Fire Safety Analysis

For Proposed
Bulk Plant Distribution Center
With Empty Tank Storage and
Delivery Truck Parking

By:

Alliance PROPANE

Project Location
Murrieta, CA
APN: 909-060-044

April 23, 2021

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	Alliance Propane Inc
2	Contact Name	Mike Mowad
3	Contact Telephone & Fax Numbers	951-676-1916
4	Contact Email Address	mike@alliancelp.com
5	Mailing Address	Street 1:31805 Temecula Pkwy #645
		Street 2:
		Temecula CA 925292

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	0	0
	1,000	0	0
	2,000	0	0
	4,000	0	0
	10,000	0	0
	18,000	0	0
	30,000	6	180,000
	60,000	0	0
	Other:		0
	Other:		0
	Other:		0
	Other:		0
2	**Aggregate Water Capacity[4]**		180,000

Notes: **(1)** Column D = Column B x Column C.

(1) Parked bobtails, transports and tank cars should not be considered for aggregate capacity calculations.

(2) Do not consider containers that are not connected for use.

(3) 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.

(4) 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): Alliance Propane - Murrieta

b) Type of LP-Gas Facility: ☐ Commercial ☐ Industrial ☒ Bulk Plant

c) Facility is located in: ☒ x 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: North side of Adams Ave. between Elm St. and Fig St.

f) Landmarks, if any: Adajecnt to Superior Ready-Mix Plant

g) LP-Gas liquid supply by: ☐ Bobtail ☒ Truck Transport ☐ Rail Tank Car
(Check all that apply) ☐ Pipeline

LP-Gas Distribution by: ☐ Liquid Piping ☐ Truck Transport ☐ Vapor Piping Plant
(Check all that apply): ☒ Bobtail ☐ Dispensing or Vehicle Liquid Fueling

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:
None

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

A	B	C	D	E
Container #	Service Configuration Subfigure (in Figure 5-1)	Number of Product Control Appurtenances		NFPA 58 Section Reference (2017 edition)
		Required by NFPA 58 (applicable edition)	Installed on the Container	
1	N/A			5.9.4.1, Table 5.9.4.1 (B) and 5.9.4.4
2				
3				
4				
5				
6				
7				

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 (2017 edition)**
					Required by NFPA 58 (applicable edition)	**Installed on the container**	
1	**Vapor**	Inlet	5-2	2	4	4	5.9.4.2, Table 5.9.4.2 and 5.9.4.3
		Outlet	5-3	2	4	4	
	Liquid	Inlet	5-6	2	4	4	
		Outlet	5-7	2	4	4	
2	**Vapor**	Inlet	5-2	2	4	4	
		Outlet	5-3	2	4	4	
	Liquid	Inlet	5-6	2	4	4	
		Outlet	5-7	2	4	4	
3	**Vapor**	Inlet	5-2	2	4	4	
		Outlet	5-3	2	4	4	
	Liquid	Inlet	5-6	2	4	4	
		Outlet	5-7	2	4	4	
4	**Vapor**	Inlet	5-2	2	4	4	
		Outlet	5-3	2	4	4	
	Liquid	Inlet	5-6	2	4	4	
		Outlet	5-7	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.

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?**		**NFPA 58 Section Reference (2017 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.	X	☐	6.14.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 ºF.	X	☐	6.14.6
		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.	X	☐	6.14.6
		Manually operated remote shutoff feature provided for ESV.	X	☐	6.14.12.1
		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.	X	☐	6.14.12.2
		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.	X	☐	6.14.5 and 6.21.2.6 (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.	X	☐	6.14.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection.	X	☐	6.14.3
		BCK is designed for this specific application.	X	☐	6.14.4
		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.	X	☐	6.14.5
		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.	X	☐	6.14.8
3	Debris protection ++	Liquid inlet piping is designed or equipped to prevent debris and foreign material from entering the system.	X	☐	6.21.2.5
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.	X	☐	6.21.2.6 (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 (6.14.3, 6.14.4).

