

# Dangerous misuse of propane cylinders



Albertans have always been innovative and creative in the way they approach solving problems. While this is an especially important quality to have for life on the farm, there are instances when this can put you and the people around you at considerable risk.

Recently in Alberta, a farmer used a 20-pound propane cylinder to melt ice from his cattle's drinking trough. It was the same kind of cylinder you use to fuel the family barbecue, and its improper use had tragic consequences

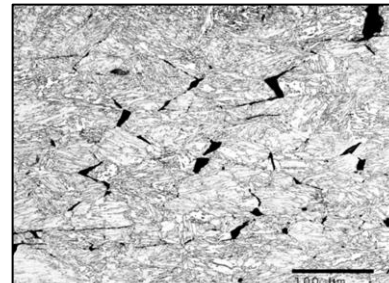
Propane cylinders are only designed to store and handle propane. When they're used for other purposes than their intended safe design, a number of dangerous things happen to the cylinders that you can't see with the naked eye. Learn why you should never use propane cylinders for anything other than handling and storing propane.

## Safety standards

When a 20-pound propane cylinder is manufactured, it meets specific requirements set out by the Canadian Standards Association. This includes the design, testing, repair, and rebuilding of cylinders to transport propane. Anyone manufacturing, rebuilding or repairing the cylinder must follow the rules in the standard.

## Metal fatigue

The 20-pound cylinders are made from a specific type of manufactured carbon steel, with grain structures that can be seen under a microscope. When the steel is heated or subjected to higher pressures than the cylinder was originally designed to withstand, there is stress and strain put on the grain structure and tiny movement occurs within the metal itself. This may form a crack that can't be seen by the naked eye. When this stress and strain is applied many times the crack will become larger, the material can become fatigued and it will lose its strength and burst open. This is similar to when you bend a paper clip back and forth until it breaks – it's called metal fatigue.



Example of microscopic cracks in propane tank metal, caused by heat damage.

## Risk of corrosion

Another reason these cylinders can only be used for propane storage and transportation is the risk of corrosion, or rust. When a propane cylinder is used for other purposes, such as filling the cylinder with water and heating it up, or using the cylinder to hold compressed air, the moisture formed in the cylinder will start the corrosion process. Corrosion will affect the thickness of the metal and strength. It will weaken the ability of the cylinder to hold gas or liquid under pressure, which can further weaken the cylinder to the point of rupturing.

### **Danger of steam**

Making modifications to the cylinder so it can be used to heat water to produce steam is extremely dangerous. When water changes from a liquid to steam, it expands 1700 times its size. When the heated water is contained in a closed cylinder it cannot expand. This puts extreme stress on the steel and can cause it to burst open, sending fragments everywhere.



Metal fragment from the fatal 2016 propane cylinder explosion.

### **Danger of compressed air**

Reusing a propane cylinder to hold compressed air has its own dangers. When air is compressed, it creates heat. After the air is added to the propane cylinder, the air starts to cool and condense, forming moisture that will cause corrosion. The metal will start to get eaten away from the inside of the cylinder, further weakening the metal.

### **Nozzle safety**

In addition to the cylinder itself, the opening for the valve fitting assembly, or nozzle, is also an important part of the safe design of a propane cylinder. If a hole is cut in a cylinder and a nozzle inserted, there is no reinforcement, to strengthen the cylinder opening. According to the Canadian Standards Association approved design, the head of the cylinder is only designed for one nozzle, using a standard valve fitting. No other nozzles are allowed to be added, at any time during the life of the cylinder.

### **Welding on the propane cylinder**

Welding is not allowed on the cylinder, unless you are the manufacturer following the requirements of the safety standard. Welding will shrink the cylinder material by approximately 7% and creates stress on each side of the weld. It can cause cracks that weaken the cylinder material and can potentially put you at risk of the cylinder rupturing.

### **The fatal accident**

In early 2016, a farmer attempted to thaw frozen ice in a cattle trough using two 20-pound propane cylinders. The farmer was not aware of the safety risks of using the cylinders in this way. The farmer was using one of the propane cylinders to make steam and the other cylinder was used to fuel a tiger torch that was the heat source for the cylinder making steam.



Photograph from the 2016 fatality investigation showing the top of the ruptured propane cylinder.

The cylinder used for the production of steam catastrophically failed, resulting in explosive shrapnel that struck the farmer and caused a fatal injury. Propane cylinders are not designed for generating steam and it is unsafe and illegal to use propane cylinders for purposes other than the intended safe design.

If you're using a propane cylinder for any other purpose than the design intends, you should stop immediately and return the cylinder to one of the nearest propane supply companies. Help make sure you and your family stay safe.