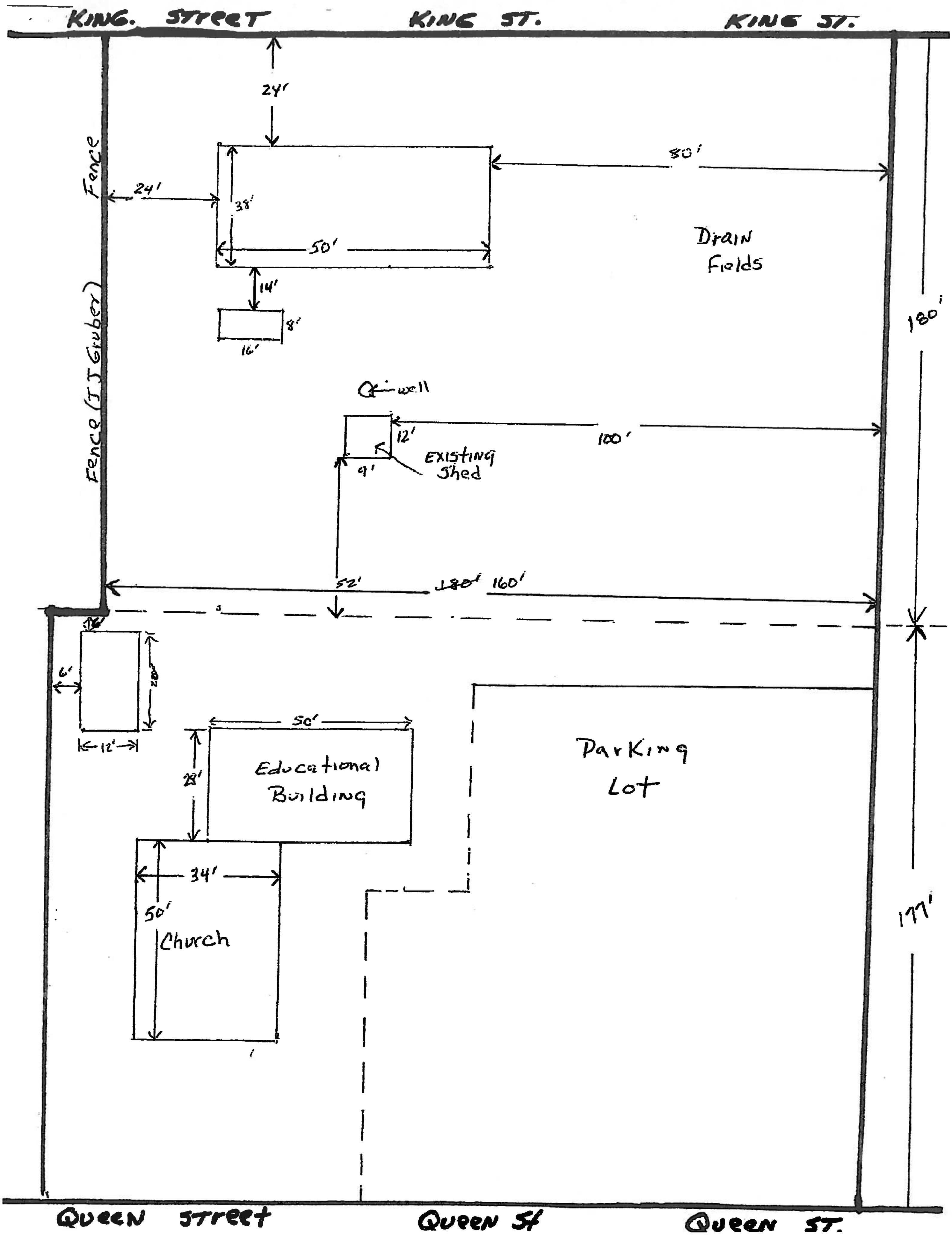
Notification Requirements (to be completed by staff)

Notice of a public hearing for an appeal shall be advertised in a newspaper having general circulation in the County at least 15 days before the hearing. The subject property shall be posted conspicuously by a zoning notice no less than 28" x 22" in size, at least 15 days before the hearing (pursuant to the Zoning and Land Development Ordinance Section 3.4A(3)(b).

Nov 9, 2017	October 25, 2017	October 25, 2017
Date of Public Hearing	**Advertising Date**	**Placard Posting Date**


STREET
W. VA.
180
121.2
1/16
90
101
160
21
20
19
ROCK
180
180
180
(54)
(51)
(50)
(47)
94s
10
101
160
107s
(53)
(52)
(49)
(48)
(46)
(45)
41
42
43
44
180
180
180
177
ALLEY
2.45AC
76
114
81.5
STREET
364
180
1 inch = 50 feet
N


This is the existing building on Lot #43
180'
6'
16'
6'
8'
New Utility Building.
68'
166'
88'
37'
Handicap Parking
Handicap Walk
50' 3in
28'
Educational Building
Height About 8ft
40'
34
Church
18'
50'
166'
180'
Walk
Walk
Walk
Walk
Parking Lot
43
44
Stone Wall
180'
Road.
Queen Street


KING. STREET
KING ST.
KING ST.
24'
Fence
24'
38'
50'
80'
Drain Fields
14'
8'
16'
180'
Fence (I J Gruber)
well
12'
100'
9'
EXISTING Shed
52'
~~180'~~ 160'
6'
28'
12'
50'
Educational Building
28'
Parking Lot
34'
50'
Church
177'
QUEEN STREET
QUEEN St
QUEEN ST.