++ 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 (2017 Edition)**
			Yes	**No**	
1	Emergency shutoff valve (ESV) (Ref § 6.14)	Installed within 20 ft. of lineal pipe from the nearest end of the hose or swivel-type connections.	X	☐	6.14.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	X	☐	6.14.6
		Temperature-sensitive element installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	X	☐	6.14.6
		Manually operated remote shutoff feature provided for ESV.	X	☐	6.14.12.1
		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.	X	☐	6.14.12.2
		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.	X	☐	6.14.5 and 6.21.2.6 (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.	X	☐	6.14.8
		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 (2017 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.	X	☐	6.14.2
		Automatic shutoff through thermal (fire) actuation element with maximum melting point of 250 °F.	X	☐	6.14.6
		Temperature-sensitive element installed within 5 ft. from the nearest end of the hose or swivel-type piping connected to liquid transfer line.	X	☐	6.14.6
		Manually operated remote shutoff feature provided for ESV.	X	☐	6.14.12.1
		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.	X	☐	6.14.12.2
		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.	X	☐	6.14.5 and 6.21.2.6 (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.	X	☐	6.14.8
2	Backflow check valve (BCK)**	Installed downstream of the hose or swivel-type connection.	X	☐	6.14.3
		BCK is designed for this specific application.	X	☐	6.14.4
		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.	X	☐	6.14.5
		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.	X	☐	6.14.8

****** 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 (6.14.3, 6.14.4).

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?		NFPA 58 Section Reference (2017 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.	X	☐	6.30.3 and 6.28.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve having internal excess-flow valve	X	☐	6.30.3.1 and 6.30.3.2
			Positive shutoff valve installed as close as practical to the internal valve	X	☐	6.30.3.4
3	Liquid or vapor inlet		Internal valve having internal excess-flow valve or backflow check valve (BCK)	X	☐	6.30.3.5
			Positive shutoff valve installed as close as possible to the internal valve or the backflow check valve (BCK)	X	☐	6.30.3.5
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	N/A	☐	6.21.2.6 (1) and 6.30.4
		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	N/A	☐	6.21.2.6 (2) and 6.30.4
5	Cargo tank transfer		Protection provided in accordance with 6.30.4.1	X	☐	6.30.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (fire) actuation	X	☐	6.30.4.2
			Actuated by a hose pull-away due to vehicle motion	X	☐	6.30.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft. of the point of transfer	X	☐	6.30.4.3 (A)
			Another remote shutdown station between 25 ft. and 100 ft. of the transfer point	X	☐	6.30.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and shut down all primary valves (internal & emergency valves).	X	☐	6.30.4.3
			Signs complying with the requirements of 6.30.4.3 (C) provided	X	☐	6.30.4.3 (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	Installed in the facility? No	NFPA 58 Section Reference (2017 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	X	☐	6.30.5.3 (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	X	☐	6.30.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 inch	X	☐	6.30.5.4 (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?		X	☐	6.30.5.4 (F)
		Do containers 2,001 gal (w.c.) or greater have a float gauge or other non-venting device?		X	☐	6.30.5.4 (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		☐	X	6.30.5.4 (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 (2017 Edition)
			Yes	No	
1	Lighting‡	Provide lighting for nighttime operations to illuminate storage containers, container being loaded, control valves, and other equipment	X	☐	6.21.5
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.	X	☐	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.	X	☐	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?	X	☐	6.21.4.2
		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	☐	X	6.21.4.2 (A)
		Is a clearance of at least 3 ft. all around to allow emergency access to the required means of egress provided?	X	☐	6.21.4.2 (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?	N/A	N/A	6.21.4.3
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?	X	☐	6.21.4.2 (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 (2017 Edition)
		Yes	No	
1	Are combustible materials not closer than 10 ft. from each container?	X	☐	6.5.3.3
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)?	X	☐	6.5.3.6
3	Are electrical equipment and wiring installed per Code requirements?	X	☐	6.25.2
4	Is open flame equipment located and used according to Code?	X	☐	6.25.3.1
5	Are ignition control procedures and requirements during liquid transfer operations complied with?	X	☐	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?	X	☐	6.29.4.2
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?	X	☐	9.3.5 and 9.4.7
8	Is the prohibition on smoking within the facility premises strictly enforced?	X	☐	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? Yes	Is the Facility compliant? No	NFPA 58 Section Reference (2017 Edition)
1	501 through 2,000	Above Ground	25	N/A	☐	6.4.1, 6.4.2 and Table 6.4.1.1
		Underground or Mounded	10	N/A	☐	
		Between containers	3	N/A	☐	
2	2,001 through 30,000	Above Ground	50	X	☐	
		Underground or Mounded	50	N/A	☐	
		Between containers	5	X	☐	
3	30,001 through 70,000	Above Ground	75	N/A	☐	
		Underground or Mounded	50	N/A	☐	
		Between containers	¼ sum of diameters of adjacent containers	N/A	☐	
4	70,001 through 90,000	Above Ground	100	N/A	☐	
		Underground or Mounded	50	N/A	☐	
		Between containers	¼ sum of diameters of adjacent containers	N/A	☐	
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	X	☐	6.5.3.6 and 6.5.3.7

