



# Residential Propane Installation Guide



# **Propane Residential Installation Guide**

The purpose of this manual is to set forth general safety practices for the installation, operation, and maintenance of LP-Gas equipment. It is not intended to be an exhaustive treatment of the subject, and should not be interpreted as precluding other procedures, which would enhance safe propane operations. The Minnesota Propane Gas Association assumes no liability for reliance on the contents of this manual.

Information for this guide was taken from:

National Fire Protection Association  
NFPA Pamphlet 58  
Liquefied Petroleum Gas Code

National Fire Protection Association  
NFPA Pamphlet 54  
National Fuel Gas Code

The Minnesota  
State Fire Code  
[firecode@state.mn.us](mailto:firecode@state.mn.us)

State Building Code  
State Mechanical Code  
651-284-5012

Call before you dig!  
Gopher State One Call  
(see nest 2 pages)

**For More Information Contact:  
Minnesota Propane Gas Assn  
PO Box 220  
Princeton, MN 55371  
763-633-4271**

**[www.mnpropane.org](http://www.mnpropane.org)**



# **Call before you dig!**

**To Locate Utilities:  
Call 800-252-1166  
Or 651-454-0002**

**For a list of private  
locators go on line  
at:  
[www.gopherstateonecall.org](http://www.gopherstateonecall.org)**

**This safety message:  
brought to you by your professional  
Minnesota Propane Dealers**

# **PROPANE CUSTOMERS!**

## **BE SAFE!**

**Call before you dig!** Gopher State One Call coordinates with your utility companies to have them locate their buried utility lines on your property before you begin to dig. To be sure that you and your family are safe. Gopher State One Call will contact utility companies to locate the following lines:

- Electric
- Gas-Oil-Steam
- Water
- Communications
- Reclaimed Water, Irrigation
- Sewer

**WARNING:** The propane line to your home is considered a ‘private’ line. Private lines include communications, electric, sewer, water, gas-oil and other structures that are not utility owned. Propane companies in most cases do not own the gas line at a private residence or business. It is the homeowner’s responsibility to have these ‘private’ lines located before beginning any digging project.

A list of companies that can locate private gas, telephone, water, electric and other private lines on your property is available on the Gopher State One Call web site at [www.gopherstateonecall.org](http://www.gopherstateonecall.org)

## **Propane For The Home Owner**

This guide will include basic information on the following:

- Physical Properties of Propane
- Propane Odorization
- Propane Containers
- Container Location
- The Need for Regulators
- Proper Piping
- Pressure Testing
- Leak Checks
- Safety Considerations

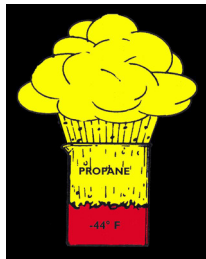
The guidelines in this publication are general in nature and are not intended replace local and state building and fire codes. Contact your local building code official for specific requirements in your area.

## **What is Propane**

Propane is an LP-Gas. LP-Gas is simply the abbreviation for “Liquefied Petroleum Gas”. A gas –liquefied? This might seem to be a contradiction in terms. However, it does make sense. Under moderate pressure and/or temperature, propane is a liquid. But when the pressure is released it becomes a clean burning gas. Propane is environmentally friendly, clean burning, very portable and economical. These characteristics make propane an excellent fuel choice.

# Physical Properties of Propane

Propane's boiling point is minus **44 degrees Fahrenheit**. The pressure inside a propane container will vary with the temperature of the liquid propane.



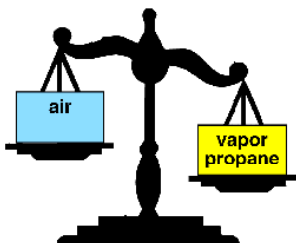
## Liquid Propane Temp Pressure

-44 deg F  
70 deg F

0 PSIG  
145 PSIG

Thus, the higher the temperature of the propane liquid the higher the pressure.

