

LP GAS

This article will discuss the basic properties of LP gas and the two types of storage containers used in recreation vehicle applications. Because of the volatile nature of LP gas, filling and servicing the system must be done by a professional.

The on-board LP system furnishes fuel for all gas-fired appliances. The system is designed to perform adequately under most conditions encountered in recreational vehicle applications. Extreme care must be taken during the repair and replacement of system components to assure the safety of the motor home owner and service personnel.

NOTE: Some states and localities may impose restrictions or requirements regarding the servicing of LP gas fuel systems. It is the servicing technician's responsibility to comply with all regulations.

The term LP gas stands for Liquefied Petroleum Gas, which refers to a variety of substances that are by definition gases at room temperatures and atmospheric pressure and that liquefy under moderate pressure and readily vaporize when released from pressure.

For our purposes, the term LP gas will refer to "propane." An odorless and colorless substance that is refined from natural gas and crude oil. Its chemical formula is C₃H₈.

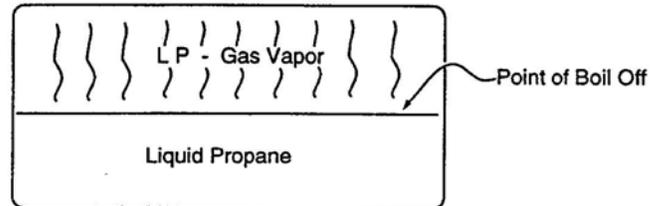
For safety reasons, an odorant is added so that a leak will be noticed by sense of smell. The odorant, which is usually ethyl mercaptan, gives off a distinctive "rotten egg smell." And is added to the LP at the bulk station.

PROPERTIES OF LP GAS:		
Lbs. Per gal.	⇒	4.2
BTUs per gal.	⇒	91,500
BTUs per lb.	⇒	21,500
Boiling point	⇒	-44 F
Upper limit of combustibility	⇒	9.6% (gas in air mixture)
Lower limit of combustibility	⇒	2.4% (gas in air mixture)
Ignition temperature	⇒	1,000 F
Burning temperature	⇒	3,500 F

Liquid propane's boiling point is -44°F (-43°C). That is the point where the liquid begins to turn to vapor. Just as in boiling water, the more heat that is introduced to the process, the more rapid the transfer of vapor. When propane gas is pressurized, it readily turns to a liquid state. As liquid propane is contained in a pressure vessel (tank), the following events will occur:

- The liquid in the tank begins to boil.
- Vapor is produced which is contained in the tank.
- The increase in vapor causes a corollary increase of the pressure in the tank.
- Soon the pressure in the tank builds to a high enough level to stop the boiling off of the LP. The

pressure in the tank has in effect caused the boiling point of the LP to be raised.



The mixture of liquid versus gas in the tank will remain in this state of balance until either of the following two conditions is met:

1. Gas is released from the tank causing internal pressure in the tank to drop, which allows the liquid to boil off more gas.

2. The temperature of the tank changes. If the temperature in the tank increases, the resulting effect is a lowering of the boiling point of the LP and more vapor will be produced.

The following chart depicts the correlation between temperature and tank pressures.

Temp (F)	Pressure (PSIG) Approx.
-10	16.7
0	23.5
10	31.3
20	40.8
30	51.6
40	63.3
50	77.1
60	92.5
70	109.3
80	128.1
90	149.3
100	172.3
110	197.3

LP STORAGE CONTAINERS

Winnebago Industries has installed two types of LP storage containers on products manufactured for use in North America DOT cylinders and ASME tanks.

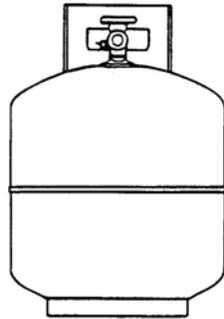
DOT Cylinder:

A DOT cylinder is a portable container which is constructed in accordance with standards set forth by the DOT. NOTE: Prior to April 1, 1967, specifications and regulations dealing with LP gas cylinders were

covered by the ICC (Interstate Commerce Commission).

For our purposes, there are two types of DOT cylinders:

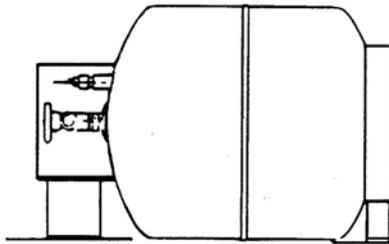
⇒ Vertical – A cylinder designed to operate when its longitudinal axis is in a vertical position. In its operating position, the service valve will be located on the top of the cylinder.



20-LB. DOT CYLINDER

⇒ Universal – A cylinder designed to operate with its longitudinal axis in either the vertical or horizontal position.

20-LB. DOT CYLINDER (UNIVERSAL)



DOT 20-LB. CYLINDER
DESIGNED FOR HORIZONTAL OR VERTICAL USE

Every DOT cylinder is marked with the following information as required by the DOT. The information can be stamped into the cylinder or on an attached metal plate.