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

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? Yes	Is the Facility compliant? No	NFPA 58 Section Reference (2017 Edition)
1	Buildings, mobile homes, recreational vehicles, and modular homes with at least 1-hour fire-rated walls		X	10	X	☐	6.7.2 and Table 6.7.2.1
2	Buildings with other than at least 1-hour fire-rated walls		X	25	X	☐	
3	Building wall openings or pits at or below the level of the point of transfer		X	25	X	☐	
4	Line of adjoining property that can be built upon		X	25	X	☐	
5	Outdoor places of public assembly, including school yards, athletic fields, and playgrounds		X	50	X	☐	
6	Public ways, including public streets, highways, thoroughfares, and sidewalks	From points of transfer in LP-Gas dispensing stations and at vehicle fuel dispensers	X	10	X	☐	
		From other points of transfer	X	25	X	☐	
7	Driveways		☒	5	X		
8	Mainline railroad track centerlines		N/A ☐	25			
9	Containers other than those being filled		☒	10	X	☐	
10	Flammable and Class II combustible liquid dispensers and the fill connections of non-stationary containers		X	10	X	☐	
11	Flammable and Class II combustible liquid aboveground containers and filling connections of underground containers		X	20	X	☐	
12	LP-Gas dispensing device located close to a Class I liquid dispensing device		X	10	X	☐	6.27.4.3

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 (2017 Edition)
			Yes	No	
1	Container Insulation	Insulation provided on each of the containers?	X	☐	6.29.5.1
		Insulation material complies with the requirements of NFPA 58?	X	☐	6.29.5.1 and 6.29.5.2
2	Mounding of containers	Each container in the facility is mounded?	☐	X	6.29.5.3
		Mounding complies with each requirement under section 6.8.6.3 of NFPA 58?	☐	X	6.8.6.3 and 6.29.5.3
3	Burying of containers	Each container in the facility is buried?	☐	X	6.29.5.4
		Buried containers comply with each requirement under section 6.8.6.1 of NFPA 58.	☐	X	6.8.6.1 and 6.29.5.4

Form 6.6
Special Protection Measures – Active Systems

#	Special Protection Option	Question	Is the Facility compliant?		NFPA 58 Section Reference (2017 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?	☐	☐	6.29.6.1
		Do fire responsive devices actuate water spray system automatically?	☐	☐	6.29.6.2
		Can the water spray systems be actuated manually also?	☐	☐	6.29.6.2
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?	☐	☐	6.29.6.3
		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?	☐	☐	6.29.6.3
		Do fixed monitor nozzles comply with NFPA 15[1] requirements?	☐	☐	6.29.6.1
		Do fire responsive devices actuate the monitor nozzles?	☐	☐	6.29.6.2
		Can the monitor nozzles be actuated manually also?	☐	☐	6.29.6.2

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 (2017 Edition)
		Yes	No		
1	Storage containers	X	☐		6.8.1.2, 6.8.6.1(B), 6.8.6.1(C), 6.11.3.10 and 6.27.3.13
2	Transfer stations	X	☐		
3	Entryway into plant	X	☐		

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 80°F) 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).	6B	100	☐	X
Institutional Occupancies (Elderly Persons' Homes or Nursing Homes, Hospitals, Alcohol & Drug Rehabilitation Centers, Prisons).	N/A		☐	☐
Educational Occupancies (Elementary Schools, Day Care facilities, etc.).	N/A		☐	☐

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.	☐	X
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	☐	X
5	Other operations that may pose hazards (gasoline and other hazardous material dispensing stations, fertilizer storage, etc.)	☐	X

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

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 firefighters on duty at any time.		
5	Average number of firefighters available for response.		
6A	Number of firefighters qualified to:	"Firefighter I" level.	
6B		"Firefighter II" level.	
7A	Number of firefighters 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 <u>similar</u> 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.	

