

Step-by-step Transport and Connection of Compressed Gases

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BACKGROUND INFORMATION

In all cases users of compressed gas cylinders must follow the Occupation Health Safety & Environment document [Compressed Gas Cylinders: Safe Handling and Use](#). Hands-on training in the safe handling and use of compressed gases is required. This step-by-step document is strictly intended to assist and not to replace hands-on training.

Compressed gas cylinders must be properly stored, transported, and handled to prevent accidents or injuries. Please strictly observe the OHSE Safe Handling and Use document, familiarize yourself with the following safety information when transporting and connecting compressed gas cylinders and with the appropriate Material Safety Data Sheet. Contact your supervisor for further information.

Sources for this information are:

[OHSE Compressed Gas Cylinders: Safe Handling and Use](#) [Compressed Gas Presentation](#) [MSDS](#)

Contacts: [Science Stores](#) local 8853 [Occupation Health, Safety and Environment](#) local 8791

For after-hours assistance call Campus Security local 721-7599

The following sections provide descriptions and procedures around replacing a cylinder.

- Personal Protective Equipment
- Ordering a cylinder
- Collecting and transporting a new cylinder to your lab
- Disconnecting an empty cylinder
- Connecting a new cylinder
- Returning an empty cylinder

PERSONAL PROTECTIVE EQUIPMENT

The following personal protective equipment (PPE) is required when transporting gas cylinders:

- Safety glasses
- Steel-toed safety shoes (for users who transport cylinders frequently); or
- External steel-toe cap overshoes (for users who transport cylinders infrequently). Overshoes can be borrowed from Science Stores when you pick up a cylinder.

General purpose work gloves are also recommended to protect hands against pinching injuries and cold exposure. Other PPE may be required based on the MSDS for your specific gas.

ORDERING A CYLINDER

Once you know what gas cylinder you need to order contact Science Stores as follows:

Stock Order ([see our website for stock gases](#)) – email your request to scistore@uvic.ca

Example:

This is Matt from the Brown Lab in CHEM.

I would like a replacement Nitrogen cylinder for pick-up on Wednesday March 6th at 2 PM.

Please charge to account Brown1.

Thanks.

Special Order (not on our stock list) – complete and send a [Stores Requisition or Webreq](#) to Stores for any non-stock item such as a specialty gas, a regulator, etc.

CYLINDER PICK-UP and TRANSPORT

Go to the front counter and ask a Storekeeper to get the cylinder you ordered. If your name is not on the list of personnel approved to pick-up gas cylinders then you will have to return to your PI/supervisor and ask them to contact sciadmin@uvic.ca approving you as someone to handle compressed gases for their lab.

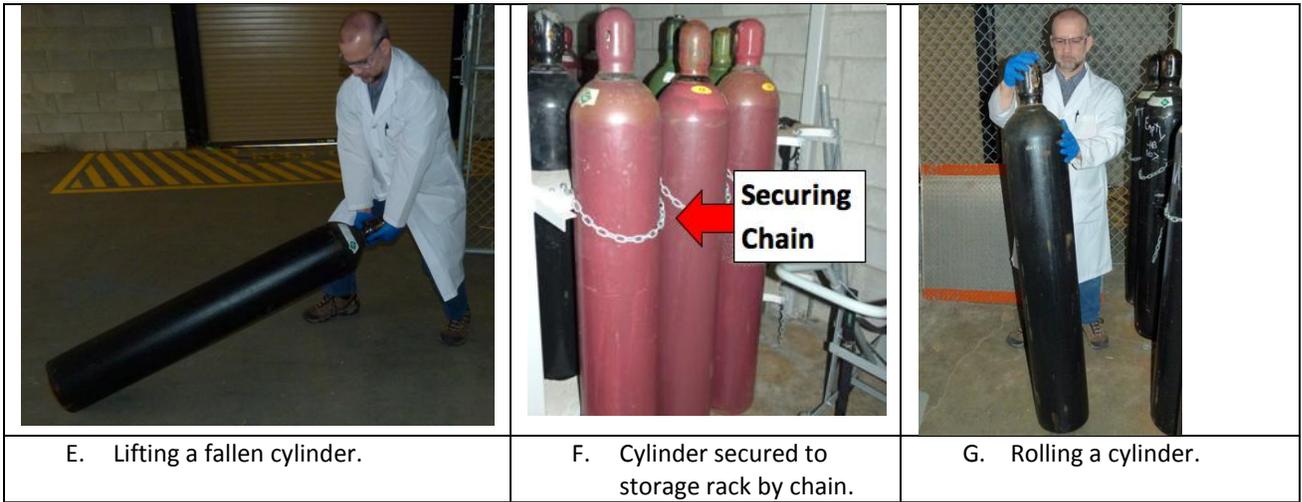
A Storekeeper will confirm which cylinder you have ordered and load it onto a cart for you. The cylinder must be capped as required for every transport and handling (see pictures A and B below). Before unsecuring ANY cylinder from its mountings it must be capped.