Propane vapor has a specific gravity of 1.50, which means it is **1.5 times heavier** than air. When propane vapor is



released from a container into the atmosphere in calm (no air currents) situation, it will tend to settle to the lower areas. **It is important to remember**

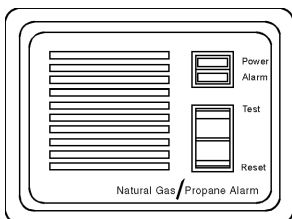
**that propane vapor readily mixes with air. Even minimal air currents will mix propane vapor throughout a space.**

## Propane Odorization

Propane in its natural state contains no odor. In order to make propane detectible should there be a leak, an odorant is added. Regulations require that the odor of propane shall be detected at 1/5<sup>th</sup> the lower limit of flammability. This means that most people will be able to detect the odor of propane long before it becomes a combustible mixture.

## Combustible Gas Detectors

It should be noted that not everyone can smell the odorant in propane or other gases. For added protection combustible gas detectors may be purchased at local hardware stores or in some cases from your propane supplier. Gas alarms are similar to smoke alarms in size and shape. Always install gas alarms in accordance with the manufacturer's instructions.



## Heat Value of Propane

The heat value of energy products is measured by btu's (British Thermal Unit). A btu is the amount of energy needed to heat 1 pound of water 1 degree F. The following is a comparison of propane to electricity:

Propane	1 gallon liquid	=	91,500 btu
Electricity	1 KWH	=	3,413 btu

Simply stated, 1 gallon of propane equals 26.8 KWH of electricity. This comparison can be used to compare the value of propane and electricity.

### Simple Comparison Chart

Electricity Cost	=	Propane Cost
\$.04/ KWH		\$1.07/ gallon
\$.05/ KWH		\$1.34/ gallon
\$.06/ KWH		\$1.61/ gallon

## Propane Containers

The selection of the proper type and size of LP-Gas storage container at a residential site, depends on quantity of propane required, utilization, location and portability need. The most commonly used containers are:

### CYLINDERS

The most commonly used cylinder container by the home owner is the grill cylinder. It holds 15 to 18 pounds of liquid propane when filled to its proper level. The most common use is for grilling and other recreation activities.



**NOTE:** Cylinders are regulated by the Department of Transportation and must be requalified periodically. Contact your propane supplier for details.

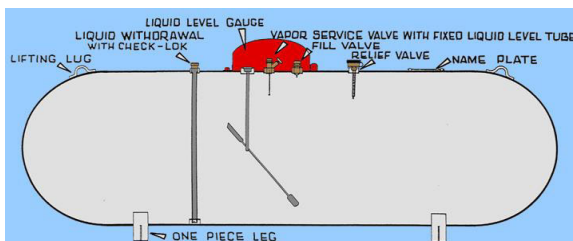
Another size used at many homes and cabins is the 100 pound cylinder. They are very portable and can be manifold together for needed fuel capacity and proper vaporization. Full cylinders are exchanged for empties and then transported to the suppliers plant for refilling.

### ASME Containers

When a home contains several propane appliance, or appliance with high usage, larger propane containers called bulk tanks are often required. These ASME containers are horizontal, cylindrical vessels with water capacities in ranges of 120, 250, to the most common 500, and 1,000 gallon water capacity. They will hold liquid propane in the amount of 80% of the container water capacity. Several residential propane burning appliances can be connected to



## Typical Propane Tank (500 gallon depicted)



one of these containers and more than one container can be placed at a home.

### Tank Gauges

Most propane tanks have as part of its valves and fittings a visible liquid level gauge.

The gauges typically read in percentages.

The reading gives a percentage of the possible liquid volume.

Thus a 500 gallon tank that reads 40%, has

approximately 200 gallons of liquid propane in it. All liquid level gauge readings are approximate, and the gauges are there for customer convenience.