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 (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	0.0	
	1,000	172	86	21.5	0	0.0	
	2,000	290	145	36.3	0	0.0	
	4,000	374	187	46.8	0	0.0	
	6,500	570	285	71.3	0	0.0	
	9,200	790	395	98.8	0	0.0	
	12,000	990	495	123.8	0	0.0	
	18,000	1,160	580	145	0	0.0	
	30,000	1,610	805	201.3	6	1207	
	45,000	2,366	1,183	295.8	0	0.0	
	60,000	3,090	1,545	386.3	0	0.0	
	90,000	4,600	2,300	575	0	0.0	
	Other Size		0	0.0	0	0.0	
2a	Calculated water flow rate for container protection					1207	
2b	Water flow rate rounded up to nearest multiple of 125					1250	
3	Water for firefighter protection, if required ☐					250	
4	Total water flow rate and volume					1500	15000

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 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

A	B	C	D		
Item #	**Water from…**	**Available?**	**Quantitative information**		
1	Public supply or from another piped-in supply through one or more fire hydrants in or near the facility.	☒ Yes ☐ No	Hydrant data	Distance from Container(s) on which water will be applied (feet)	Available water flow rate from all hydrants[1] (gpm)
			Hydrant 1	75	
			Hydrant 2	150	
			Hydrant 3		
2	A nearby static water source (stream, pond, lake, etc.).	☐ Yes ☒ No	Distance to water source =_____feet Time to set up relay =_____minutes Rate of delivery =_____gpm		
3	Only through mobile water tanker shuttle.	☐ Yes ☒ No	Time to set up shuttle =_____minutes Sustainable flow rate =_____gpm		

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 58-2017 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 6.29.5 of NFPA 58, 2017 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 (2017 Edition)
				Yes	No	
1	Container sizes for which the appurtenances are provided		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.	X	☐	6.30.3 and 6.30.4
2	Liquid or vapor withdrawal (1-1/4 in. or larger)		Internal valve with internal excess-flow valve.	X	☐	6.30.3.1 and 6.30.3.2
			Positive shutoff valve installed as close as possible to the internal valve.	X	☐	6.30.3.4
3	Liquid or vapor inlet		Internal valve with internal excess flow valve or backflow check valve (BCK).	X	☐	6.30.3.5
			Positive shutoff valve installed as close as possible to the internal valve or the backflow check valve (BCK).	X	☐	6.30.3.5
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.	N/A	☐	6.21.2.6 (1) and 6.30.4.1
		Flow only into railroad tank car	Emergency shutoff valve or backflow check valve (BCK) installed in the transfer hose or the swivel-type piping at the tank car end.	N/A	☐	6.21.2.6 (2) and 6.30.4.1
5	Cargo tank transfer		Protection provided in accordance with 6.30.4.1.	X	☐	6.30.4.1
6	Automatic closure of all primary valves (IV & ESV) in an emergency		By thermal (fire) actuation.	X	☐	6.30.4.2
			Actuated by a hose pull-away due to vehicle motion.	X	☐	6.30.4.2
7	Manually operated remote shutdown of IV and ESV		Remote shutdown station within 15 ft. of the point of transfer?	X	☐	6.30.4.3 (A)
			Another remote shutdown station between 25 ft. and 100 ft. of the transfer point?	X	☐	6.30.4.3 (B)
			Shutdown stations will shut down electrical power supply to the transfer equipment and all primary valves (Internal and Emergency Valves).	X	☐	6.30.4.3
			Signs complying with the requirements of 6.30.4.3 (C) provided?	X	☐	6.30.4.3 (C)