- Before transporting visually inspect the cylinder for any indications of damage or leakage. If there is any damage or leakage advise the Storekeeper and do not transport the cylinder.
- Cylinders must be transported using a cylinder cart (picture C). Inspect the cart before you transport the cylinder, checking that the wheels are firm and secure, that there are no cracks or damage to the cart, and that the cylinder cart strap or chain is in good repair.
- If you need to move a cylinder between floors, stay with the cart and cylinder in the elevator and hold on to cart during the elevator ride. Do not leave an unaccompanied cylinder in the elevator. Ensure no one else is in the elevator during transportation.
- It is extremely important to keep the safety cap on the cylinder during transport. A valve damaged or severed during transport can cause the cylinder to become a missile.
- If a cylinder starts to fall, do not attempt to catch it. Stand back and let the cylinder fall to the ground to avoid any physical injury. With the safety cap in place, cylinders can generally withstand a fall and not result in damage to the valve or cylinder body. To get a cylinder upright get help as they are very heavy. Typically there is no reason why you cannot first roll a cylinder to a safe place and then get help to lift it.

- Because cylinders are very heavy and pose a risk of injury when lifting them, only those physically able to lift a heavy object should upright a cylinder. When lifting a cylinder it is best to straddle the cylinder then lift up from the base of the secured cap (see picture E).

			
<p>A. Uncapped gas cylinder.</p>	<p>B. Capped Gas cylinder.</p>	<p>C. Cylinder cart – down position.</p>	<p>D. Cylinder cart – upright position.</p>

1. Ensure you are wearing the appropriate personal protective equipment. External steel toe cap overshoes can be borrowed from Science Stores.
2. To load a cylinder onto a cart, make sure the cylinder cart is placed as close as possible to the secured cylinder while allowing room to 'roll' the cylinder into position. Place the cart in the upright position (Picture D).
3. Unsecure the cylinder by removing the securing chain or strap (see picture F).
4. Roll the cylinder to the cart by keeping it fairly upright and rotating it slowly while directing it toward the cylinder cart (see picture G below). Once on the cart secure it with the cart's chain or strap before putting the cart in the down position (picture C).
5. Now you are ready to cart the secured cylinder to your lab. Make sure you have planned your route in advance and know of any uneven flooring. Be aware and if possible avoid any slippery areas.
6. Position the cylinder cart in the upright position near to the final location where you will secure your full tank. Assess the area to make sure no one is likely to walk through your work area while you are moving the cylinder from the cart to its final location.



DISCONNECTING the EMPTY CYLINDER

1. Empty tanks (marked 'MT') have lower pressure than full tanks but are not completely empty. If the tank contents are toxic you must follow your lab's specific safe operating procedures. The procedure below is for non-toxic gases.
2. Keep in mind that regulators are specific to the type of gas and cylinder and should not be used except as designed. If in doubt ask your supervisor who can contact the supplier for a regulator assessment.
3. Turn the empty cylinder's main valve off (see picture H). If you have an isolation valve then close it (picture I). Close the regulator valve (picture J).
 - Regulators should always have an isolation valve (ask Science Stores how to get one).
 - Regulators should be labelled with a tag clearly indicating the history of what gases it was used for and dates gases were received. A small amount of gas remains inside the regulator so ask your supervisor before using a regulator on a cylinder with a different gas. The residual gas in the regulator may react with or contaminate your new gas.
 - Label what pressure the regulator valve should be set at. The regulator valve must be closed to connect and leak test, so a clear indication of the pressure setting is required.
4. Unscrew the regulator from the main valve using a wrench (see picture K below). Note: Flammable gases are reverse threaded.
 - You'll need a place to temporarily hang or rest the regulator while moving cylinders.