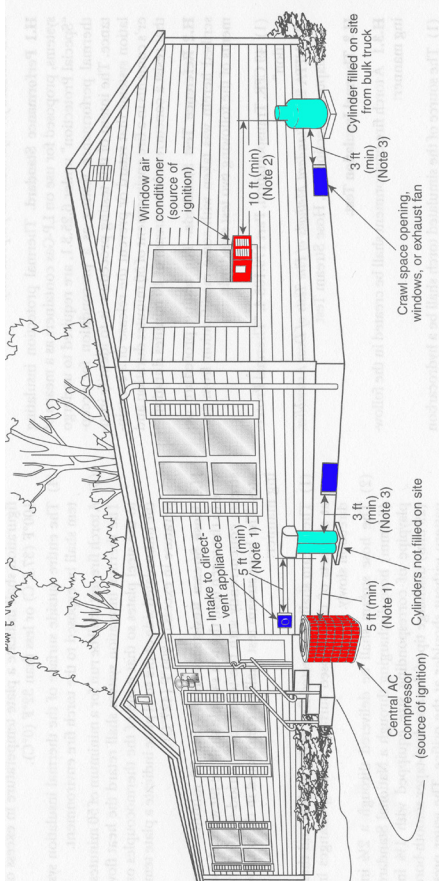


### Location of Containers

Propane containers are located at consumer sites, must take into consideration the following factors:

- Distance from buildings
- Distance from property lines that can be built upon
- Distance to wells and septic systems
- Distance to potential sources of ignition
- Distance to and location of openings into the house. (windows, doors, etc)
- These distances are designed to keep your home, your family and the propane containers safe from damage.

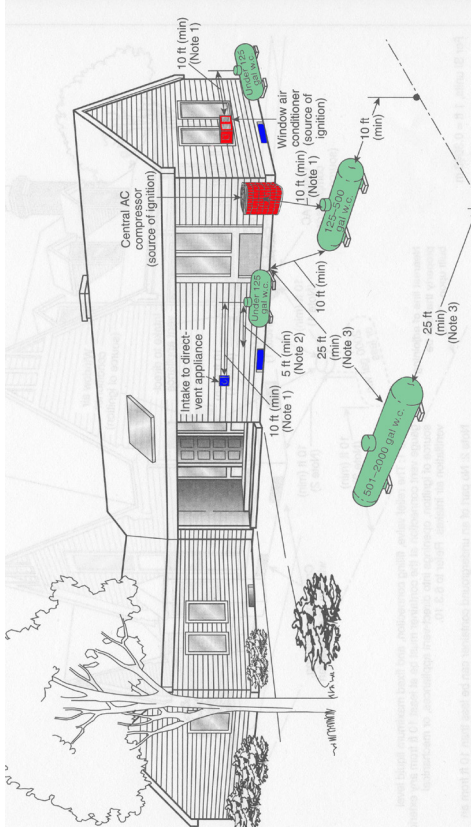
# Location of Propane Cylinders



**Note 1:** 5 ft minimum distance from relief valve in any direction away from any exterior source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes.

**Note 2:** If the cylinder is filled on site from a bulk truck, the filling connection and vent valve must be at least 10 ft from any exterior source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes.

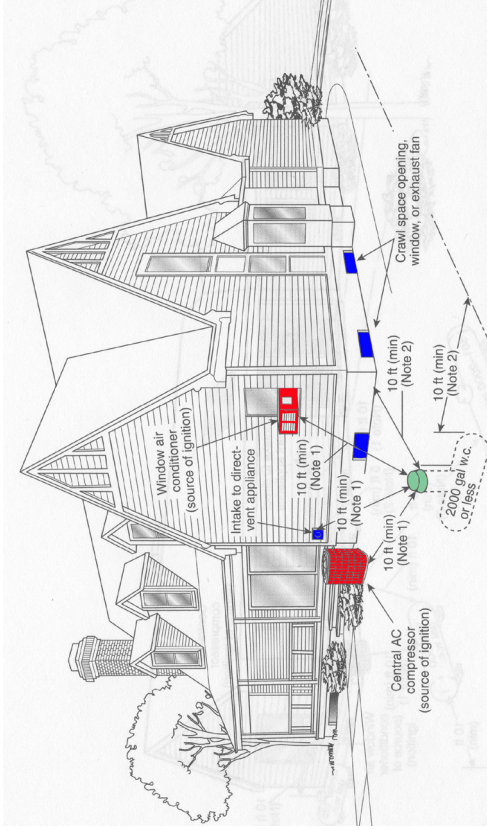
# Location of Propane Bulk Storage Tanks



**Note 1:** Regardless of its size, any ASME container filled on site must be located so that the filling connection and fixed maximum liquid level gauge are at least 10 ft from any external source of ignition (e.g., open flame, window AC compressor), intake to direct-vented appliance, or intake to a mechanical ventilation system.

