How to Work Safely with – Compressed Gases – Fact Sheets



WHAT ARE CYLINDERS AND FITTINGS?

Compressed gases are stored in heavy-walled metal cylinders designed, produced and tested for use with compressed gases. Cylinders are made in a wide variety of sizes and shapes. They range from small lecture bottles, often used for demonstration purposes, to large cylinders over 3 metres long. Cylinders for transportation must meet CSA standard CAN/CSA-B339 “Cylinders, Spheres and Tubes for the Transportation of Dangerous Goods”. This standard covers requirements for the manufacturing, inspection, testing, marking, requalification, reheat treatment, repair, and rebuilding of cylinders, spheres, and tubes (containers) for the transportation of dangerous goods. In addition, it includes the requirements for the qualification of new designs and registration requirements. You should also consult CAN/CSA-B340 “Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2”.

Cylinders that meet these criteria are often referred to as “TC approved” cylinders. Cylinders are permanently marked, typically on the shoulder or the top surface of its neck.

Usually, cylinders must be retested or inspected every five or ten years. The date of each test must be stamped on the cylinder.

Cylinder Valves and Connections

Compressed gas cylinders must be connected only to regulators and equipment designed for the gas in the cylinder. Since connecting the wrong equipment can be dangerous, a number of different standard cylinder valve outlets are available for different classes of gas. For example, these standard connections prevent the valve connection for a flammable gas from fitting the connections for an incompatible gas, such as an oxidizing gas.

Most compressed gas cylinders have valve caps or some other method of protecting the valve from damage during handling and transportation. A dust cap may be placed over the valve outlet itself to help keep it clean.

What are cylinder safety devices?

Most cylinders have one or more safety-relief devices. These devices can prevent rupture of the cylinder if internal pressure builds up to levels exceeding design limits. Pressure can become dangerously high if a cylinder is exposed to fire or heat, including high storage temperatures.

There are three types of safety-relief devices. Each relieves excessive gas pressures in a different way:

- **Safety- or Pressure-Relief Valves:** These valves are usually a part of the cylinder. They are normally held closed by a spring. The force holding the valve closed is set according to the type of gas in the cylinder. The valve opens if the cylinder pressure exceeds the set safety limit. Gas is released until the cylinder pressure drops back to the safety limit. The valve then closes and retains the remaining gas in the cylinder.
- **Rupture Discs** (also known as frangible or bursting discs): These discs are usually made from metal. They burst or rupture at a certain pressure, releasing the gas in the cylinder. The bursting pressure is designed so that the disc ruptures before the cylinder test pressure is reached. These devices cannot be reclosed, so the entire contents of the cylinder are released.
- **Fusible Plugs** (also called fuse or melt plugs): Temperature, not pressure, activates fusible plugs. These safety devices are used where heat could initiate an explosive chemical reaction. A pressure-relief valve or rupture disc acts too slowly and too late to prevent rupture of the cylinder if an explosive reaction has already begun. The fusible plug releases the gas before the hazardous reaction can begin. Fusible plugs are made of metals that melt at low temperatures. For example, acetylene cylinders have a fusible plug which melts at about 100°C (212°F). This temperature is safely below the temperature at which hazardous polymerization may occur.

Not all compressed gas cylinders have safety devices. Some gases are so toxic that their release through a safety device would be hazardous. Cylinders for these gases are built to withstand higher pressures than normal cylinders. When these “toxic gas” cylinders are involved in a fire, the area must be evacuated.

Why should I use substitution as a method of controlling exposure to compressed gases?

Substitution can be the best way to avoid or reduce a hazard. But it is not always easy or even possible to find a less hazardous substitute for a particular compressed gas used for a certain job. Speak to the chemical supplier to find out if safer substitutes are available. For example, in some cases, methylacetylene-propadiene (MAPP) gas, propylene, propane or mixtures of liquefied petroleum gas can be substituted for acetylene as fuel gases for cutting, welding and brazing. These gases are more stable and can be stored in normal cylinders. Their flammable limits are much narrower than those of acetylene (e.g., 3.4 to 10.8 percent for MAPP versus 2.5 to 82 percent for acetylene), so they represent a reduced fire hazard.

Obtain MSDSs for all possible substitutes. Find out about all of the hazards (health, fire, corrosivity, chemical reactivity) of these materials before making any changes.