H. Cylinder valve.	I. Isolation valve.	J. Regulator valve.	K. Unscrewing regulator from main valve.
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5. Cap the empty cylinder. If you do not have a spare cap you can borrow one from Science Stores. You must cap the cylinder before unsecuring it from its location in the lab.
6. Unsecure the cylinder and roll it to a place nearby but out of the way of the main traffic routes in the lab. The best practice would be to keep the cylinder upright and temporarily secure it with a chain. A bench mounted clamp (picture L) can also help in this regard.

CONNECTING the NEW CYLINDER

1. Review your work area making sure you have room to work and no one will get in the way.
2. Place the cylinder cart in the upright position (D) and unhook the cylinder. Carefully roll the new cylinder (E) to the location in your lab where it will be used and secure it at or above the cylinder's midpoint.
 - Cylinders can be secured to wall mounted racks (pictures M and N) or bench mounted (L).
 - Large cylinders must be strapped or chained to a secure object. As a minimum, ensure the cylinder is secured between its mid-point and shoulder (M).
 - Smaller cylinders including lecture bottles must be secured as above, or in an appropriate rack. If the cylinder is too short to secure properly as above then as a temporary measure only you can secure it to a larger properly secured cylinder (O). You must inform your supervisor who will make a request to Facilities Management for proper mountings.
3. Now roll the MT cylinder to the cart and secure it with a chain or strap. Next, return the cart to the down position. If not already been done then use chalk to write 'MT' on the cylinder.
4. Once both cylinders are secure attach the regulator to the new cylinder. Ensure the regulator is being used for the same gas as before, that there is no obvious damage to the regulator, and that you know what output pressure setting is needed. Remove the cylinder cap.
 - If the cap is stuck tap it gently on the top or around the base with a wrench to free any rust. Never put anything into the holes of the cap. Inserting anything into the cap to torque it loose could accidentally open or damage the cylinder valve which you will be unable to close with the cap on.
 - If you cannot remove the cap contact Science Stores.

			
<p>L. Secured bench mounted cylinder.</p>	<p>M. Single strap secured cylinder.</p>	<p>N. Two strap secured cylinder.</p>	<p>O. Temporarily secured short cylinder.</p>

5. If you are changing regulators or anything about the operation of the gas cylinder (pure gas versus a gas mixture, gas pressure, etc.) then check with your supervisor that the regulator is the correct one. Your supervisor can contact the supplier for advice. To attach the regulator:
 - a. CO₂ tanks have a plastic washer that should be replaced. They are available free of charge from Science Stores. Most cylinders don't use washers.
 - b. The regulator nut tightens righty-tighty (hence clockwise if facing the cylinder valve with the regulator between you and the valve). Flammable gases are reverse threaded so in that case it turns left (counter clockwise) to tighten.
 - c. You want the regulator gauges to be vertical when the nut is tight so hold them horizontal to start with and allow it to creep up as the nut starts to tighten. Tighten the nut with the large wrench attached to each Science Stores carts. The gauge should end upright (see picture J). For non-CO₂ tanks the nut should be firmly tight. CO₂ tanks can be looser as the washer will seal. Your leak test will tell you if it's too loose.

6. Now leak test the regulator-cylinder valve seal. There are two ways to test for leaks: by the Static Pressure Test (checking if the gauge needle jumps) or by using Snoop (a sudsy liquid available from Science Stores that makes leaks appear as bubbles).
 - Slowly open the cylinder valve to avoid damaging the regulator. Do not stand directly in front of a regulator attached to a compressed gas cylinder when the valve is being opened.

