

ANIMAL BIOSCIENCES DEPARTMENT

Compressed Gas Cylinders * Handling, Use and Storage * Standard Operation Procedures

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Compressed gas cylinders present many safety hazards. The most important are mechanical hazards and hazards with each cylinder's contents.

MSDS

Obtain a copy of the MSDS (Material Safety Data Sheet) for the gas you are using, read thoroughly and become familiar with the gas properties and hazards prior to use.

Suggest: www.lindecana.com or www.scottecatalog.com

MECHANICAL HAZARDS

Compressed gas cylinders are under extreme pressure. Cylinders whose valves have been accidentally broken off can easily be propelled great distances and penetrate reinforced concrete walls.

HAZARDS FROM CYLINDER CONTENTS (list including but not limited to)

Inert or Flammable gases - Asphyxiation - resulting if the concentration in an enclosed space (ie lab) exceeds certain levels

Flammable gases - Ignition and/or explosion hazards - examples include hydrogen, organic gases such as acetylene, and methane.

TO OBTAIN OR RETURN TANKS IN ABS

To take a new tank or return an empty tank - refer to the clipboard outside room 253.

Fill in the information requested:

1. Name
2. Faculty
3. Type of gas
4. Code for that gas
5. Grant number (most important) for billing

Don't take a tank unless you have provided coding for payment.

WHERE STORED IN ABS

Gas cylinders - inert gases only (new and empty tanks) are stored in Room 176 of the Animal Wing.

Gases are separated by Dept (HHNS and ABS).

Gases are stored by type.

Flammable gases are stored in the storage unit on the loading dock.

While in storage, cylinder valve protection caps MUST be firmly in place.

Tanks come in different sizes, K & T is the most common.

TO TRANSPORT TANKS

Safety shoes should be worn at all times when handling cylinders.

Move cylinders by hand trucks or carts designed for this purpose (fitted with a securing chain)

NEVER EVER transport a gas cylinder (even a short distance) without its valve protection cap firmly in place.

EMPTY CYLINDERS

HHNS and ABS empty tanks are stored together, separate from the full tanks, at the end of Room 176. Return empty cylinders promptly. **DO NOT REMOVE THE STICKER INDICATING THE DEPT!** Some pressure should be left in a depleted cylinder to prevent air suck-back that would allow moisture and contaminants to enter the cylinder. [100 to 200 PSI or about 1000 KPa]

TO USE CYLINDER

Secure the cylinder to something solid, with a tank bracket or chain at least 2/3 up the height of the tank. Remove the valve protection cap.

Inspect the cylinder valve for damaged threads, dirt, oil or grease.

Remove any dust or dirt with a clean cloth.

If oil or grease is present on the valve of a cylinder which contains oxygen or another oxidant, do NOT attempt to use it. Combustible substances in contact with an oxidant are explosive.

Disconnect equipment from the cylinder when not in use & return the protection cap to the cylinder.

ATTACHING REGULATOR

Use Safety glasses when installing a regulator. Keep a wrench handy.

Determine that you have the appropriate regulator for the gas cylinder. (Scott offers an on line gas regulator selection guide.)

- Use the regulator with the correct pressure output range for your application.
- Note: “full” can read different psi depending on the gas (tanks filled by weight not volume).
- Never cross thread or use adapters between non-mating equipment and cylinders.
- Use washers only if indicated.
- Check that the threads on the tank and the regulator are in good condition.
- Use of Teflon® tape on the threaded connection is not recommended.

All fittings and connection threads must meet properly - never use excessive force to tighten a connection..

- Outlet **MUST NOT** be facing you if you “crack” (ie briefly open) cylinder - before putting regulator on, to get dust out - **NEVER** “crack” a hydrogen tank.
- Hold the regulator vertically and horizontally at a right angle to the cylinder
- Connect the regulator to the cylinder valve by closing the thread finger-tight
- The thread should move easily - you will damage it by forcing it
- With a wrench, tighten the connection carefully, a maximum of one turn - normally a right turn (see “regulator connections” below for details)

Turn regulator valve on. **Arrow on top of valve indicates which way to turn to open or close the tank.**

REGULATOR CONNECTIONS

Regulators attach to a gas cylinder by a CGA valve connection. The CGA number will be stamped on the regulator, and are specific to the type of gas cylinder the regulator is compatible with. **Tables are available from Linde to match regulators/CGA numbers with the appropriate gas cylinders.**

To identify whether to expect a right hand or left hand thread look at the CGA number. If the middle digit is an even number, right hand thread (clockwise), if the middle digit is odd, then the thread is a left hand and tightening is done in a counterclockwise manner. Example - 580 is a right hand and 350 is a left hand thread. As well left hand thread regulators have a notch cut all the way around the nut that goes onto the CGA valve. Examples of left hand thread are regulators for hydrogen and acetylene.