Sometimes, process changes or modifications can reduce a material’s hazards. For example, many cylinders of the same gas may be used in different areas of a

workplace. Installing fixed pipelines connected to a central gas supply in a safe area can often reduce the hazard. It can also reduce the need for many sets of portable equipment supplied through flexible hoses. Similarly, ordering cylinders equipped with flow limiting restrictors can minimize the hazards of a sudden failure of a process gas line.

Choose the least hazardous material and process that can do the job effectively and safely. Then learn how to work safely with them.

Why is proper ventilation important?

Well-designed and well-maintained ventilation systems remove gases from the workplace and reduce their hazards.

The amount and type of ventilation needed depends on such things as the type of job, the kind and amount of materials used, and the size and layout of the work area.

Assess the specific ways your workplace stores, handles, uses and disposes of its compressed gases. An assessment can reveal if existing ventilation controls and other hazard control methods are adequate. Some workplaces may need a complete system of hoods and ducts to provide acceptable ventilation. Others may require a single, well-placed exhaust fan. Storage facilities for particularly hazardous materials such as chlorine, may require an additional emergency ventilation system, or continuous monitoring with appropriate alarms. Other workplaces using small amounts of inert gases may require no special ventilation system.

Make sure ventilation systems are designed and built so that they do not result in an unintended hazard. Ensure that hoods, ducts, air cleaners and fan are made from materials compatible with the gas used. Systems may require explosion-proof and corrosion-resistant equipment. Separate ventilation systems may be needed for some compressed gases to keep them away from systems exhausting incompatible substances.

How do I store compressed gas cylinders?

Store compressed gas cylinders in compliance with the occupational health and safety regulations and fire and building codes applying to your workplace. These laws may specify the permissible kinds of storage areas and the construction of these storage areas. They may also specify the kinds and amounts of different gases that can be stored in each safe storage area.

What should I do when I receive cylinders?

Inspect all incoming cylinders before storing to ensure they are undamaged and properly labelled. Do not accept delivery of defective cylinders. Be sure they are not giving off odours, visible fumes or hissing sounds. Check that the cylinder was last tested within the required time (usually 5 or 10 years, but some containers may be as low as 3 years or as long as 12 years).

Also check that the cylinder labels are intact and that they match other identifying markings on the cylinder. Do not rely on cylinder colour to identify the gas. Different suppliers may use different colours for cylinders of the same gas. In addition, colours appear different under artificial lights and some

people are colour blind. Gases that cannot be clearly identified should not be used.

Call compressed gases by the name on the supplier label. This reduces confusion, promotes recognition of the hazards involved and precautions to take, and can prevent accidental use of the wrong gas. If oxygen is called “air,” someone who wants air to run a tool may use oxygen with possible serious results. Leave the valve cap securely in place until the cylinder is to be used. Inspect the cylinder valve by looking through the ports in the valve cap. Do not accept dirty, rusted or otherwise damaged valves and fixtures.

How do I transport or move cylinders?

Always transport cylinders with valve caps or other valve protection in place. Pulling cylinders by their valve caps, rolling them on their sides or dragging or sliding them can cause damage. Rolling cylinders on their bottom edge (“milk churning”) may be acceptable for short distances. Never lift cylinders with magnets or chain or wire rope slings. Transport cylinders on specially built hand carts or trolleys or other devices designed for this. All transport devices should have some way of securing cylinders to prevent them from falling.

What should I know about the compressed gas storage area?

Store compressed gas cylinders separately, away from processing and handling areas, and from incompatible materials. Separate storage can minimize personal injury and damage in case of fires, spills or leaks. Many compressed gases can undergo dangerous reactions if they come in contact with incompatible materials (gases, liquids or solids), so store them apart from each other. For example, store oxidizing gases at least 6 metres (20 feet) away from fuel gases or other combustible materials, or separate them with an approved fire wall. Check the reactivity information and storage requirements sections of the MSDS for details about which materials are incompatible with a particular compressed gas. The National Fire Code addresses requirements for segregation of different gases in storage.

If compressed gas cylinders are stored outside, use a well-drained, securely fenced area. Keep them on a raised concrete pad or non-combustible rack. Protect cylinders from the weather and do not allow them to stand directly on wet soil as this can cause corrosion.

