

LP-Gas Dispensing



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Abbreviations/Acronyms

- AHJ: Authority having jurisdiction...You
- FMCAP: Fire Marshal Code Advisory Panel
- LPG: Liquid Propane Gas
- MPA: Minnesota Propane Association
- NPGA: National Propane Gas Association
- FSA: Fire Safety Analysis Manual

Learning Objectives

- Review SFM 2013 Code Interpretation
- 2015 MSFC Requirements
- Installation requirements
- Installation problems
- 2015 International Fire Code
- Future possibilities
- What can go wrong

Handouts

- Updated Information Sheet
- 2015 MSFC Chapter 2307 Dispensing
- Fire Chief Magazine Article Feb 2016

SFM 2013 Code Interpretation

- Can the public dispense LPG into their vehicle?
- Met with LPG industry and MPA
- Reviewed MSFC, Code Commentary and NFPA 58
- Interpretation and information sheet developed
- Information presented to FMCAP and recommended approval
- State Fire Marshal approved interpretation

What were the findings

- LPG dispensing most restrictive in IFC
 - Why...guessing heavier than air
 - Liquid transfer
- IFC not kept up with industry change
- 2011 NFPA 58 dispensing requirements
 - NFPA concerned with security

Information Sheet Sections

- Introduction and code history
- General fire safety
- Installation
- Fire extinguishers
- Signs
- Vehicle installation
 - Labeling per MSFC Chapter 84
- Training

MSFC Chapter 84



2015 MSFC



- Moved the interpretation into code
- Replaced Section 2307 LPG Dispensing
- Self serve public dispensing allowed
 - Trained user by owner
 - Access code, key or card

Who are the users of LP?

- Private fleets
- General consumers
 - **New vehicles can be ordered**
- School buses

School Buses

- School districts and private companies
- Buying new buses powered by LPG
- Advantages
 - **Burn cleaner**
 - **Lower fuel costs**
 - **Quieter than diesel**
 - **Warmer interiors than diesel**
 - **Lower maintenance costs**

School Buses

- Disadvantages
 - **Travel distance may be limited**
 - **Availability of fuel at destination**
 - **Access code for self-service**

Installation

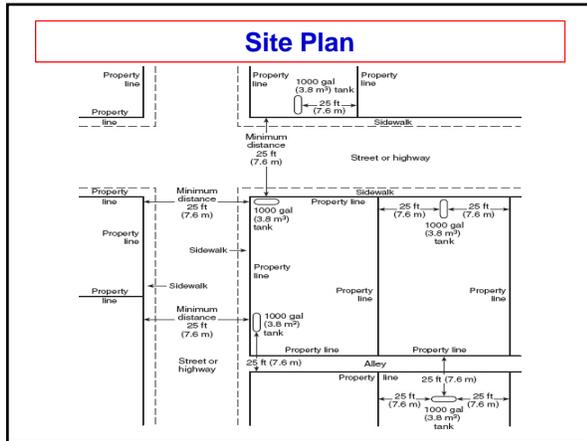
- Need to know
 - Fleet vs public dispensing
 - Size and how many LP containers
 - Site plan
 - Mounting surface
 - State electrical permit and approval
 - Vehicle impact protection

Installation

- Need to know
 - Emergency fuel shut off
 - Dispenser location and hose length
 - Dispenser distance to gasoline dispensers
 - Training of users
- Fire Safety Analysis Manual
 - NFPA 58 Section 6.25.3

Fire Safety Analysis Manual

- Required for any installation > 4,000 gallon aggregate water capacity
- 200 page doc @ NFPA.org search FSA
 - Developed by NFPA, NPGA
 - Grant by Propane Ed & Research Council
- Code info, photos, sample manual
- Fillable form for installer to complete