LEAK TEST THE CONNECTION

There are commercially available products (Snoop) or a solution of water / isopropanol alcohol / dish soap (100:100:1) will work - apply the solution to the connection - if bubbles are appearing - You have a gas leak! Turn off tank, and correct the problem before proceeding.

SINGLE-STAGE AND TWO-STAGE REGULATORS

(reference www.scottgas.com, <http://www.Scottcanada.com>, 11/12/2009 and www.lindecana.com<http://www.lindecana.com> , discussions with personnel 14/12/09)

A *single-stage gas regulator* has only one diaphragm and one regulating seat. Full cylinder pressure is reduced to the output pressure desired, in one step. The easiest way to identify a single-stage regulator - the back side of the regulator will be **FLAT**.

ALL single-stage regulators suffer from drift / creep, since the initial pressure is set against a full tank. For a full tank of say 2200 psi, for every 100 psi drop in tank pressure, the regulator will make a 1 psi compensation (will be visible as increased pressure reading on the outlet gauge). As an example, a full oxygen tank, with an outlet pressure of 40 psi, may reach 50 psi or more by the time the tank is depleted, unless the outlet pressure is adjusted as the tank empties.

It is recommended for use where inlet pressure does not vary greatly, such as with liquefied gases (ie. CO₂, is 80% liquid, 20% vapor on the top of the tank) or where periodic readjustment of delivery pressure does not present a problem.

A *two-stage gas regulator* consists of 2 single stage regulators used in series. It reduces gas cylinder pressure in two steps. A two-stage regulator is identified by having another whole section sticking out the back. The first of the diaphragms is preset to step the pressure down from the full tank value to around 600 psi. The front of the regulator contains the outlet/delivery adjustment for the second diaphragm.

These regulators should be used when constant delivery pressure is needed with no periodic adjustment necessary. This style of regulator is useful for equipment that is not shut off. It smoothes out pressure fluctuations - a set it and forget it scenario.

Generally single and two-stage regulators are equipped with two gauges: a cylinder or inlet pressure gauge, and a delivery or outlet pressure gauge. The cylinder pressure gauge has the higher pressure range and is located adjacent to the tank inlet port. The delivery pressure gauge of lower pressure range is located adjacent to the outlet port. Although most cylinder regulators have two gauges, regulators utilized on cylinders containing liquefied gases may not have a cylinder pressure gauge because the cylinder pressure varies only with temperature as long as liquid is present in the cylinder.

Linde Gases Safety Tips Inspection Check List

1. Ensure all compressed gas cylinders are secured in a cart or chained to a wall.
2. Identify the gas in the cylinder before using it.
3. Blow out cylinder valves before attaching the regulator. Do not follow this procedure with **hydrogen gas** or **any corrosive gases**.
4. Check the CGA# on the cylinder valve and make sure the regulator you are attaching has the same CGA#.
5. Attach the regulator directly on to the cylinder valve.
6. Use the proper size wrench to tighten the regulator nut on the cylinder valve.
7. Make sure the adjusting screw [threaded “T shaped” screw] on the regulator is backed out before opening the cylinder valve [Tap].
8. Always stand on the other side of the cylinder when opening the cylinder valve [Tap].
9. Open the cylinder valve slowly [Tap].
10. Turn in the regulator adjusting screw to the desired release pressure.
11. When finished using the gas shut off cylinder valve [Tap].
12. Drain all pressure from the regulator.
13. Back out regulator adjusting screw.
14. Never completely empty a compressed gas cylinder.
15. Always store the compressed gas cylinder full or empty with a cylinder cap attached.
16. Never use oil or grease on a regulator, torches, hose connections, etc.
17. Do not use oxygen as a substitute for air.
18. Keep your work area clean
19. Check this equipment for leaks on a regular basis. Use snoop leak detector only if it is available.

KEEP SAFETY IN MIND AT ALL TIMES