Indoor storage areas must have walls, floors and fittings made of suitable materials. For example, use non-combustible building materials in storage areas for oxidizing gas and corrosion-resistant materials in storage areas for corrosive gas. Make sure floors are level and protect cylinders from dampness. Avoid overcrowding in storage areas or storing cylinders in out-of-the-way locations.

Always chain or securely restrain cylinders in an upright position to a wall, rack or other solid structure wherever they are stored, handled or used. Securing each cylinder individually is best. Stacking of groups of cylinders together offers some protection, but if this is done improperly, the entire group or individual cylinders could fall.

Store compressed gas cylinders in areas which are:

- Well-ventilated and dry.
- Fire-resistant and supplied with suitable firefighting equipment including sprinklers, where appropriate.
- Away from electrical circuits and ignition sources such as sparks, flames or hot surfaces.
- Accessible at all times, but away from elevators, staircases or main traffic routes where cylinders may be dangerous obstacles.
- Labelled with suitable warning signs.

Always store full cylinders separately from empty cylinders.

What should I know about compressed gas storage temperatures?

Store compressed gas cylinders in dry, cool areas, out of direct sunlight and away from steam pipes, boilers or other heat sources.

Follow the gas supplier’s recommendations for storage and use temperatures. To prevent excessive pressure buildup, never expose cylinders to temperatures above 52°C (125°F). Do not subject them to temperatures below -29°C (-20°F), unless they are designed for this. Cylinders that become frozen to a surface can be freed by using warm water (less than 52°C). Never apply direct heat to a cylinder.

What are some general precautions about compressed gas storage?

At all times:

- Allow only trained, authorized people into storage areas.
- Keep the amount of compressed gases in storage as small as possible.
- Inspect storage areas regularly for any deficiencies such as damaged or leaking cylinders and poor housekeeping.
- Correct all deficiencies as soon as possible.

What should I know about using and discharging compressed gas cylinders?

General precautions

When moving cylinders, securely fasten them to a suitable cylinder transporting device. At the site, chain or otherwise secure the cylinder in place. Remove the valve cap only after the cylinder has been safely installed then check the cylinder valve and fixture. Remove any dirt or rust. Grit, dirt, oil or dirty water can cause gas leaks if they get into the cylinder valve or gas connection.

Never open a damaged valve. Contact your gas supplier for advice.

There are four standard types of cylinder valve outlets to prevent interchanges of gas handling equipment between incompatible gases. Use only the proper equipment for discharging a particular gas from its cylinder. Never use homemade adaptors or force connections between the cylinder valve outlet and gas handling equipment.

Whether a compressed gas is a liquefied, non-liquefied or dissolved gas, the gas supplier can give the best advice on the most suitable gas discharge equipment and the safest way to use it for a specific job.

In general, do not lubricate any cylinder valves, fittings, or regulator

threads, or apply jointing compounds and tape. Use only lubricants and sealants recommended by the gas supplier.

Cylinders stored in cold areas may have frozen valves. Use only warm water to thaw the valve or bring the cylinder into a warm area and allow it to thaw at room temperature.

Use only recommended keys or handwheels to open valves. Never use longer keys or modify keys to increase their leverage. Avoid using even the correct key if it is badly worn. Do not use pipe wrenches or similar tools on handwheels. Any of these practices could easily damage the valve seat or spindle.

Always open valves on all gas discharge equipment slowly. Rapid opening of valves results in rapid compression of the gas in the high-pressure passages leading to the seats. The rapid compression can lead to temperatures high enough to burn out the regulator and valve seats. Many accidents involving oxidizing gases result from burned out regulator and valve seats, usually caused by opening valves too quickly.

Do not use excessive force when opening cylinder valves—use no more than three quarters of a turn if possible. If a problem develops, the valve can then be closed quickly. Leave keys on cylinders when valves are open so the valve can be closed quickly in an emergency. Some cylinder valves, such as oxygen valves, have double seating. These valves should be fully opened, otherwise they may leak.

Do not use excessive force when opening or closing a cylinder valve. When closing, turn it just enough to stop the gas flow completely. Never force the valve shut.

Close cylinder valves when the cylinder is not actually in use. Do not stop the gas flow from a cylinder by just backing off on the regulator. Regulators can develop seat leaks, allowing pressure to build up in equipment attached to the regulator. Also if the cylinder valve is left open, foreign matter can enter the cylinder if the cylinder pressure drops lower than the pressure in attached equipment. Close the cylinder valve first and then close the regulator.