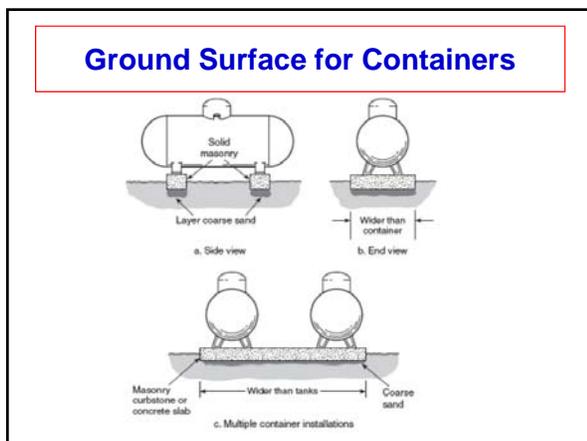


Container Size & Distances

Table 6.3.1 Separation Distances Between Containers, Important Buildings, and Line of Adjoining Property That Can Be Built Upon

Water Capacity per Container		Minimum Distances					
		Mounded or Underground Containers ^a		Aboveground Containers ^b		Between Containers ^c	
gal	m ³	ft	m	ft	m	ft	m
<125 ^d	<0.2 ^d	10	3	0 ^e	0 ^e	0	0
125-250	0.5-1.0	10	3	10	3	0	0
251-500	>1.0-1.9	10	3	10	3	3	1
501-2,000	>1.9-7.6	10	3	25 ^f	7.6	3	1
2,001-30,000	>7.6-114	50	15	50	15	5	1.5
30,001-70,000	>114-205	50	15	75	23		
70,001-90,000	>205-341	50	15	100	30		3/4 of sum of diameters of adjacent containers
90,001-120,000	>341-454	50	15	125	38		
120,001-200,000	>454-757	50	15	200	61		
200,001-1,000,000	>757-3785	50	15	300	91		
>1,000,000	>3785	50	15	400	122		

^a See 6.3.4.
^b See 6.3.11.
^c See 6.3.10.
^d See 6.3.9.
^e See 6.3.7 and 6.3.8.
^f See 6.3.5.



Saddles for Large Containers



Concrete Column



Vehicle Impact Protection

- Types available
- Guard posts per MSFC Section 312
 - Installation already engineered
- Other engineered barriers
 - 36 inches minimum
 - 12,000 pound force
 - Force applied at 36 inches
- Dispensing island 6 inches in height

Emergency LPG Shut-Off Switch



Key switch to activate pumps



Dispenser Location



Propane Dispensers



Nozzle



Installation Problems

Discovered by SFM
Inspectors

Nice Posts...Too Close to Container



Diesel Dispensing Truck Stop



Landscape Blocks







Is this acceptable protection?

A. Yes

B. No



Installation not approved





Dandi Block



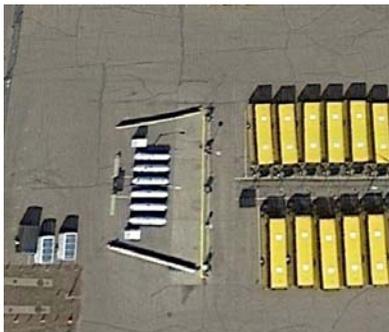
Dandi Block Concerns

- NFPA 58 Section 6.6.3.3
- **(B)** Horizontal ASME containers of 2000 gal or less, on foundations in their installed condition, shall meet the following:
 - (1) Structurally support the containers when subject to deteriorating environmental effects including, but not limited to, ambient temperature of -40°F to 150°F or local conditions if outside this range, ultraviolet rays, radiant heat from fires, and moisture
 - (2) Be of either noncombustible or self-extinguishing material (per the definition in NFPA 99, *Standard for Health Care Facilities* 3.3.165)

Relocated Jersey Barriers



Public School Buses



Emergency Switch not installed



Other Issues

- FSA not completed
 - Misinterpreted when required
 - Took few attempts to get it correct
- Electrician working without permit

School District Changes

Start Over

Replace Containers



New Dispensers



New Low Emission Nozzles



Retrofit Buses with New Fitting



Fitting Accepts Adapters





Protection of Dispensers



Propane Labels



Finished Product

- Code compliant installation
- Original installer keeps the gas supply account
 - District signed multiyear agreement
- Drivers all trained in the operation
- District secured key fobs for other suppliers when traveling

