

Focus Sheet | Lab Pressure Vessels

Preventing Explosion, Damage, or Injury

What is a Pressure Vessel?

A pressure vessel is a closed container designed to hold gases or liquids at a pressure substantially higher or lower than the ambient pressure. Examples include glassware, autoclaves, compressed gas cylinders, compressors (including refrigeration), vacuum chambers, and custom designed laboratory vessels.

What Can Happen?

The pressure differential, whether created from chemical reaction, compressed gas, heating, chilling, or vacuum, is a potential hazard and many serious or fatal accidents have occurred when a pressure vessel or a component failed and generated flying projectiles and hazardous materials causing exposure or injury.

Tips on How to Use and Handle Pressure Vessels Safely

1. Small autoclaves must have an American Society of Mechanical Engineers (ASME) and an Underwriters Laboratory (UL) certification. Lab staff must follow manufacturer's operating and maintenance instructions. Most manufacturers recommend an inspection every two years. If the equipment is physically damaged, it must be recertified or disposed.
2. When working with pressurized systems that are not specially constructed and certified to contain the pressure (or systems that may develop pressure due to heat or reaction) take the following steps to prevent personal injury:
 - Use a metal or shatter proof glass or plastic screen to protect personnel from physical injury;
 - Use a pressure relief valve if the device is connected to an external source (gas cylinder, compressor, pump, etc.) that creates a pressure above 15 psi;
 - Make sure the regulator is appropriate or designed for the system;
 - Periodically inspect the set up for physical damage or stress. (If not sure what to look for contact EH&S Building and Fire Safety);
 - Use vessels that have been certified (ASTM) or at least tested by the manufacturer to withstand the operating pressures, plus a margin of safety (verified through manufacturers listing or calculations by qualified engineer);
 - Use a lower pressure or a different system (e.g., a pump) if it will not adversely affect the research;
 - Consider all conditions that may affect the pressure vessel (gas versus liquid, heated/cooled, corrosion, etc.);



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- Compressed gas cylinders must be secured at all times. At point of use, two straps or chains should secure cylinders;
- Wear your safety glasses, lab coat, plus any other equipment (such as rubber gloves) needed to protect you from the specific hazards in the lab.

Are Pressure Vessels Regulated?

Pressure vessels with a pressure greater than 15 pounds per square inch (psi) and a volume greater than 1.5 cubic feet (ft³) are regulated by Washington State law (Chapter 296-104 WAC) and must have a permit and be inspected by a state official biennially. Examples include autoclaves and electric boilers.

The UW Facilities Services Department's Preventive Maintenance Manager (PMM) coordinates the regulated inspections and maintains building records for inventoried pressure vessels. To determine if your pressure vessel has been inventoried for periodic structural assessment, it will have a State ID sticker; if your pressure vessel qualifies but is not inventoried please contact Facilities Services PMM.

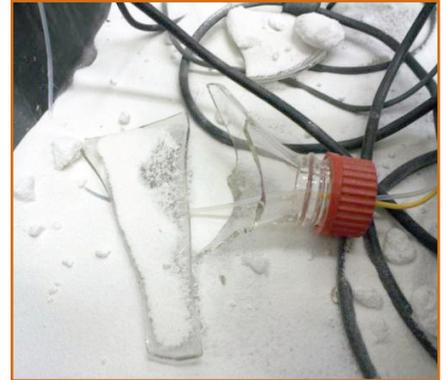
Compressed gas cylinders and tanks are regulated by the US DOT (Chapter 296-24 WAC, Part K).

Which Pressure Vessels are not Regulated?

Pressure vessels are exempt if they:

- have a safety valve set at 15 psi or less or
- are smaller than 1.5 ft³ with a safety valve set at 150 psi or less, or
- are less than 6 inches internal diameter and less than 5 ft³ in volume with a safety valve set for the appropriate pressure.

While these pressure vessels are exempted they still present a hazard to researchers and students, and the applicable precautions outlined above must be followed to prevent injuries.



Additional Resources

Facilities Services Preventative Maintenance Department for Autoclave Structural Inspection:
<https://www.washington.edu/facilities/mad/autoclaves>

Washington Administrative Code, Chapter 296-104 WAC: <http://apps.leg.wa.gov/wac/default.aspx?cite=296-104>

EH&S Autoclave information page: <http://www.ehs.washington.edu/rbsbiosafe/autoclave.shtml>

For Technical Assistance contact EH&S Building Fire Safety Section at 206-543-0465.

Environmental Health and Safety

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