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?**		**NFPA 58 Section Reference (2017 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 gauge not used during transfer operations	X	☐	6.30.5.3 (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	X	☐	6.30.5.4 (A)
			Does not exceed 15 cm^3 (0.91 in^3) from a hose of nominal size larger than 1 inch	X	☐	6.30.5.4 (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?		X	☐	6.30.5.4 (F)
		Do containers greater than 2,000 gal (w.c.) have a float gauge or other non-venting device?		X	☐	6.30.5.4 (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		X	☐	6.30.5.4 (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 (2017 Edition)**
			Yes	**No**	
1	Container insulation	Insulation provided on each of the containers?	X	☐	6.29.5.1
		Insulation material complies with the requirements of NFPA 58?	X	☐	6.29.5.1 and 6.27.5.2
2	Mounding of containers	Each container in the facility is mounded?	☐	X	6.29.5.3
		Mounding complies with each requirement under section 6.8.6.3 of NFPA 58?	☐	X	6.8.6.3 and 6.29.5.3
3	Burying of containers	Each container in the facility is buried?	☐	X	6.29.5.4
		Buried containers comply with each requirement under section 6.8.6.1 of NFPA 58.	☐	X	6.8.6.1 and 6.29.5.4

Form 9.7
Special Protection Measures – Active Systems

Item #	**Special Protection Option**	**Question**	**Is the Facility compliant?**		**NFPA 58 Section Reference (2017 Edition)**
			Yes	**No**	
1	Water spray systems	Are fixed water spray systems, complying with NFPA 15 requirements, used for each container in the facility?	☐	☐	6.29.6.1
		Do fire responsive devices actuate water spray system automatically?	☐	☐	6.29.6.2
		Can the water spray systems be actuated manually also?	☐	☐	6.29.6.2
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?	☐	☐	6.29.6.3
		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?	☐	☐	6.29.6.3
		Do fixed monitor nozzles comply with NFPA 15 requirements?	☐	☐	6.29.6.1
		Do fire responsive devices actuate the monitor nozzles?	☐	☐	6.29.6.2
		Can the monitor nozzles be actuated manually also?	☐	☐	6.29.6.2

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

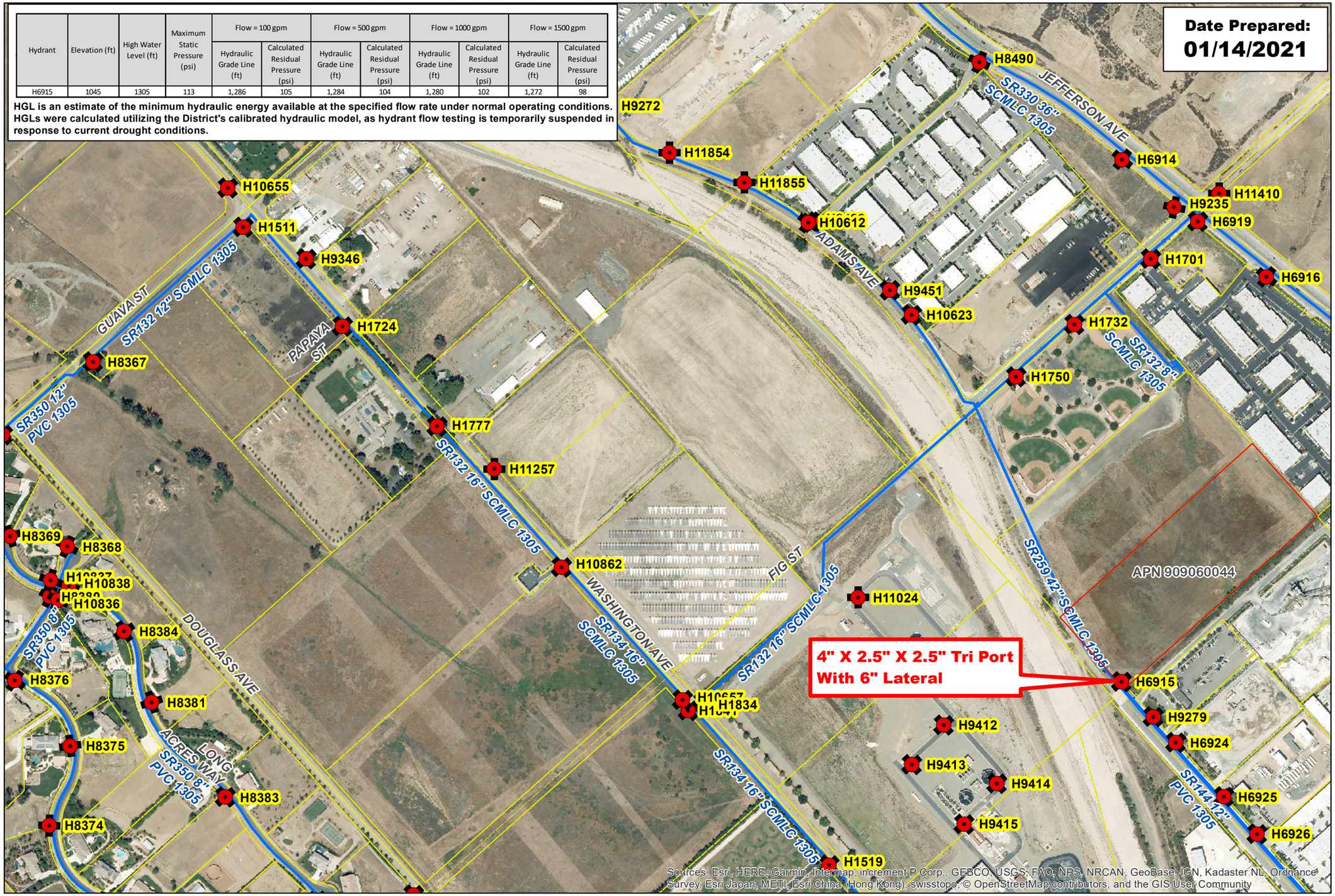
Item #	Possible options to implement when adequate water supply is not available
1	Reduce the service life of hoses.
2	Increase frequency of equipment inspection.
3	Establish a service life program for the maintenance of the container pressure relief devices. This could include the installation of a 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.