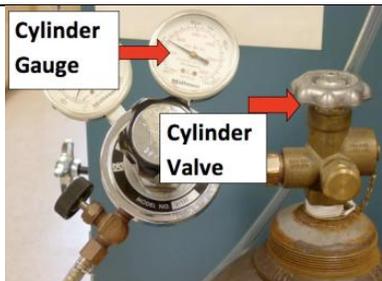
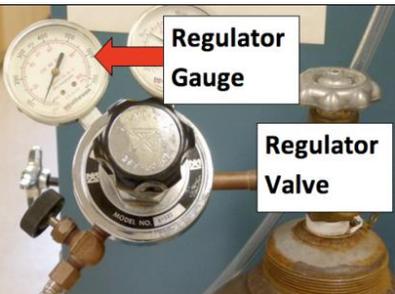
Static Pressure Test

- a. Ensure that regulator valve is off (J) so that no gas can flow downstream from the regulator.
- b. Open the cylinder valve (picture H) slowly and almost completely (if you open it fully then back it off a half turn). Always stand to the side of the regulator when opening a cylinder valve in case the regulator fails. The cylinder pressure should never be at the maximum reading for the gauge. If it's too high then you have the wrong regulator for your cylinder. In this case, close the cylinder valve and contact your supervisor. If the cylinder pressure is very low you may have an empty cylinder or are using the wrong regulator.

- c. Wait about 30 seconds for the regulator to fill completely then turn the cylinder valve fully off.
- d. Wait 60 seconds. Tap the gauge as needles sometimes stick. While carefully watching the needle open the cylinder valve. Tap the gauge again. If there is a leak then once you close the cylinder valve the pressure in the regulator will drop. Therefore after opening the cylinder valve again the needle should jump up. If the needle does not jump then it has passed the static pressure test.
- e. If the needle jumped then you have a leak. In this case tighten the regulator nut a bit and repeat steps c and d. Tighten and repeat until there is no leak. If it's very tight and there is still a leak then turn off the cylinder valve and contact your supervisor.

Snoop Leak Test

- a. Ensure that the regulator valve is off (J) so that no gas can flow downstream from the regulator.
- b. Apply some Snoop around the regulator nut (picture P).
- c. Open the cylinder valve (picture H) slowly and almost completely (if you open it full then back it off half a turn). Always stand to the side of the regulator when opening a cylinder valve in case the regulator fails. The cylinder pressure should never be at the maximum reading for the gauge. If it's too high then you have the wrong regulator for your cylinder. In this case close the cylinder valve and contact your supervisor. If the cylinder pressure is very low you may have an empty cylinder or are using the wrong regulator.
- d. Watch for bubbles in the Snoop, either new bubbles will form or existing bubbles will get bigger. If after 60 seconds you don't see any new or growing bubbles then it passed the Snoop leak test.
- e. If you see a change in the bubbles there is a leak. In this case, tighten the regulator nut a bit, wipe the old Snoop liquid off and reapply. Watch for new or growing bubbles. Tighten and reapply Snoop until there is no leak. If it's very tight and there is still a leak then turn off the cylinder valve and contact your supervisor.

		
<p>P. Apply Snoop to regulator nut.</p>	<p>Q. Cylinder valve and gauge.</p>	<p>R. Regulator valve and gauge.</p>

- 7. Set the regulator pressure correctly. You need to adjust the regulator valve to show the desired pressure on the regulator gauge (picture R).
 - a. If you have an isolation valve and it's turned off then adjusting the regulator valve to the desired output pressure will not cause gas to flow through the line.
 - b. If you do not have an isolation valve then adjusting the regulator valve to the desired output pressure will cause gas to flow so make sure you are set-up for that. The valve on a compressed gas cylinder must be kept closed when the cylinder is not in use.

RETURNING the EMPTY CYLINDER

1. If you have successfully completed step 3 of the **CYLINDER PICK-UP and TRANSPORT section**, you are ready to cart the secured empty cylinder back to the loading dock. Make sure you have put the wrench back on the cart. Make sure you have planned your route in advance and know of any uneven flooring. Be aware and if possible avoid any slippery areas. Wear appropriate personal protective equipment during transport.
2. Once you arrive at the loading dock leave the cylinder on the cart and ask a Storekeeper to secure the empty cylinder and cart. Remember to return any external steel-toe cap overshoes you have borrowed.