2015 IFC LPG Dispensing

- Now allows public dispensing
- Code recognizes new technologies
- New nozzles provide for safer operation
 - **Release only 1/8 fluid ounce to air**
- User is still required to have training
 - **Hands on training**

2015 IFC LPG Dispensing

- Why not adopt this language?
- MSFC was well into the adoption process
- Need to give this code time
- Existing dispensers not equipped with new nozzles
- Not all vehicles can accept new nozzle
- Unsure about adapters for fueling

Future

- 2018 IFC in development now
- Unknown what changes will occur
- The Minnesota code cycle
 - **After 2018 then 2024**
 - **A lot of change can occur in the model codes**
 - **A lot of change in the industry outpacing the codes**

Why so important to get it right?



Questions



MINNESOTA STATE DEPARTMENT OF PUBLIC SAFETY



Alcohol &
Gambling
Enforcement

Bureau of
Criminal
Apprehension

Capitol Security

Crime Victim
Services

Driver & Vehicle
Services

Emergency
Management /
Emergency
Response
Commission

State Fire
Marshal /
Pipeline Safety

State Patrol

Traffic Safety

State Fire Marshal Division

445 Minnesota Street, Suite 145, St. Paul, Minnesota 55101-5145
Phone: 651/201-7200 FAX: 651/215-0525 TTY: 651/282/6555
Internet: <https://dps/mn.gov/divisions/sfm>

LP-GAS SELF-SERVICE DISPENSING INFORMATION SHEET

SECTION 1 — INTRODUCTION

This fire safety information sheet is based on the 2015 Minnesota State Fire Code (MSFC) Section 2307.5. This contains information for authorities having jurisdiction (AHJ) and other parties for the installation and use of LP-Gas self-service dispensers by the general public. This information sheet does not apply to other types of LP-Gas dispensing covered by MSFC Section 2307.

Section 2307 has remained unchanged since development of the I-Codes by the International Code Council in 2000. These same requirements first appeared in the 1994 Uniform Fire Code and had been brought forward to the I-Codes. LP-Gas dispensing appears to be the most restrictive when it comes to dispensing products for motor vehicles. In Minnesota, chapters in the Uniform and International Fire Codes regulating LP-Gas have been deleted for many years and replaced with National Fire Protection Association (NFPA) 58, the Liquefied Petroleum Gas Code. NFPA 58 has sections for LP-Gas transfer from container to container, training requirements for dispensing, vehicle fuel dispensing systems, and installation of equipment on a vehicle's engine fuel system and training requirements.

The following sections should guide all interested parties through the process to install a self-service LP-Gas dispenser per the applicable codes. LP-Gas dispensers may be required to meet other provisions that are not listed here. This information sheet provides an overview of the major code requirements that apply to LP-Gas self-service dispensing by the general public.

References to the applicable code sections are found in brackets, []. The applicable edition of NFPA 58 is the 2011 edition, for NFPA 30A the 2012 edition and 2015 edition of the MSFC.

More information is available from the Minnesota State Fire Marshal Division at 651-201-7221. Email questions to firecode@state.mn.us or view our web page at <https://dps.mn.gov/divisions/sfm> for the latest information on fire in Minnesota.



SECTION 2 — GENERAL FIRE SAFETY PROVISIONS

2.1 Permits

Permits for the installation of the dispenser and the operation of the dispenser may be required by the AHJ for any size LP-Gas container. [MSFC Sections and 105.6.27, 105.7.9 and 2301]

2.2 Documents

Documents and plans where required by the AHJ shall indicate the equipment to be installed, site plan showing any set back requirements and signs required by this code [MSFC Section 2301.3].

SECTION 3 — INSTALLATION

3.1 Dispenser Assembly

Assembling a dispenser is considered to be an installation of the container, pumps, meters, etc. which is covered in NFPA 58, Section 6.24.

3.2 Dispenser Installation

Code requirements for the installation of the dispenser assembly including separation distances, general requirements, emergency shut off systems and breakaway devices, hose requirements and location when dispensing near Class I liquids are found in Section 6.24 and Table 6.5.3 of NFPA 58 and MSFC Section 2307.