Aerial Photo of Proposed Location

Fire Hydrant Map & Flow Request

Hydrant	Elevation (ft)	High Water Level (ft)	Maximum Static Pressure (psi)	Flow = 100 gpm		Flow = 500 gpm		Flow = 1000 gpm		Flow = 1500 gpm	
				Hydraulic Grade Line (ft)	Calculated Residual Pressure (psi)	Hydraulic Grade Line (ft)	Calculated Residual Pressure (psi)	Hydraulic Grade Line (ft)	Calculated Residual Pressure (psi)	Hydraulic Grade Line (ft)	Calculated Residual Pressure (psi)
H6915	1045	1305	113	1,286	105	1,284	104	1,280	102	1,272	98

HGL is an estimate of the minimum hydraulic energy available at the specified flow rate under normal operating conditions. HGLs were calculated utilizing the District's calibrated hydraulic model, as hydrant flow testing is temporarily suspended in response to current drought conditions.



Rancho California Water District
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Temecula, CA. 92589-9017
(951) 296-6900
www.ranchowater.com

0 50100 200 300 400
Feet

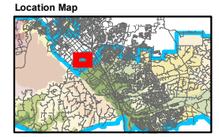
1 inch = 400 feet

Aerial Image
Data Collected May 2010

Legend

- Hydrant
- **Potable MainLine**
  - Active
- **Subject Property**

Location Map



Engineering Planning

Redundant Failsafe Product Control Measures:
The code is specific in stating that its purpose is, "to enhance safety and to mitigate distance and special protection reduce requirements." In other words, the intent of installing Redundant Failsafe Product Control measures is to provide extraordinary levels of safety in situations where there are heightened levels of concern or vulnerability, such as in densely populated areas.

There are three essential features that provide the redundant failsafe protection: a) Internal Safety Control Valves, b) Emergency Shut-off Valves, c) Hose End Lock Box, and d) Emergency Shutdown stations, which are described as follows.

Internal Safety Control Valves: The Internal Safety Control Valves that are proposed for this facility were first designed for transportation tanks and have been required by the Department of Transportation for many years. They are designed to be failsafe. That is, some force must be used to hold them in an open position. They are not only spring-loaded to be normally closed, but if the springs should brake, gravity and /or product flow will close them when mounted in the bottom of a tank. They also include excess-flow protection. A major benefit to their design is that the actual valve disc and seat are inside the tank and therefore kept cool by the liquid in the bottom of the tank. Again, the liquid temperature cannot exceed approximately 140°F due to the refrigeration that occurs when the relief valves are venting. In the photograph, the white pneumatic operators are holding both internal valves open in that product transfer was occurring. In the picture, a one-quarter inch plastic line can be seen. This tubing carries pneumatic pressure to the diaphragm operators and traces all of the piping, thereby providing thermal shutdown protection over the entire system. These two tank openings, liquid and vapor, would be in the access tunnel, the first one being about seven feet in from the outer edge of the retaining wall. Beneath both internal valves will be manually operated valves and after the elbow that makes the transition to horizontal, a stainless-steel flexible joint will be installed to provide seismic protection.

