



## Is it unsafe to store or use a cylinder beyond the hydrotest date?

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With the few exceptions which are noted below, cylinders will not fail because it has not been tested and examined by the hydrotest date. The DOT regulations which regulate compressed gas cylinders in the US state that it cannot be refilled after the hydrotest date. Gas suppliers that have filled cylinder prior to the hydrotest date can legally ship the cylinder and it can be used until empty. This could take months or years.

49CFR §173.301 General requirements for shipment of compressed gases and other hazardous materials in cylinders, UN pressure receptacles and spherical pressure vessels.

(6) No person may fill a cylinder overdue for periodic requalification with a hazardous material and then offer it for transportation. The prohibition against offering a cylinder for transportation that is overdue for periodic requalification does not apply to a cylinder filled prior to the requalification due date.

Cylinder failures will typically occur during refilling of the cylinder when it is being repressurized. This will physically stress the cylinder walls and if the cylinder has been damaged, it could cause it to tear and rupture. Cylinder walls will work harden with repeated pressurization above the yield strength of the steel.

It is not uncommon to find cylinders that have been filled and at a user location for over 20 years. The author inspected one of the US National Laboratories that had gas reference standards in cylinders from the 1950's (60+ years). He also audited a major US university where the professor had hundreds of cylinders he that he routinely used for over 50 years without the required retest. At a second university the professor was filling cylinders from the gas supplier with his experimental gases, a dangerous practice since he was not following safe filling practices nor was the gas supplier aware of the foreign gases that were being put into their returned cylinders. Users have sent cylinders back to supplier in a dangerous condition, a gas that was not legal to be filled with the type of cylinder, valve or PRD or with a reactive combination of gases.





DOT regulations provide that “a cylinder filled with a hazardous material may not be offered for transportation unless it was filled by the owner or with the owner’s consent.” 49 CFR173.301(e). Cylinders if properly inspected and maintained can last for many years. There are many industrial gas cylinders that were manufactured in 1917 that are still in use today. Some are refilled every few days.

Active sites such as rust ( $\text{Fe}_2\text{O}_3$ ) on the carbon steel cylinder walls can catalyze a slow decomposition reaction with some gases. While these are not self-sustaining reactions they can slowly continue until the cylinder is compromised by pressure. hydrogen fluoride and hydrogen bromide that can react over time to form  $\text{H}_2$  as a byproduct. This reaction is slow but steady. In normal use this is not a problem as the excess pressure is vented when the valve is opened, the gas is used. After extended storage of 20+ years these cylinders have suddenly ruptured due to the excessive  $\text{H}_2$  pressure (<3,000 psig).



Some gases are unstable, hydrogen cyanide. See Unstable/Reactive Gases

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