3.3 Dispenser Protection

Dispenser assemblies shall be protected from impact damage per the requirements in MSFC Section 2307.4. This section references requirements in MSFC Section 2306.7.3 or Section 312.

3.4 Dispensers Located on island with Class I liquid dispensers

The following requirements will apply to a dispenser located on an island at a motor fuel dispensing facility near a Class I liquid dispenser [NFPA 58 Section 6.24.4.3]:

- *Conventional dispenser at least 10 feet from any dispensing device for Class I liquids OR,*
- *Low emission transfer complying with NFPA 58 Section 6.26 at least 5 feet from any dispensing device for Class I liquids.*

3.5 Dispenser Operation

Self-service LP-Gas dispensing shall be controlled by a key, code or access card issued to the trained person and limited to the fueling of containers mounted on LP-Gas powered vehicles. [MSFC 2307.5]

SECTION 4 — FIRE EXTINGUISHERS

4.1 Extinguisher Size and Location

Fire extinguishers shall be installed per MSFC Section 2305.5. Commentary in NFPA 58 Section 6.25.4 suggests it is more important to locate the shut off valves to the propane dispenser to stop the flow of LP-gas and then extinguish any remaining fire with the fire extinguisher. [MSFC Section 2305.5, NFPA 58 Section 6.25.4.3]

SECTION 5 — SIGNS

5.1 Sign Location and Details

- Signs shall be installed in the area of the dispenser and contain the following information [MSFC Sections 2304.3.5 and 2305.6, NFPA 58 Section 7.2.1.2]:
- No Smoking or Open Flame
- Shut off Motor
- Emergency Contact Numbers
- Emergency Procedures
- Trained Person to remain with vehicle at transfer point.

SECTION 6 — VEHICLE INSTALLATION

6.1 LP-Gas System Installation

Chapter 11 of NFPA 58 contains the requirements for installing LP-Gas fuel system for internal combustion engines using propane as its fuel source.

6.2 Training

Only trained persons shall install, repair, fill or otherwise service LP-Gas engine fuel system on a motor vehicle to supply LP-Gas to fuel the engine. The installer shall follow the installation requirements in Chapter 11 of NFPA 58. [NFPA 58 Section 11.2]

6.3 Labeling of Vehicles

Vehicles powered by LP-Gas used over-the-road shall be marked with a diamond shaped Propane label on the right rear of the vehicle. See Minnesota Rule 7511.8400 through 7511.8440. <https://www.revisor.mn.gov/rules/?id=7511.8410>

SECTION 7 — TRAINING

7.1 Transfer of Liquid

Portions of Chapter 7 of NFPA 58 will apply to the dispensing operation.

7.2 Training of the Public

Anyone dispensing LP-Gas into a container on a motor vehicle to fuel the engine shall be trained by the owner of the dispenser in the safe operation of the dispensing equipment. [MSFC 2307.6.1, NFPA 58 Section 4.4 and 7.2.2.1]

7.3 Documentation

The owner of the dispenser shall document the training prior to issuing a key, code or access card to the vehicle owner and any operators of that vehicle. [MSFC 2307.6.1, NFPA 58 Sec. 4.4]

SECTION 2307

LIQUEFIED PETROLEUM GAS MOTOR FUEL-DISPENSING FACILITIES

2307.1 General. Motor fuel-dispensing facilities for liquefied petroleum gas (LP-gas) fuel shall be constructed and installed in accordance with NFPA 58 and this section.

2307.2 Approvals. Storage vessels and equipment used for the storage or dispensing of LP-gas shall be *approved* or listed in accordance with Sections 2307.2.1 and 2307.2.2.

2307.2.1 Approved equipment. Containers, pressure relief devices (including pressure relief valves), pressure regulators, and piping for LP-gas shall be *approved*.

2307.2.2 Listed equipment. Hoses, hose connections, vehicle fuel connections, dispensers, LP-gas pumps, and electrical equipment used for LP-gas shall be *listed*.