Emergency Shutoff Valve: Near the point of transfer, an ESV (emergency shutoff valve) is installed. This valve addresses concerns about a "drive-away", where a truck moves with hoses still connected. This is a fail-safe fire rated valve that is held open by a pneumatic operator. However, unlike the internal valves, this valve must be manually opened after the pneumatic control system is pressurized. In the photograph, the red valve near the ground just behind the red 90-degree elbow is the ESV. The yellow stanchion is set in concrete and designed to provide pull-away protection. A two-inch coupling is welded into this anchorage with a short pipe of no less than 12 inches screwed into it. This is designed as a shear point. We know through testing that 1,200 pounds of pull on the hose will cause the pipe nipple to shear at the lower threads. On the horizontal member of the stanchion, may be seen a loop with a cable clamped around it. The other end of this cable is attached to the valve at the end of the hose. In a pull-away the hose will stretch and beak the tubing thereby instantly closing all the automatic valves in the system. All piping in the system is at least schedule 80 and all the fittings are rated for 2,000 psi.

Historically, transfer hose failure has been exceedingly rare. The more common problem has been failure of the hose end clamps to hold. As a result, code has become very restrictive regarding hose assembly and inspection. The hose end is swaged on at the factory and numerous pull tests indicate the two-inch hose will not fail before 10,000 pounds of pull and then not pull free of the coupling.

Lock Box: The hose-end lock box is an important safety feature in removing the human element.

Though not required by code it is common practice. The lock in the photo is a special design that will not release the key until the lock is closed. The ignition key for any bobtail truck loading from this system is attached to the lock box key. The loading procedure therefore is that upon positioning and leaving the truck, the driver takes the ignition key and unlocks the lockbox leaving both keys in the lock. As the hose is lifted from the box, the internal valves automatically open and charge the piping. After the hose is connected, the driver manually opens the hose end valve, the valve on the truck and the emergency shutoff valve. After filling, all valves, ISC and ESV automatically close as the hose end valve is placed into the lockbox. This guarantees that the valves under the tank and the emergency shutoff valves are always closed except during transfer. This provides further seismic protection and protection against vandalism.

Emergency Shutdown Stations: Emergency shutdown stations will be installed at both the bobtail loading side and at the transport connections on the opposite side of the storage. There will also be another at the opposite end of the tank. These stations will be red and white signs with a plunger valve in the center. Attached to the plunger valve will be a large red button that when pushed will close all the internal and emergency shutoff valves instantly. All the piping will be surrounded with either curbs or heavy steel pipe filled with concrete as required by code.

Transport and Bobtail Safety: The safety record for product release from highway vehicles is very good both while in transit and during the loading and unloading process. Although the wall thickness of their tanks is less than that of the 30,000-gallon tank that we have been discussing, the tanks are made of high tensile steel. The only transportation tanks that I am aware of that failed, were traveling at a high rate of speed and failed upon striking a solid object. I cannot recall any occasion where a highway type transportation tank failing even when involved directly in a fire. In such cases, the action of the relief valve saved the tank. These tanks are manufactured to ASME code, but they are also DOT rated. All transfer openings are in the bottom of the tank and must be fitted with internal valves or back-flow check valves. The internal valves on transport trucks must have a minimum of two quick-closing stations. One station will be on the rear of the trailer and the other toward the front, often on both sides. The local delivery trucks normally have an interlock system such that the internal valve is open only while a delivery is being made. This interlock prevents the truck from moving while the valve is open. To further enhance safety, most local delivery trucks fill through a dedicated opening that is fitted with a back-flow check valve.

