



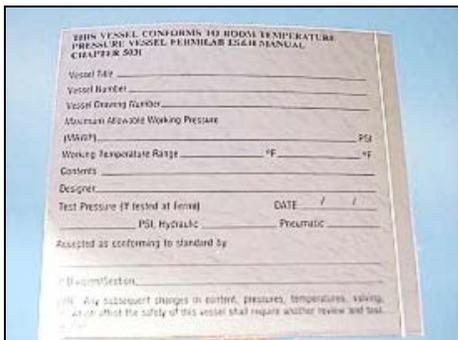
Pressure Vessel Safety at Fermilab

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To most people, *pressure vessels* are boring. When designed, used, and maintained correctly, they are static pieces of equipment that attract very little attention. But when mistakes are made, they can result in headline stories. Chapter 5031 of the Fermilab ES&H Manual - *Pressure Vessels* - is written to help prevent pressure vessel explosions, which can present a serious risk to life and property. Although the chapter is usually used only by employees who design or review pressure systems, all Lab personnel can help out by looking for and reporting vessels which are not certified as being *safe*.

Pressure vessels are used throughout Fermilab to store cryogenics, compressed air, and other gases. Those that operate above 15 PSI pressure and have a minimum dimension larger than six inches require a formal engineering review.



A certified vessel can be identified by the presence of a metallic silver sticker that is attached when the review is successfully completed.

The most common pressure vessels on site are compressed air receivers. They are often purchased with an attached air compressor and many are portable. When purchasing a pressure vessel, make sure that it has an American Society of Mechanical Engineering (ASME) stamp, which guarantees that the vessel was built in compliance with the pressure vessel code. All

purchased vessels that require review must have the ASME U-stamp. Vessels fabricated at the Lab or experimenter shops need to be pressure tested to ensure that they are free of defects.



In addition to an ASME stamp or a completed pressure test, a relief valve (also ASME stamped) must be installed on a vessel to ensure that it cannot exceed its design pressure. The relief valve not only needs an appropriate set pressure but it must also be able to relieve as much gas as the compressor or other source can supply. If the relief valve opens at 100 PSI but cannot pass as much fluid as its compressor is delivering, the vessel pressure can climb above 100 PSI and present an explosion risk. Proper maintenance requires periodic inspection and testing of relief valves. Fermilab policy requires visual inspection every three years and either testing or replacing of relief valves every six years (FESHM Chapter 5031.4).



If a vessel operates below 15 PSI or the vessel's smallest dimension (diameter, diagonal width, or length) is less than six inches, certification as described in FESHM 5031 is not required.

Following are some examples of common pressure vessels that can be found around the Fermilab site.

Portable compressor with *Hot Dog* style tanks: These pressure vessels operate at 125 PSI but because the vessel diameter is less than six inches, no formal review is required. It therefore does not require a silver sticker.

Portable air receiver: This vessel was purchased without an attached compressor. It is pressurized with an *in-house* compressor. It has a diameter greater than six inches and operates at 100 PSI so it requires a formal review. The attached silver sticker shows that this review has taken place.



The preparation and review of pressure vessel safety documentation is the responsibility of team engineers or physicists. However, compliance with safety rules is the responsibility of everyone who uses such equipment. Please report any suspect vessels to your SSO or immediate supervisor. Employees who are responsible for pressure vessel equipment must remember to perform the scheduled maintenance on their relief valves. With proper diligence from all Fermilab personnel, pressure vessels can remain silent, and even uninteresting, while only our particle physics discoveries make headlines.

The following items DO NOT require silver stickers:

- *Gas bottles*
- *Vessels holding 15 PSI or less*
- *Vessels with an inside dimension of six inches or smaller*
- *Water tanks/vessels, including those with an air cushion, with a pressure less than 300 PSI or temperature less than 210 F*
- *Structures which primarily transport fluids (i.e. piping systems)*