2307.3 Dispensing. Motor fuel-dispensing operations for LP-gas shall comply with Section 2304 and NFPA 58.

In addition, the following requirements shall apply:

1. The filling of portable containers is prohibited.
2. The filling of tanks on recreational vehicles other than those used for engine fuel systems is prohibited.
3. No smoking or open flame is permitted within 25 feet of any dispenser operations.

2307.4 Vehicle impact protection. Vehicle impact protection for LP-gas storage containers, pumps, and dispensers shall be provided in accordance with Section 2306.7.3 or 312.

2307.5 Self-service fueling of motor vehicles. Self-service LP-gas dispensing systems shall be controlled by key, code, or access card issued to trained persons and shall be limited to the filling of permanently mounted fuel containers on LP-gas powered vehicles.

2307.6 Operational requirements. Self-service LP-gas dispensing systems shall comply with the operational requirements of Section 2305.

2307.6.1 Training. The owner of the LP-gas motor fuel dispensing facility shall provide for the safe operation of the system and the training of users.

2307.7 Emergency shutoff switch. The LP-gas motor fuel-dispensing system shall be provided with an emergency shutoff distinctly labeled as EMERGENCY LP-GAS FUEL SHUTOFF installed in accordance with Section 2303.2.

2307.8 Overfilling. LP-gas containers shall not be filled in excess of the fixed outage installed by the manufacturer or the weight stamped on the tank.

FIRE CHIEF MAGAZINE

Deadline: Feb. 3, 2016

Author: Tom Jenson, SFMD Code Specialist

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LP-Gas Dispensing – Fleet Vehicles and Self Service Public Dispensing

Liquefied petroleum gas (LP gas) has been around for many years as an alternative fuel for vehicles, mostly in fleet vehicle and company owned operations. Fuel dispensing has only been done by trained personnel at private facilities — but that is about to change thanks to a code interpretation that will be adopted into the 2015 Minnesota State Fire Code.

LP gas dispensing first appeared in the 1982 Uniform Fire Code adopted in Minnesota on April 11, 1983. The code allowed for the private dispensing of LP gas into fleet vehicles. Public dispensing was not allowed. Trained drivers used dispensers at private facilities to fuel some of their vehicles. School bus companies were converting some of their buses to run on LP gas but this wasn't a widely accepted alternative fuel and only available at fleet vehicle and company owned sites.

But times have changed. LP gas is now a more widely used alternative fuel for vehicles. Which is why in September 2013, in response to a code question from a local fire marshal, the Minnesota State Fire Marshal Division (SFMD) developed a fire code interpretation to allow the self-service public dispensing of LP gas by trained users. This was based on the current fire code and NFPA 58. We recognized that this industry was changing and the interpretation would provide for a safe operation to the trained general public. This interpretation will be adopted into the 2015 Minnesota State Fire Code. The 2015 International Fire Code has added new language for public dispensing that is very similar to our code language. The code development process takes time and is slower than the industry would like.

Code Requirements for LP gas Dispensing

As the fire chief and/or local fire code official, it is important to know what is going on in your community. There have been dispensing stations installed without approval and not in compliance with the fire code. Many stations have been incorrectly installed. Here are some items local fire code officials need to review prior to installation approval:

- Fleet vehicle (private dispensing) or public self-service dispensing.
- Number of and size of LP gas containers.
- Site plan with location of containers in relation to important buildings and property lines.
- Mounting surface for the containers.
- NFPA 58 Fire Safety Analysis completed when aggregate water capacity is over 4,000 gallons.
- State electrical permit, inspection and approval.
- Vehicle impact protection, bollards per fire code or an approved alternate barrier.
- Emergency fuel shut off switch within 100 feet of dispensers.
- Dispenser location and length of hose.
- Dispenser location distance from gasoline dispensers.
- Training of the users documented.

What Have We Seen That Doesn't Comply?

Vehicle impact protection at dispensing operations is not complicated but continues to be a problem. The fire code has clear language on the installation of guard posts that has been engineered and approved.

We have observed posts too close to the containers or dispensers, too far apart or no protection installed. Others have used jersey barriers without engineering on how to install them.