DOT CYLINDER SPECIFICATION TAG

1 →	DOT - 4BA240	CR	←	4
2 →	Manchester	WC 47.7	←	5
3 →	TW-18	D.T. 3.5	←	6
		1 - 95	←	7

1. DIT or ICC Design Code Markings



- A. Material and Method of Fabrication
 4B = Steel, 2 pc. Welded and Brazed
 4BA = Alloy, Steel, 2 pc. Welded and Brazed
 4E = Aluminum, Welded and Brazed
 4BW = Steel, 3 pc. Welded

B. Service Pressure

2. Tank Manufacturer
3. Tare Weight in Lbs.
4. Inspector's Initials
5. Water Capacity in Lbs.
6. Dip Tube Length
7. Date of Manufacture

INSPECTING DOT CYLINDERS

DOT regulations require that cylinders must be visually inspected prior to each filling. Any cylinder that shows evidence of exposure to fire, bad gouges, or dents, seriously corroded areas, leaks, or any condition that could compromise the integrity of the cylinder must be rejected and not filled until such a time as it has been requalified by a manufacturer or DOT approved testing station.

Additionally, all DOT cylinders must be requalified within 12 years of the date of manufacturer. The requalification date will be stamped beside the date of manufacture on the cylinder specification tag: and then at varying intervals, dependent on the method used to requalify. The DOT allows for three methods of requalification. These methods and the associated length of requalification are listed below.

Method	Length	Marking
Water jacket-type hydrostatic test	12 yrs	Date & Year Ex: 7-95
Simple Hydrostatic test	7 yrs	Date & Year, S Ex: 7-95S
Recorded Visual Test	5 yrs	Date & Year, E Ex: 7-95E

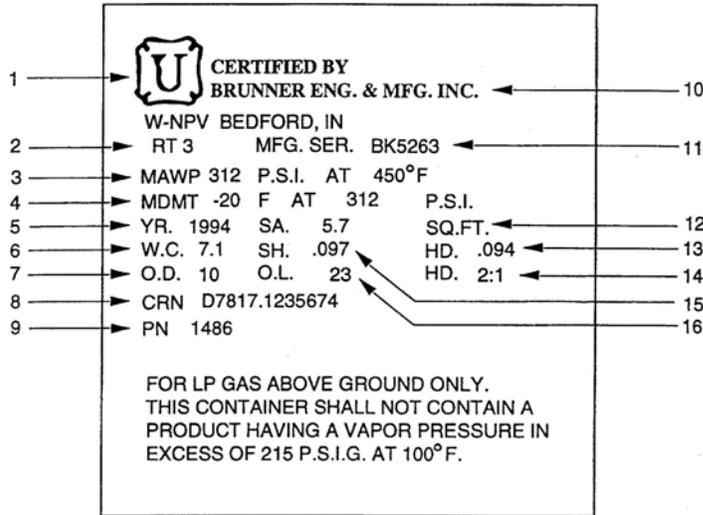
CAUTION
 Never fill a cylinder that is out of date or that you suspect has compromised integrity.

ASME Tanks:

An ASME tank is a container constructed in accordance with standards set forth by ASME (American Society of Mechanical Engineers). ASME tanks are bolted directly to a frame rail of the vehicle and are not removed from the vehicle for filling.

We hope this has given you a general understanding of LP gas and storage tank on your vehicle. Again, if you suspect any problems with the system on your coach, seek professional assistance.

ASME TANK SPECIFICATION TAG



- | | |
|--------------------------------|-----------------------------------|
| 1 ASME Certification Stamp | 9 Manufacturers Part Number |
| 2 X-Ray Certification | 10 Manufacturer |
| 3 Maximum Working Pressure | 11 Serial Number |
| 4 Minimum Design Temperature | 12 Surface Area of Tank |
| 5 Year of Manufacture | 13 Minimum Design Thickness,Head |
| 6 Water Capacity | 14 Design of Head |
| 7 Outside Diameter | 15 Minimum Design Thickness,Shell |
| 8 Canadian Registration Number | 16 Overall Length |

LP TANK SAFETY

1. Whenever an LP tank is filled, it should be on a relatively level surface to ensure that the tank is not overfilled.

2. Never allow an LP tank to be filled beyond the legal liquid level indicated by the 20% liquid level gauge.

3. Do not use wrench or pliers to close service valve or 20% liquid level gauge. These valves are designed to be closed leak-tight by hand. If the valve cannot be made leak-tight by hand, valve requires service.

4. When connecting upper and lower body of service valves, draw connection snug with proper size wrench. Do not jam the nut. This is a machined brass fitting which seats securely against a female seat in the valve. No gasket material or pipe dope is required.

5. If a leak is detected, perform soapy solution leak test to pinpoint leak.

6. Inspect LP tank mounting brackets at chassis mounting points. Mounting hardware must be tight and brackets undamaged.

7. Maintain LP tank exterior by removing rust and scale and repaint periodically.