Liquefied Gases

Manual valves are normally used on cylinders containing liquefied gases. Special liquid flow regulators are also available. If it is necessary to remove liquid as well as gas from a cylinder, discuss this with the gas supplier before ordering. Some liquefied gas cylinders have eductor tubes which allow the liquid to be withdrawn from the cylinder. The supplier can provide suitable cylinders and special instructions.

Do not remove gas rapidly. The pressure in the cylinder could drop below the required level. If this happens, or if rapid gas removal is needed, follow the gas supplier’s advice.

Non-Liquefied and Dissolved Gases

Use automatic pressure regulators to reduce gas pressure from the high levels in the cylinder to safe levels for a particular job.

There are two basic types of automatic pressure regulators: single-stage, and double- or two-stage. Generally, two-stage regulators deliver a more constant pressure under more precise conditions than single-stage regulators. Sometimes, manual flow controls are used on non-liquefied gases. Fine flow control can be obtained, but an operator must be present at all times. Manual flow controls do not automatically adjust to pressure buildups in blocked systems.

What are some guidelines for safe handling and use?

Use the smallest practical cylinder size for a particular job. Do not keep cylinders longer than the supplier recommends. Compressed gas cylinders are mainly shipping containers. They are built to be as light as possible while remaining safe and durable. Do not drop cylinders or otherwise allow them to strike each other. Rough handling, including using cylinders as hammers or as rollers to move equipment, can seriously damage them.

Do not strike an electric arc on a cylinder. Arc burns can make the metal brittle and weaken the cylinder.

Never tamper with cylinders in any way. Do not repaint them, change markings or identification, or interfere with valve threads or safety devices.

Apart from the fact that it is illegal, it can be dangerous for non-specialists to refill cylinders or to change their contents. Explosions, cylinder contamination or corrosion can result.

What should I know about equipment associated with compressed gases?

All equipment used with compressed gases must be clean, properly designed and maintained, and made from materials compatible with the gas used. For example, acetylene forms explosive compounds in contact with copper, silver and mercury or their alloys, including bronze or brass containing more than 65 percent copper. Ammonia attacks brass and can react with mercury to form an explosive compound. Do not use mercury pressure gauges in ammonia systems.

In general, avoid pressurizing ordinary glass equipment. Use specially designed glass equipment and protective devices. Where cylinders are connected to a manifold or header, make sure specialists properly design and install the system. Use effective flashback arrestors on acetylene and other flammable gas systems.

Always follow the correct procedures for assembling and disassembling compressed gas equipment. Check that all the connections are clean and do not leak. Check for leaks, using the gas suppliers recommended method, after assembling and before starting to use equipment. Never use old clips or twisted wire for hose connections. If a hose works loose and flails around, serious injury could result. Poor hose connections are a common cause of accidents.

Acetylene under pressure can explode. Never use acetylene outside of the cylinder at pressures over 103 kPa (15 psig) unless you take special precautions. If an acetylene cylinder has been accidentally left on its side, set it upright for at least an hour before use. Otherwise, it will emit a burst of solvent instead of gas when the valve is opened.

Corrosive gases can “freeze” the valve stem, making it hard to open the valve.

This results from the gas corroding the valve metal. Minimize “freezing” by rotating the valve stem at least once a day while the cylinder is in use. Also, flush the regulator or manual control valve with dry nitrogen or dry air as soon as possible after use.

Are there special precautions for oxidizing gases?

Special cleaning procedures (equivalent to oxygen service) are required for all equipment to be used with oxidizing gases. There are several ways to do this. Contact your gas supplier for the best methods for specific systems.

Do not oil or grease any equipment that may contact oxidizing gases. Keep greasy hands, rags and gloves away from any part of the cylinder and fittings. Normal body oils are usually not hazardous, although it is a good practice never to touch any surface that may contact an oxidizing gas. Use lubricants and connection or joint sealants recommended by the gas supplier.

Only use oxygen for its intended purpose. Never use it to purge pipelines or to provide ventilation. Freshening the air with oxygen may make people more comfortable, but it also enriches the oxygen content in the area which can quickly create a major fire hazard. Serious accidents have occurred when oxygen was used to run tools designed for compressed air. High oxygen pressure can cause the lubricant in the tool to explode.

Can I use compressed gases in confined spaces?