**Note 2:** This distance can be reduced to no less than 10 ft for a single container of 1200 gal water capacity or less, provided such container is at least 25 ft from any other LP-Gas container of more than 125 gal water capacity.

# Location of Underground Propane Tanks



**Note 1:** The relief valve, filling connection, and fixed maximum liquid level gauge vent connection at the container must be at least 10 ft from any exterior source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes

**Note 2:** No part of an underground container can be less than 10 ft from an important building, or line of adjoining property that can be built upon

## Regulators

Because propane pressure in a container will vary greatly with the temperature of the propane liquid, pressure regulators are used. Regulators decrease the gas vapor pressure from variable container pressure to the low and constant pressure required by the appliances. Regulators in residential propane systems are:

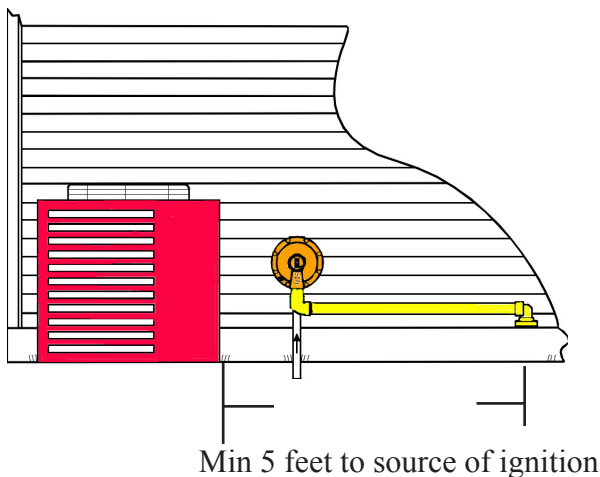


- Selected to match the total gas requirements of the system
- Installed to protect them from the effects of freezing rain, sleet, and snow.
- Set by trained propane personnel using proper techniques and accurate instruments, to deliver the proper gas flow at the proper pressure for the total system
- Inspected periodically, rechecked, and replaced according to manufacture's recommendations.
- Installed with the regulator vent pointed down or with a dome or cover to protect the regulator.

## Regulator Vent Discharge

Regulators are required to have pressure relief devices to safely discharge excess gas pressure outside of the home or building in the event of a regulator malfunction. The point of discharge from the required pressure relief device on regulating equipment installed outside of buildings in fixed piping systems shall be located not less than **3 ft horizontally** away from any building opening below the level of such discharge, and not beneath any building unless this space is well ventilated to the outside and is not enclosed for more

than 50 percent of its perimeter. The point of discharge shall also be located not less than **5 ft in any direction** away from any source of ignition, openings into direct-vent (sealed combustion system) appliances, or mechanical ventilation air intakes. Where a vent line is used to comply with the point of discharge requirements, it shall comply with the current editions of the building and fire codes.



## Gas Piping

All gas piping installations and testing shall comply with the State Fire, Building and Mechanical Codes.

Prior to acceptance and initial operation, all piping installations shall be inspected and pressure tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of the State Fire Code.

## Pressure Test

A pressure test is required only on NEW piping introduced to a system. The pressure test is conducted at a minimum of 1/12 times the working pressure of the system. Only new piping is required to be pressure tested.

## Leak Check

A **leak test** must be performed immediately after the gas is introduced into a new system or into a system that has been initially restored after an interruption of service. Leak tests are conducted at a pressure equal to the designed operating or working pressure of the system.

**Pressure tests and leak checks should be conducted by trained and qualified personnel.**



**Common Testing Device  
use for a Leak Test**

## Line Sizing

Proper line sizing is very important to the safe and efficient operation of a propane system. Lines must be sized to ensure that the necessary supply pressure is available when all appliances are operating at the same time.