Employee Training and Safety Practices: Perhaps this should have been noted first, but propane is a very stable product. It is a refined product with identified and consistent characteristics. As with any energy source, it has a hazardous potential, but the industry understands this. They know that they cannot afford accidents. As a result, both the National Propane Gas Association and the Western Propane Gas Association sponsor training and safety programs. Equipment manufacturers also contribute to these programs. Alliance Propane has a well-defined and maintained safety and inspection programs.

In conclusion this facility will pose little to no risk base on the design review and installation of the above listed Redundant Failsafe Product Control Measures and the available water supply and its location in-regards to tank placement there is no reason for any other protection for this facility. I would recommend the Alliance Propane Inc hold safety class for all responder in the area so they will have better understanding of the facility and the emergency shutdown system.

RANSOME
MANUFACTURING

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Steel frame design for a 30,000 gallon LPG tank. Tank is 9'-8’ diam. x 60’ O.A.L. Tank will be permanently attached to the frame by welding so that the tank and frame act as a single unit for purposes of this design. The tank is to be installed on a 6" thick concrete slab. This design complies with the 2013 California Building Code (CBC), and by reference, ASCE Standard 7-10. The following criteria was used in this design:

Occupancy Category : III, Table 1-1, ASCE

Earthquake design data:

Site Class D (USGS)

Ss = 1.916 (USGS for Lat. & Long.),

Fa = 1.0 (USGS)

ASCE Equation 15.4-5 (For Rigid Nonbuilding Structures that have a fundamental period T less than 0.06 s: V = 0.30 x SDS x W x I, where SDS = 1.277, W = total weight of tank and content, and I = 1.25(Importance Factor).

CBC Equation 16-22 : L = (0.9D ± (E ÷ 1.4), a 1/3 increase is permitted in allowable stresses)

Dead Load D:

Wt. Of Tank	= 68,900 lbs.
Wt. Of Content	= 108,360 lbs.
Tank and content	= 177,260 lbs.
Wt. Of frame and equipment	= 11,610 lbs.
Total Wt.	= 188,870 lbs.

Seismic Force V = 0.30 x SDS x W x I

= 0.30 x 1.277 x 188870 x 1.25

= 90445 lbs.

Check Overturning:

Mo = 6.4 x 90445 = 578848 ft. lbs.

Mr = 5.1x 188870 = 963237 ft. lbs.

Factor of safety against overturning:

F.S. = 963237 ÷ 578848 = 1.7 Unit is stable against overturning

Check Base Bearing Pressure: Total length of bearing surface = 217 ft.

Bearing area of frame = 217 x .67 = 145.39 sq. ft.

Combined loading L = .9D ± (E ÷ 1.4), where D = 188870, and

E = Ra = Rb = (90445 x 6.4) ÷ 10.21 = 56694

L = .9 x 188870 ± (56694 ÷ 1.4)

= 169983 ± 40496

Load per linear foot of Frame = (169983 ÷ 217) ± (40496 ÷ 108.5)

= 783 ± 373

= 1156 plf max., and 410 plf min. (no uplift)

Maximum Soil Pressure: Assuming a 45 degree angle of fracture for the concrete, each lineal foot of frame will have .67 + .5 +.5 = 1.67 sq. ft. per lineal of bearing surface. Therefore, the maximum soil pressure will = 1156 ÷ 1.67 = **692 psf.** Slab: Since there is no beam action involved, use #4 rebar @ 1'-6" centers each way for temperature steel.

Check frame as a beam:

Cantilevered End Section: $M = (w\ l^2) \div 2$

$= (1156 \times 10.06^2) \div 2$

= 58496 ft. lbs - worst case

Center Section: $M = (w\ l^2) \div 12$

$= (1156 \times 24^2) \div 12$

= 55488 ft. lbs.

Sreq. = (M x 12) ÷ (fs x 1.33)

= (58496 x 12) ÷ (22000 x 1.33)

= 24.0 in^3 O.K. < 51.9 in^3 provide O.K.

Wind Force is negligible, seismic governs.

Check welds at Tank Support:

Allowable load for ¼" fillet welds using E6010 electrodes is 3.2 K/in.

Length of weld required = 323K (4xWeight of Tank and Frame) x 2 ÷ 3.2 K/in. = 145 in.

Length of weld available = 56.25 in (Length of Baseplate) x 6 = 337.5 in. O.K.