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Authorization

- No one should undertake this task until they have successfully completed the University of Calgary WHMIS course and completed a site specific Laboratory Orientation.
- The [Compressed Gas Cylinder – Use, Handling and Storage Standard](#) must be read prior to performing this task for the first time.
- The first time this task is carried out it must be performed under the supervision of a competent person who is familiar with these instructions.

Hazards & risks associated with equipment/machinery/materials/technique/process

- High pressure
- Potential of toxicity/low or high oxygen atmosphere/explosion/caustic
- Dust, glass and particulates in the eyes
- Ergonomic overstress

Personal Protective Equipment

- Lab coats and safety glasses are mandatory
- Work gloves, face shield, as required

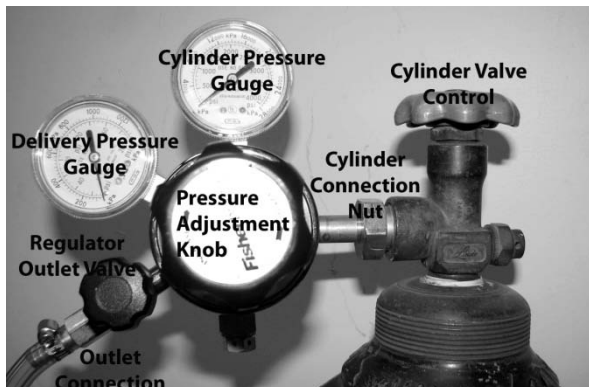
Before you start work:

1. Ensure that the gas cylinder is appropriately identified. Tank colour is not a reliable method of identification.
2. Know the hazards specific to the gas in the cylinder (know the location of the MSDS).
3. Be aware of any special purging, ventilation, lab or equipment specific procedures or other requirements that may be in addition to those listed in this document.
4. Ensure you know the desired delivery pressure to your system, apparatus or equipment.
5. Assemble required tools.
 - Non-adjustable wrench of the right size. Adjustable wrenches if not tight may damage brass nuts. Pliers should never be used
 - Leak detection solution – e.g. SNOOP® (a commercial product that will not leave a residue) or prepare a soap solution by adding a few drops of liquid soap to water in a squeeze bottle.
**If using Snoop check the label for recommended temperature range.*

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6. Check that you have the proper regulator for the compressed gas. If unsure contact the compressed gas vendor.

- A regulator as shown here is strongly recommended especially for long duration process such as gas chromatography as this keeps the pressure flow constant until the tank is nearly empty.
- **THE USE OF AN ADAPTOR BETWEEN A CYLINDER AND A PRESSURE-REDUCING REGULATOR IS PROHIBITED.**



Pressure Reducing Regulator

- The cylinder connection nuts of different families of gases are specific and will allow only pressure reducing regulators that are safe for use with those gases.
- Examine your delivery pressure gauge, It's midpoint should be considered the upper end of it's useable delivery pressure range.
- Some regulators (e.g. CO₂) require a washer to be inserted between the outlet and regulator. Check to see if this is required and present.
- Label each new gas regulator with its intended gas use. Regulators that have been used for oxygen or oxidizing gas must not be used for a different gas. Cross-contamination of internal parts (especially with grease or oil) could cause a rapid oxidation and fire. To ensure safety and to avoid contamination, it is strongly recommended that all regulators be dedicated to one gas service.

7. Ensure you have the correct outlet connection for your use. All connections must be able to withstand the maximum delivery pressure of the regulator.

- Compression fittings are required for copper and stainless steel tubing,
- Hose barbs are normally used for plastic tubing.
- Tapered fittings are normally for specific applications (e.g. welding).
- Seek assistance if you are unsure.

Procedure

Installation

1. Put on personal protective equipment.
2. Pre-position tank so that the regulator will be protected once installed. Securely strap or chain tank so that the strap or chain is above the midpoint and below the shoulder of the cylinder. If possible the contents label should be facing out so as to be visible.
3. Remove the cylinder valve cap.
 - A cylinder cap hook can be used to loosen tight cylinder caps. Do not insert a wrench or other device through the cap to loosen as this can damage the valve inside or accidentally open the valve.

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4. Remove any loose debris from the threads and seat. Ensure that the regulator adjustment knob (counterclockwise) and the pressure outlet valve (clockwise) are in the closed position and inspect the regulator and washer, if required, for wear or damage.
5. Thread regulator onto cylinder by hand until snug and then tighten the connecting nut with a wrench. Nuts with a notch thread counter clockwise and nuts without notch thread clockwise.



Left Hand Thread



Right Hand Thread

- Lubricants should never be used on connections.
 - Avoid the use of Teflon tape or any other sealing material. Cylinder connections are designed to connect without the use of these. Small particles can get into the regulator with the potential to cause a leak, malfunction and/or reading error.
6. Stand at an angle to the gauge face and open the cylinder tank valve slowly.
 - Do not look directly at the gauge as sudden pressurization can cause the glass face to shatter.
 - Open the cylinder valve until the cylinder pressure gauge needle indicates pressure. It is not necessary or desirable to turn the valve to the full open position and by opening it only part way prevents confusion by subsequent users and speeds shutdown in the case of an emergency. With older models of oxygen cylinders, if you detect leaking, you may have to open the cylinder all the way to back-seat the valve.
 7. Test the cylinder/regulator connection with leak detection solution by squeezing a small amount of solution ensuring coverage of the circumference of the cylinder connection nut as well as the space between the stem and the nut.
 - The formation of small bubbles indicates a loose or poor connection, try and tighten.
 - If the connection keeps leaking turn off the gas from the cylinder and disconnect the regulator (see below). Check for damage to the face of the fitting, debris in the cylinder valve connection or a missing washer.
 8. Turn the pressure adjustment knob slowly clockwise monitoring the delivery pressure gauge until desired delivery pressure is achieved. **DO NOT EXCEED THE MAXIMUM DELIVERY PRESSURE FOR THE REGULATOR OR THE SYSTEM.** Never use a regulator with the pressure adjustment knob fully screwed in. If higher pressures or flow rates are required, select a suitable regulator. If a hissing sound is heard from the regulator, immediately close the cylinder valve control and have the regulator serviced.
 9. Open the outlet valve and readjust the delivery pressure if required.

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During Use

1. Do not let the cylinder pressure drop below 25 psi. Below 25 psi there is a potential for backflow and cylinder contamination.
2. Monitor the delivery pressure;
 - A single-stage regulator will usually require delivery pressure adjustment as the cylinder pressure decreases.
 - Two-stage regulators will usually require no adjustment
 - Do not try and control delivery pressure using the outlet valve

Disconnecting

1. With the equipment valve open, close the cylinder valve control.
2. Slowly open the regulator outlet valve,
3. Monitor the pressure gauges; they should both drop to zero.
4. Disconnect the delivery hose from equipment.
5. Disconnect the regulator from the cylinder.
6. Replace the cylinder valve cap.

Servicing

All servicing is to be performed only by an authorized service center.