

Section 5.27 Title: Handling Gas Cylinders
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Revision Date: 11/01/19
P.I.: Prof. John F. Berry

Prior Approval: This procedure is NOT considered hazardous enough that prior approval is needed from the Principal Investigator.

Involves Use of Particularly Hazardous Substance (PHS)? No
 Carcinogen Reproductive Toxin High Acute Toxicity
Does this procedure require medical surveillance? No
Does this require use of a fit-tested respirator? No

Brief Description of Procedure:

Transfer gas cylinders and attaching/detach regulators.

Location: *List the locations (buildings/rooms) where this procedure may be performed. For use of a PHS indicate a more precise location within the room, if appropriate, as a designated area.*

Daniels Chemistry - All Berry group labs

Chemicals Involved:

Chemical	Physical or Health Hazard (e.g. carcinogen, corrosive)
N/A	N/A

Other Hazards: *Include hazards, other than chemical, that may be present during operation of the procedure.*

High pressure. No other inherent hazards, but some cylinders may contain hazardous chemicals. Consult relevant SOP(s) and SDS as needed.

Exposure Controls: *(Check all that apply)*

PPE: Safety Glasses Face Shield Chemical Splash Goggles
 Chemical Apron Gloves (Nitrile) Lab Coat
 Respirator (type) Other:

Engineering Controls:

Fume Hood Biosafety Cabinet Glove box
 Vented gas cabinet Other: High pressure valves and fittings.

Administrative Controls: *List any specific work practices needed to perform this procedure (e.g., cannot be performed alone, must notify other staff members before beginning, etc.).*

Do not install or remove cylinders or regulators without another lab member nearby.

Task Hazard Control Table: *For procedures involving numerous steps, it may be convenient to indicate specific requirements for individual tasks in the table below:*

N/A

Waste Disposal: *Describe any chemical waste generated and the disposal method used.*

Return empty cylinders to 1237B and dispose of lecture bottles according to vendor or EH&S instructions.

Accidental Spills: *Describe the procedure for handling small chemical spills that may occur during this procedure. Note that for large spills it may be appropriate to call 911.*

N/A

Decontamination Procedures (required for PHS use): *Describe the procedure for decontamination of personnel and equipment.*

N/A

Training: *Describe any training needed prior to performing this procedure. Include training performed in-lab and any required demonstrations of competency.*

Training is required. Training is performed by a group CHO or another lab member they have approved. The procedure will be demonstrated at least once and new members will be supervised their first time.

Principle Investigator Approval: I have reviewed this procedure and approved it for use. Note: Modifications to the procedure may require update to this form.

