

RV Propane



Filling a propane Tank

Originally, this section was farther down the document, but I'm guessing this is what you want to read.

Many RV parks and gas stations have propane refueling stations with people trained in the handling of propane. I'm thinking it's probably a bad idea to have self-serve propane fill-up. When filling the on-board propane tanks, the engine must be shut off and all propane appliances must be turned off. Everyone will need to be out of the RV when refilling it for safety in case of an explosion. This also ensures no one can inadvertently turn on an appliance or the vehicle ignition. Probably No Smoking too – Daah!

- Turn off the propane switch. This closes the solenoid valve on the tank outlet.
- Make sure all propane appliances are off, including the hot water heater and heater are off.
- If you have an older absorption type refrigerator that runs on propane, it must be off as well.
- Pull up to the filling station as directed by the attendant.
- Turn off the engine.

NOTE: All people and pets must be out of the vehicle.

- Let them know of the tank capacity and how much is already in there, so they have some idea of how much to put in.
- The attendant will connect the supply hose and turn on the fuel pump.
- They will open the bleeder valve to indicate when the tank is full.

NOTE: The OPD valve tank will only allow the tank to be filled to 80%, leaving room for the liquid to expand.

- It is a good idea to pull away from the station before powering up any appliances and get some distance from anyone else fueling.

NOTE: As a general rule, RV manufacturers, propane appliance makers, and insurance companies recommend keeping the propane off while driving. There are also restrictions on bringing propane through some tunnels, and you may need to find an alternate route. There are phone apps that can show route restrictions.

NOTE: Propane should also be turned off when refueling your vehicle. (Cell phones should not be used while refueling vehicles, but you see it all the time.)

Some extra page space

I ended up with a little extra space here... How about a joke?

A camper van got hopelessly stuck trying to drive through a muddy hole on a dirt road to a campground. After a few minutes, a farmer on an old rickety tractor drove up and offered to pull them out for the bargain price of \$100. After the van was back on high ground, the RVer said to the farmer, "You must be making a pretty penny pulling vehicles out of the mud day and night!"



"Well," replied the farmer, "I can only pull them out during the day. At night I have to haul water to fill up the hole."

What is Propane?

Propane is a fossil fuel made from the buried remains of plants and animals that lived millions of years ago. It is extracted from natural gas by a separation process that uses refrigeration to condense propane and other gases like butane, ethane, and methane. 70% of natural gas content is methane, a greenhouse gas. In the United States, 40% of the propane is extracted during the fractional distillation process of crude oil. Propane is a clean-burning, colorless and odorless gas that is easily stored as a compressed liquid, sometimes referred to as LP or LPG (liquid petroleum gas).

Propane was first discovered in 1857 in France by Marcellin Berthelot.

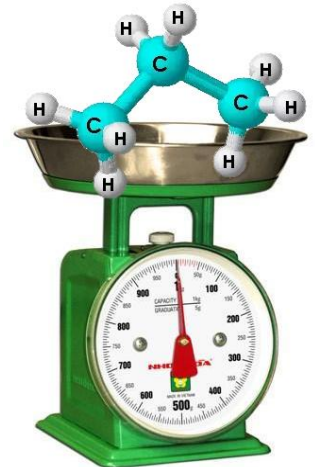


The real beginning of the propane industry began in 1910 when chemist and explosives expert, Dr. Walter Snelling, realized its potential as a household energy source. He was working for the US Bureau of Mines when some mine owners complained that their gasoline was disappearing from their new Model T's on their drive home. Snelling put gasoline in a glass jug, and on the way back to the lab, noticed vapors were forming in the jug and it kept popping the cork out. He concluded that propane gas was a component of gasoline and could be used for lighting, cooking, metal cutting torches, and other uses. In 1913, Snelling sold his patents for propane to Frank Phillips, the founder of Phillips Petroleum.



Chemistry

And now a little chemistry lesson (and there will be a quiz). Propane is composed of three carbon atoms and eight hydrogen atoms (C₃H₈) but, I bet you already knew that. Methane has a single carbon atom and four hydrogen (CH₄). In its liquid state, propane is 240 times more compact than as a gas. At temperatures above -44 degrees Fahrenheit, propane boils and changes to a gaseous state. The maximum flame temperature limit is 3,595 degrees Fahrenheit. One cubic foot of propane gas weighs 0.1162 lbs. while the same volume of air is 0.07655 lbs. This means propane is heavier than air and will sink to the lowest space available. Headache – too many numbers!



NOTE: Propane is heavier than air, which is why RVs have a propane detector close to the floor.