## Electrical Circuits

Because propane is flammable, electrical circuits shall not utilize gas piping or components as conductors. Electrical systems should not be grounded to any gas piping.

## Gas Piping Material

Gas piping material must meet the requirements of state and or local building codes, or the requirements of NFPA 58 - The Liquefied Petroleum Gas Code, or NFPA 54, the National Fuel Gas Code. In general, the following materials may be used for gas piping:

### For Piping Indoors:

- **Steel and Wrought Iron Pipe**
- **Copper and Brass Pipe**
- **Threaded Copper, Brass, and Aluminum.**
- **Metallic Tubing.**
- **Steel Tubing**
- **Copper and Brass Tubing** Type K or L, or *Air Conditioning and Refrigeration tubing*
- **Aluminum Tubing**
- **Corrugated Stainless Steel Tubing (CSST)**

(More CSST Info on page 22.)



(Corrugated Stainless Steel Tubing)  
CSST

### For Piping Outdoors:

- **Steel and Wrought Iron Pipe**
- **Black or Galvanized**
- **Copper and Brass Pipe**
- **Threaded Copper, Brass, and Aluminum**
- **Metallic Tubing**
- **Steel Tubing**
- **Copper and Brass Tubing** Type K or L, or *Air Conditioning and Refrigeration*
- **Corrugated Stainless Steel Tubing**
- **Plastic Pipe, Tubing, and Fitting**

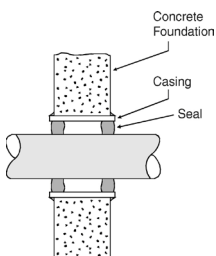
Plastic pipe, tubing, and fittings shall be used **outside underground only** and shall conform with ASTM D 2513, Pipe to be used shall be marked “gas” and “ASTM D 2513.



**Cast-iron pipe** shall not be used in a gas piping application. **Aluminum** alloy pipe shall not be used in exterior locations or underground.

## Piping Through Foundation Wall.

Underground piping, where installed through the outer foundation or basement wall of a building, shall be encased in a protective pipe. The space between the gas piping and the building shall be sealed to prevent entry of gas or water.



## Piping Underground Beneath Buildings.

Where the installation of gas piping underground beneath buildings is **unavoidable**, the piping shall be encased in an approved conduit designed to withstand the superimposed loads. The conduit shall extend into a normally usable and accessible portion of the building and, at the point where the conduit terminates in and be sealed to prevent gas from entering the building. A vent will be connected to the conduit to allow and gas leakage to pass to the outside of the building.

## Piping Installed Aboveground

Proper selection and placement of piping is extremely important. Above ground piping shall be securely supported and located where it will be protected from physical damage. Where passing through an outside wall, the piping shall also be protected against corrosion by coating or wrapping with an inert material approved for such applications. Where piping is encased in a protective pipe sleeve, the annular space between the gas piping and the

sleeve shall be sealed at the wall to prevent the entry of water, insects, or rodents.

## Buried Metallic Pipe and Tubing

Buried pipe and tubing shall be installed underground with a minimum 12 in. of cover. The minimum cover shall be increased to 18 in. if external damage to the pipe or tubing from external forces is likely to result. If a minimum 12 in. of cover cannot be maintained, the piping shall be installed in conduit or shall be bridge (shielded).

## Appliance Installation

### Unvented heaters



Unvented room heaters and unvented decorative appliances shall not be installed in any dwelling or occupancy, per the State Fire Marshall's Fire Code, which is in force in all areas of

the state. This code has been on the books since 1991.

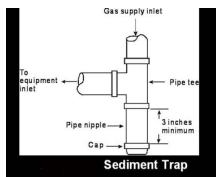
### General

- All appliances shall be approved for propane gas and leak tested when installing or replacing existing appliances.

- All appliances must be properly vented per manufacture instruction, per State fire code, and international building code.

- An appliance shall have an accessible approved manual shut-off valve installed within 6 feet of the appliance.

- Where a sediment trap is not incorporated as a part of the gas utilization equipment, a sediment trap shall be installed as close to the inlet of the equipment as practicable at the time of equipment installation.