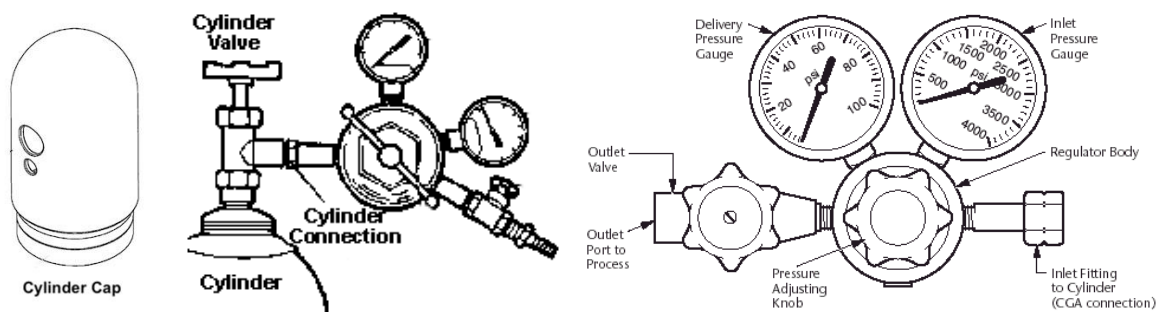
Name: John F. Berry

Signature: _____

Date: _____

Handling Gas Cylinders

Cylinder and Regulator Components



Important General Notes

1. Never transport a gas cylinder without the cylinder cap screwed on firmly.
2. Only remove the cylinder cap when the cylinder is securely chained or strapped onto an immovable surface such as the benchtop or wall.
3. Never use Teflon™ tape on cylinder connections! Teflon™ tape should only ever be used to maintain a seal that relies on thread-to-thread pressure. Cylinder connections rely on a metal-metal ball-and-socket joint to form a seal while the threaded connections apply the necessary pressure (see figures in “Common CGA Connections”). Teflon™ tape can prevent the threaded connections from applying the necessary pressure to maintain a seal.
4. Regulators with notched inlet fittings (see far right diagram above) are reverse-threaded.
5. Regulators are not universal; make sure that you are using a regulator that is compatible with the gas in the cylinder. The different types of inlet fittings help to avoid incompatible connections (see “Common CGA connections” below).
6. Gloves are typically used when using gas cylinders for experiments, so should always be used when handling the valves and regulator. But gloves should be removed when handling cylinder cap and when transferring cylinders to other floors.

Removing Regulator

1. While the cylinder is still secured, close the cylinder valve, allow the the pressure in the regulator to fall to zero, and close the regulator outlet valve (wearing gloves).
2. Using a large adjustable wrench (typically stored on the solvent system table in 6325), loosen the inlet fitting until finger-loose.
3. Hold the regulator steady in one hand to avoid stressing the connection and completely loosen the inlet fitting with your other hand.
4. Remove the regulator and set it in safe place. Remove your gloves.
5. Locate the correct cylinder cap and twist it onto the cylinder until snug (do not cross-thread).

Moving Gas Cylinder(s)

1. Follow the “Removing Regulator” procedure above.
2. Bring a gas cylinder hand truck up to the cylinder and carefully roll the cylinder onto the truck. Fasten the straps tightly before carefully leaning the hand truck back onto the smaller wheels.

3. Once the cylinder is at its destination, carefully tilt the hand truck upright, loosen the straps, and roll the cylinder into the new holder. Fasten the cylinder with chains or straps. Note: use the freight elevator for transporting cylinders between floors in Daniels.

Returning Empty Gas Cylinder(s)

1. After completing the “Moving gas cylinder” procedure above to step 2, use the service elevator to bring the cylinder down to the 1st floor and into the loading dock area.
2. The gas cylinder storage room (1237B) is in the left hall as you enter the loading dock area. The room is on the right side of the hall past the shipping/receiving desk. Open the door and use the cable to hold it open. The light switch is on the opposite side from the door.
3. Record the cylinder number, date, gas type, group name, and last name in the “Return” log book.
4. Roll the cylinder on the hand truck to the Empty Cylinders area and follow step 3 in “Moving gas cylinder” procedure above.
5. Don’t forget to turn off the light and close the door as you leave the cylinder storage room.

Buying New Gas Cylinder(s)

1. Bring the group gas cylinder hand truck to the first floor loading dock (if not there already).
2. The gas cylinder storage room is to the left as you enter the loading dock area. The room is on the right side past the shipping/receiving desk. Open the door and use the cable to hold it open. The light switch is on the opposite side from the door.
3. Locate the desired cylinder, unfasten the chains, and roll onto the hand truck.
4. Record the cylinder number, date, gas type, group name, last name, and room number in the “Checkout” log book.
5. Don’t forget to turn off the light and close the door as you leave the cylinder storage room.

Installing Regulator

1. Remove the cylinder cap and store it close to cylinder where it will not get lost or misplaced. Put on gloves for following steps.
2. Hold the regulator in place with one hand to avoid stressing the connection and use fingers on your other hand (no wrench) to carefully tighten the inlet fitting until snug. (Note: there should be no Teflon™ tape on the connection pieces.)
3. Using a large adjustable wrench (typically stored on the solvent system table in 6325), tighten inlet fitting until snug.
4. Check that the regulator valve is closed. Carefully open the cylinder valve and listen for audible leaks. If nothing is audible, squirt Snoop™ onto the connection and look for bubbles. If any hissing is audible or any bubbles are observed, close the cylinder valve and further tighten the connection with the wrench.
5. Check the gauge connections and any other high-pressure connections in the same way. (Note: the outlet port is typically not a high-pressure connection.)