Jefferson County, West Virginia

Department of Engineering, Planning, and Zoning

Office of Planning and Zoning

116 East Washington Street, 2nd Floor

P.O. Box 716

Charles Town, WV 25414

Email: zoning@jeffersoncountywv.org **Phone: (304) 728-3228**

Zoning Administrator's Report
Board of Zoning Appeals Meeting
November 9, 2017

1) **Pending Zoning Ordinance and Subdivision Regulation Amendments**

- **Pending amendments:**

  a) Historic Preservation – No update since October 26 Meeting

     i. On July 11, 2017 the Planning Commission held a Public Hearing. The Planning Commission made additional revisions on 09-12-17 and directed Staff to work with Legal on finalizing the amendment. It is anticipated that the revised draft will go before the Planning Commission on November 14.

  b) Signage – No Update since October 26 Meeting

     i. A Work Session is scheduled with the Planning Commission for November 28 to review industry standards.

2) **Upcoming BZA meeting**

- Due to the Christmas Holiday, the next regular meeting is scheduled for **December 14, 2017** (deadline for submissions is Friday, 11-17-17)

JEFFERSON COUNTY, WEST VIRGINIA
Office of Planning and Zoning
116 East Washington Street, 2nd Floor
P.O. Box 716
Charles Town, West Virginia 25414

Phone: (304) 728-3228
Email: zoning@jeffersoncountywv.org **Fax:** (304) 728-8126

MEMORANDUM

TO: Board of Zoning Appeals Members

CC: Engineering & Building Permits Offices

FROM: Alexandra Beaulieu, Zoning Administrator

DATE: November 3, 2017

SUBJECT: October Zoning Certificate Activity Report

ISSUED ZONING CERTIFICATES

#ZC17-33 American Towers, LLC
Issued: October 30, 2017
Proposal: Co-locate weather monitoring equipment on existing tower, and ground-level support equipment.
Location: Raven Rock, 17340 Poppy Road, Bluemont, VA 20170
Zone: Rural

PENDING ZONING CERTIFICATES

#ZC17-35 Brian Carter, Applicant / Sebbahi Real Estate, Owner
Issued: TBD
Proposal: An 8' x 20' BBQ trailer and table for customers.
Location: 99 Cary Lu Circle; Harpers Ferry, West Virginia 25425
Zone: Residential-Light Industrial-Commercial

JEFFERSON COUNTY, WEST VIRGINIA
Office of Planning and Zoning
116 East Washington Street, 2nd Floor
P.O. Box 716
Charles Town, West Virginia 25414

Email: zoning@jeffersoncountywv.org **Phone: 304-728-3228**
Fax: 304-728-8126

2018 MEETING SCHEDULE OF THE JEFFERSON COUNTY BOARD OF ZONING APPEALS

Board of Zoning Appeals meetings are held in the Old Charles Town Library Meeting Room located at 200 East Washington Street, at the side entrance on Samuel Street at 2:00 p.m.

Scheduled Meetings	**Submission Deadlines***
Thursday, January 25, 2018	Wednesday, January 3, 2018
Thursday, February 22, 2018	Wednesday, January 31, 2018
Thursday, March 22, 2018	Wednesday, February 28, 2018
Thursday, April 26, 2018	Wednesday, April 4, 2018
Thursday, May 24, 2018	Wednesday, May 2, 2018
Thursday, June 28, 2018	Wednesday, June 6, 2018
Thursday, July 26, 2018	Thursday, July 5, 2018
Thursday, August 23, 2018	Wednesday, August 1, 2018
Thursday, September 27, 2018	Wednesday, September 5, 2018
Thursday, October 25, 2018	Wednesday, October 3, 2018
Thursday, November 8, 2018**	Wednesday, October 17, 2018
Thursday, December 13, 2018**	Wednesday, November 21, 2018

* The required zoning variance request form signed by the legal property owner, supporting documentation and applicable fees must be submitted to the office by close of business on the Submission Deadline date in order for the request to be sufficiently reviewed and noticed in the Spirit of Jefferson. For all other applications please contact the office for the Submission Deadline date.

*** Meeting dates have been modified in observance of the Thanksgiving and Christmas Holidays.

Changes in the time or location of the meeting shall be noticed on the County's website at www.jeffersoncountywv.org. Note: If the President of the County Commission or Chair of the Board of Zoning Appeals has determined weather conditions make travel unsafe for the public, County offices may close and/or the Board of Zoning Appeals meeting may be cancelled. Please check the County's website for possible meeting updates during inclement weather.

Agenda items that have been deferred due to a cancellation will be rescheduled. Per the Board's Rules of Procedure, no additional newspaper notice shall be given. Please keep signs posted on the respective properties until the rescheduled meeting date. Please call the office or check the County's webpage for the rescheduled meeting date.