Why are there restrictions on RVs carrying propane when driving through underwater tunnels? With the explosive flammability of propane, you probably wouldn't want to drive into a tunnel that is full of propane. As we have mentioned, propane is heavier than air and would pool in the lowest areas and displace the air (and oxygen). Keep in mind, one gallon of liquid propane is 36 cubic feet of gas vapor.

Combustion

The combustion ratio for propane is 1 part propane and 24 parts of air. To ignite propane, an ignition source needs to be 920-1020 degrees Fahrenheit or higher. Gasoline is 477-536 and diesel is 410. This means propane is safer to transport than gasoline.



NOTE: At higher altitudes, your propane appliances, like an absorption refrigerator and propane powered generators, may have trouble running because of the lower oxygen levels. Power decreases by 3.5% for each 1,000 feet above an altitude of 500 feet. A generator running at 4,500 feet will have a power loss of 14%. For this reason, Norcold recommends running an absorption type refrigerator on electric power at altitudes above 5,500 feet.

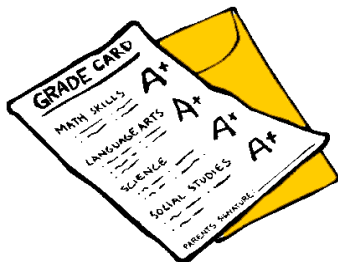
Where does Propane Come From?

Natural gas is a fossil fuel that comes from decomposing plants and animal matter. It's extracted by drilling gas wells, oil wells and coal beds. I know what you're thinking – but no, natural gas is not dinosaur farts. Hydraulic fracking has increased production from shale, sandstone and other geologic formations. While it may seem plentiful, natural gas is a limited resource and current sources are estimated to run out around 2084, so you better fire up that grill and cook those steaks while you still can.



Fascinating Fact: North American propane is stored in huge underground salt caverns. Water injected down into the salt dome dissolves the salt and it is extracted, leaving large caverns. Liquid propane is then pumped back down into the caverns for storage until needed. There are 18 large storage caverns in North America that can store 80 million barrels of propane. Unlike diesel and gasoline, propane doesn't degrade over time, so it can be stored indefinitely.

Grades of Propane



I was surprised to learn that propane comes in a couple of different grades. The consumer grade is HD5 and is the most widely sold grade in the US. The HD5 specification says it must have 95% propane and the rest can be propylene.

HD10 is a grade lower than HD5 and is commonly sold in California. It can contain 10% propylene and 90% propane. Because propylene is used in making plastic, HD10 can create problems for some engines and even cause them to gum up.

The Odor!



Wait, you said it was odorless! Ya, that stinky rotten egg smell is Ethyl Mercaptan and was first added during the 1930's so people would know if you've got a leak. It probably wasn't such a good idea to add a smell like fresh baked apple pie or hot cocoa.

What to do if you smell gas in your RV

If you smell gas in your RV or the propane detector alarm has gone off, there are a number of steps you should take:

- Extinguish all smoking materials and any other open flames.
- Get everyone and pets out of the RV.
- Do not use any electrical appliances, thermostats, or cell phones close to the RV.
- Close the valve on the propane tank.
- Open the doors and windows to air out the RV.
- Open drawers and cabinets to air them out too.
- Have a trained service technician repair the leak.



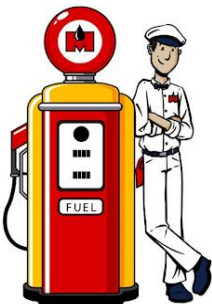
While we are talking about safety:

- Never use a propane stovetop as a heater.
- When using a propane stove, open a window and turn on an exhaust fan to vent any carbon monoxide.
- Never use a BBQ grill indoors for cooking or heating.

If you decide to check for leaks, soapy water works much better than lighting a match. Another Daaah!
Check the propane tank support mounting straps occasionally.

Tanks

There are basically two types of propane tanks used on RVs – the ASME (American Society of Mechanical Engineers) and DOT tanks. DOT tanks are used on travel trailers, small motorhomes, and are commonly used on BBQ grills. ASME tanks are mounted to the frame of a RV and are not removable. Small RVs like the 2022 Galleria have a 9.7 gallon / 41 pound tank.



Tanks have a few main components. The tank, of course, the main valve, and an Overfill Protection Device (OPD) which ensures the tank can't be overfilled.

NOTE: If you have a brand new propane tank like a 20 lb. one for a BBQ, it will need to be purged of air and moisture before being filled. The propane station technician will put some propane gas in the tank and open the valve to let it all out. This will be repeated several times. Since propane is heavier than air, this will force the air out from the top of the tank. If the tank isn't purged, the first gas to exit the tank will be air and your appliances won't light.