The fire safety analysis is required when the aggregate capacity of the container or containers exceeds 4,000 gallon water capacity. The fire safety analysis manual is available at www.NFPA.org. Search for “FSA.” This manual was developed by NFPA in cooperation with the National Propane Gas Association and a grant from the Propane Education and Research Council. This 200-page document contains code information, photos, a sample of the manual and a fillable form for the installer to complete and submit to the fire code official.

Public Dispensing Operations

Before the public is allowed to dispense LP gas into a vehicle, there must be documented training of the user by the owner of the facility. At that time the user would be issued a key, code, or access card to unlock the dispenser and begin fueling after payment is arranged. For unknown reasons at this time the national model codes require LP gas specific training of the users, public and private fleet. This may be due to the transfer of liquid under pressure and different types of nozzles at dispensers and on vehicles.

Code Development Takes Time

We are working with the Minnesota Propane Association regarding the expansion of LP gas dispensing as more vehicles will using it in Minnesota in the near future. School districts have purchased LP gas-powered buses and installed LP containers and dispensers at their bus garages and more schools will be doing so soon. More gas stations have and will be adding this fuel to their islands. However, codes have to be followed. The installations need to be by the code. As much as the industry would like to see the code changed in Minnesota, this must occur at the national level and it takes time.

We feel what we have in our interpretation and what will be in the 2015 fire code mirrors the new language in the 2015 International Fire Code where public dispensing is now addressed. We would envision that the NFPA 58 technical committee, International Code Council and the National Propane Association will continue to review this for future codes. The dispensing industry and equipment suppliers also will standardize the nozzles and vehicle connections to provide for safer dispensing.

Technical Assistance for the fire code official

LP gas container and dispenser installations may not be your area of expertise. The Minnesota State Fire Code Section 104.7.2 allows a fire marshal or chief to require a facility owner to provide, without charge to the jurisdiction, a technical opinion or report from a qualified engineer or specialist who can analyze the fire-safety properties of the design, operation and use and make recommendations. The technical opinion or report can then be compared to the requirements of the Minnesota State Fire Code to determine reasonable fire safety.

There are specialists knowledgeable about fire-safety requirements for LP gas dispensing — make use of their expertise. They include:

- Minnesota Propane Association
- Minnesota Petroleum Marketers Association

If these experts don't have the answers to your fire safety questions, they probably know of a reliable source.

7511.8430 SYMBOL DESIGN.

Subpart 1. **Design.** The required warning symbol must be of a design illustrated as follows:



Compressed natural
gas



Liquefied petroleum
gas



Liquefied natural
gas

Subp. 2. **Specifications.** The following specifications apply to each of the warning symbols:

- A. The symbol must be diamond-shaped, 2-1/2 inches in height, and four inches in width at its highest and widest points respectively.
- B. The letters and border must be silver in color.
- C. The background must be black in color.
- D. The letters within the symbol must be a minimum of one inch in height.
- E. The entire symbol, including letters, background, and border, must be made of reflectorized material and not fade or wash away when exposed to weather or other adverse elements.

Statutory Authority: *MS s 169.762; 299F.011; 326B.02*

History: *32 SR 10; 40 SR 1437*

Published Electronically: *May 12, 2016*

7511.8440 SYMBOL PLACEMENT.

A minimum of two warning symbols is required to be displayed. The warning symbols must be displayed in the places specified in item A. If the symbols cannot be clearly displayed or effectively applied to those locations they may be displayed in the places specified in item B. Display at least two symbols as follows:

A. one warning symbol on the extreme left (driver's) side of the rear-facing portion of the rear bumper, and one warning symbol on the extreme right (passenger) side of the front-facing portion of the front bumper; or

B. one warning symbol at least 12 inches but not more than 30 inches above the ground on the rear of the vehicle near the left (driver's) side and one warning symbol at least 12 inches but not more than 30 inches above the ground on the front of the vehicle near the right (passenger) side.

Statutory Authority: *MS s 169.762; 299F.011; 326B.02*

History: *32 SR 10; 40 SR 1437*

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