## Safety

Anytime a new line is installed or a gas appliance is disconnected, the line must be capped or plugged with a gastight fitting. This is true even if there is an approved shutoff valve on the line. Each outlet, including a valve, shall be closed gastight with a threaded plug or cap immediately after installation and shall be left closed until the gas utilization equipment is connected thereto. When equipment is disconnected from an outlet and the outlet is not to be used again immediately, it shall be closed gastight.

## Cylinder Storage Within Residential Buildings

Storage of cylinders within a residential building, including the basement or any storage area in a common basement storage area in multiple-family buildings and attached garages, shall be limited to cylinders each with a maximum water capacity of 2.7lb and shall not exceed 5.4lb aggregate water capacity for smaller cylinders per each living space unit

Cylinders having water capacities greater than 2.7lb LP-Gas capacity shall not be located on decks or balconies of dwellings of two or more living units above the first floor unless they are served by exterior stairways

## **If You Smell Gas**

Where an investigation discloses a concentration of gas inside of a building, it is suggested the following immediate actions be taken:

- (1) Clear the room, building, or area of all occupants. Do not re-enter the room, building, or area until the space has been determined to be safe.
- (2) Use every practical means to eliminate sources of ignition. Take precautions to prevent smoking, striking matches, operating electrical switches or devices, opening furnace doors, and so on. If possible, cut off all electric circuits at a remote source to eliminate operation of automatic switches in the dangerous area. Safety flashlights designed for use in hazardous atmospheres are recommended for use in such emergencies.
- (3) Notify all personnel in the area, Call 911, and the gas supplier from a telephone remote from the area of the leak.
- (4) Ventilate the affected portion of the building by opening windows and doors.
- (5) Shut off the supply of gas to the areas involved.
- (6) Investigate other buildings in the immediate area to determine the presence of escaping gas therein.

## Minnesota Container Law

The Minnesota legislature has passed Chapter **\_299F.40** of the state code into law. The law states that if a liquefied petroleum or industrial gas container bears the plainly legible characters of the name, mark, initials or other identifying device of the owner of the container, it shall be unlawful for any person except the owner or a person authorized in writing by the owner:

- (1) To fill or refill such container with liquefied petroleum or industrial gas or any other gas or compound;
- (2) To buy, sell, offer for sale, give, take, loan, deliver or permit to be delivered, or otherwise use, dispose of, or traffic in any such container; or
- (3) To deface, erase, obliterate, cover up or otherwise remove or conceal or change any name, mark, initials or other identifying device of the owner or to place the name, mark, initials or other identifying device of any person other than the owner on the container.

## **CSST Information/Warning Corrugated Stainless Steel Tubing**

### **WHAT IS CSST?**

Corrugated stainless steel tubing (CSST) is a flexible, stainless steel pipe used to supply natural gas in residential, commercial and industrial structures. CSST is often coated with a yellow, or in some cases, a black exterior plastic coating. CSST should NOT be confused with flexible natural gas appliance connectors – the product that joins an appliance to your home or building's natural gas supply line. The difference is that flexible connectors attach directly to the appliance from the wall or floor, while CSST is usually routed beneath, through and alongside floor joists in your basement, inside interior wall cavities and on top of ceiling joists in attic spaces.

### **Why am I being warned?**

The Minnesota Propane Association is aware that CSST manufacturers have settled a class action lawsuit related to claims against this product. If lightning strikes a structure containing CSST, there is a risk it can travel through the structure's natural gas piping system and cause a leak or, in some cases, a fire.

If work has been performed on the natural gas piping system in your home or business since 1990 – for example if you had a furnace or stove installed

– it's possible that CSST was installed. You might also have the product in your home or business if the structure was built since 1990.

### **What to do if you find CSST**

If you find CSST after inspecting your home or business, the Minnesota Propane Association strongly recommends that you contact a licensed electrician. A bonding device should be installed on your natural gas system in order to reduce the chances of a natural gas leak or fire. If you are unsure as to whether CSST has been installed since 1990, contact the company that performed the work to arrange for a professional inspection.





Minnesota Propane Association

*Promoting smart energy*