Pressure

The ambient temperature affects the propane tank pressure. The normal tank pressure is between 100-200 psi to ensure the liquid propane stays liquid. At 80 degrees Fahrenheit, the pressure is around 128 psi. If the temperature drops to 50 degrees, the pressure drops to around 78 psi. At a temperature of around zero, the tank pressure will be around 24 psi. In the other direction, a 100 degree tank will have 175 psi. Over 200 psi and the pressure relief valve may start opening to reduce pressure. BBQ tanks should be kept out of direct sunlight and painted light colors.



Regulators

As mentioned, propane tank pressure is stored at very high pressures. Without a regulator, you'd probably cook a pancake in 6 seconds. Just kidding. There are a couple of different types of regulators. Gas grills, camp stoves, and fire-pits use a first-stage regulators. RV regulators are commonly twin stage or dual stage regulators. Each stage of the regulator has a small vent hole that must be kept clean or the regulator won't work right. They usually have a cover to keep dirt out. The stage 2 regulator hole is a little bigger and must be pointed down. If possible, both vent holes should be pointed down.



Regulators have a limited life span and should be replaced after 10-15 years. If you are having problems with your appliances, a technician can check the pressure using a Manometer pressure gauge. The first stage regulator drops the tank pressure from the tank to 10 psi. The second stage regulator lowers the pressure to about 0.36-0.40 psi or 27.4 millibars.

Propane Appliances

Older RVs had several propane powered appliances. Our Great West Van had a propane powered absorption style refrigerator. Unlike a home refrigerator with an electric compressor, an absorption refrigerator uses a series of tubes filled with ammonia, water and hydrogen gas. A propane (or electric) heater boils the ammonia into a gas. When the ammonia encounters hydrogen gas, it rapidly cools the inside of the refrigerator. After a few more steps, the process begins all over again. There are no mechanical or moving parts to break down, meaning this system can last for many years.



Another common appliance found in older RVs is the propane stovetop. The hazards of cooking over an open flame in a small space have led many RV manufacturers to install induction cooktops. These use a copper coil to produce an oscillating magnetic field to induce eddy currents in magnetic pans. The energy transfer is around 84% for induction and 74% for propane, saving energy. Eliminating the open flame means you can now have a nice window and blinds instead of requiring a metal wall behind the stove. You also don't need an open window or an exhaust fan running when cooking... well, maybe when I'm cooking you want to get the smoke out.

Propane ovens were also installed in a few older RVs, but have since been replaced by microwave ovens. The latest is a microwave-convection electric oven. They offer the microwave quick heating and oven browning of conventional ovens. If only they were easier to understand how to work them without needing a spreadsheet of instructions to turn them on.

Heaters and water heaters continue to use propane and are the go-to choice for coach builders. The current model of Truma provides heat and hot water in a single unit. Many European manufacturers have replaced the propane combination units with diesel burning units. This could eliminate the use of propane in RVs altogether and save some weight.



Propane generators are the most common type of generator installed on small van RVs. They offer a long life and low maintenance since they are cleaner burning than diesel or gasoline. They are also very noisy. You will need to exercise them monthly by running them for an hour. I wish my exercise program was like that.

Small portable generators like the Honda EU2200i can be converted to run on propane, natural gas, or gasoline. A do-it-yourself kit is available on the web for around \$300. The advantage of the conversion is multiple fuel choices and propane burns cleaner and you won't get carbon build up like you would with gasoline. A 20 lb. BBQ type tank can run the generator for 20-25 hours. We converted our EU2000i using the Hutch Mountain kit and there are YouTube videos to walk you through the process. Our RV has a quick disconnect that we can attach a long hose to run to the generator for home power outages.



Compact, portable propane fire pits can also use a long hose from the propane tank when camping. The quick connect fittings are available on Amazon and other stores. It may take several thread size adapters, but it can be done. The hose can also work with portable camping stoves. It eliminates hauling and disposing of the small 1 lb. bottles. You may need to remove the stove regulator since the hose is already connected to a low pressure regulator.

One pound propane bottles are still common for portable camp stoves and lanterns, but you need to be careful of leaks when disconnecting the bottles. A little soapy water will show if it's safe to bring inside.

The Quiz: One gallon of propane weighs: A: 100 pounds, B: **4.24 pounds**, C: 3 Tons, D: 2 ounces, E: All the Above

That's all I can think of for now. If you have any other information or corrections, let us know and we will make edits.

Do you think a bull frog can jump higher than a Sprinter van?
Of course not. Sprinters can't jump!



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