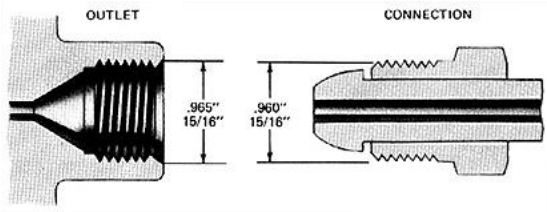
Setting Regulator Pressure

1. Regulators are usually set at an appropriate pressure, so no adjustment is required. Avoid adjusting regulator pressures unless you are completely sure that it is necessary.
2. Ensure that the cylinder valve and outlet valves are closed and that the outlet line is securely connected to your schlenk link or other apparatus.
3. Following the arrows for decreasing pressure, turn the pressure adjusting knob until it spins almost freely. (Caution: it is usually possible to spin the knob completely off, which is not recommended.)
4. Open the cylinder valve and then the outlet valve. Following the arrows for increasing pressure, slowly increase the outlet pressure until the desired pressure or flow rate is achieved.

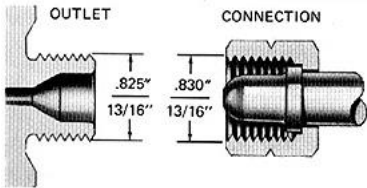
Lecture Bottle Notes

1. Lecture bottles are much smaller than gas cylinders but should still be treated with care.
2. Lecture bottles are purchased in the same way as chemicals and should be added to the inventory as such.
3. Some lecture bottles can be returned to supplier when empty or partially emptied. If this is the case, contact the vendor for return instructions.
4. If the vendor does not accept returns and if the bottle is empty, flush it with nitrogen or evacuate with vacuum and refill with nitrogen to ensure that it contains only inert and harmless gas. The bottle can then be checked out for pickup with the regular chemical waste.
5. If the vendor does not accept returns and the bottle is still partially filled, then ensure that it is clearly labeled as such and check-out for pickup with the regular chemical waste.
6. Disposal of lecture bottles can be very expensive for the university, so consult with the CHO and EHS in case of any uncertainty.

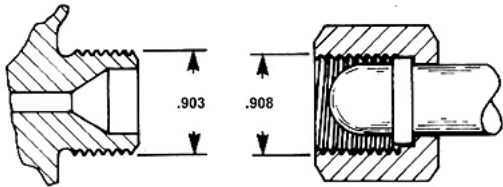
Common CGA connections (from <https://www.concoa.com/cgachart.html> and <https://www.mathesonigas.com/pdfs/litCenter/SpecGas&EquipmentBrochures/Guide%20to%20Regulators.pdf>)



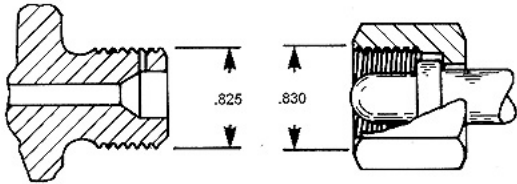
CGA-580: Argon, Helium, Nitrogen



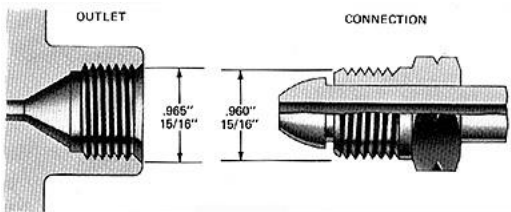
CGA 350: Carbon monoxide, H₂ (regen gas)



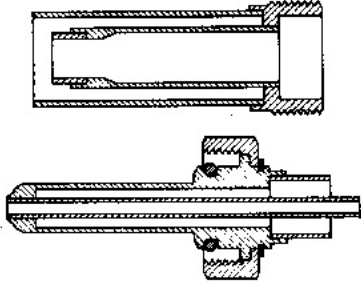
CGA-540: Oxygen



CGA-326 is used for Nitrous Oxide.



CGA-590: compressed air



CGA 792: Liquid withdrawal of Helium

CGA 180: Ammonia (lecture bottle size)

CGA 660: Nitric oxide (standard pressure), nitrogen dioxide