Always comply with applicable occupational health and safety laws when working in a confined space. When using compressed gases, including inert gases, in a confined space, be sure to check that all equipment connections are leak-tight. Remove cylinders or connected equipment that are not in use from confined spaces, even during short breaks. Check the air for oxygen levels (high and low). Also check for any possible toxic, corrosive or flammable gases before entering confined spaces and during prolonged work periods. Never work alone.

How do I handle and store “empty” cylinders?

Non-Liquefied and Dissolved Gases

The amount of material remaining in a non-liquefied or dissolved gas (acetylene) cylinder is directly proportional to the cylinder pressure gauge reading. As the gas is used, the reading on the cylinder pressure gauge drops. When the cylinder pressure gauge reads zero, the cylinder is not really empty. The cylinder still contains gas at atmospheric pressure. Keep a slight positive pressure in the cylinder. Consider it “empty” when the cylinder pressure gauge reads about 172 kPa (25 psig) or when the cylinder will not deliver at least 172 kPa to the outlet pressure gauge.

Liquefied Gases

The pressure in liquefied gas cylinders remains constant at a given temperature as long as any liquid remains in the cylinder. The only way to know how much material remains in a liquefied gas cylinder is to weigh the cylinder. The empty (tare) weight of the cylinder is stamped on its neck or valve stem. Record the net weight of the cylinder contents on a card attached to it. As with non-liquefied and dissolved gases, never empty the cylinder completely. Keep a small

amount of material in the cylinder to maintain a slight positive pressure.

What are general precautions for “empty” cylinders?

Keeping a positive pressure in an “empty” compressed gas cylinder helps to prevent back flow or suck back. This back flow is the drawing-back into the cylinder of contaminants or moist air from a higher pressure system or the atmosphere.

Keep the valves on all “empty” cylinders closed. This practice maintains a positive pressure in them. “Empty” cylinders with open valves can “breathe”. Temperature increases or drops in atmospheric pressure can force gas out of the open valve of an empty cylinder. This release could result in hazardous conditions depending on the gas and how much is forced out. Temperature drops or increases in atmospheric pressure can cause air to be drawn in through the open valve. Air could cause a serious contamination and corrosion problem inside the cylinder. When a compressed gas cylinder is “empty,” handle it as though it is full since it does contain gas.

Always:

- Close the cylinder valve before removing the gas discharge equipment.
- Clearly mark or label the cylinder “empty” or “MT.”
- Place the cylinder in a storage area separate from that used for full cylinders.
- Keep incompatible materials away from the cylinder.
- Notify the gas supplier if the cylinder or any part of it is damaged or defective, contaminated, or may have been exposed to a possibly hazardous condition such as a fire or electric arc.

Take care when scrapping unserviceable cylinders. Before scrapping, first destroy the cylinder as a pressure vessel. Contact the gas supplier for advice on disposing of unserviceable cylinders.

What are some good housekeeping rules for working with compressed gas cylinders?

Always maintain good housekeeping in the workplace:

- Never hang clothes or equipment over a compressed gas cylinder. *
- Never use oxygen or even compressed air to remove dust from clothing or equipment.
- Promptly remove combustible wastes including wood, paper, or rags from the work area.
- Properly and promptly dispose of “empty” or unlabelled cylinders.

*Note: Hanging things over a cylinder makes it harder to operate the valve. In addition, clothing may become saturated with a hazardous gas. Clothing saturated with either an oxidizing gas or flammable gas will catch on fire easily and burn intensely. Hang clothes that are even partly saturated with an oxidizing gas or fuel gas in a well-ventilated area for at least 15 minutes to remove trapped gas.

Why is personal cleanliness important?

Personal cleanliness helps protect people working with hazardous materials:

- Wash hands before eating, drinking, smoking or going to the toilet.
- Remove contaminated clothing since it may be a severe fire or health hazard.
- Do not wear or carry items contaminated with oxidizing or flammable gases into areas having ignition sources or where smoking is allowed.
- Store food and tobacco products in uncontaminated areas.
- Clean yourself thoroughly at the end of the workday.

Why is equipment maintenance important?

Regular workplace inspections can help to spot situations where compressed gases are stored, handled, or used in potentially hazardous ways.

Regular inspection of equipment can provide a warning of potential hazards:

- Examine regulators, pressure relief valves and cylinder connections.
- Ensure that cylinders are free of corrosion, leakage, pitting, dents or gouges.
- Regular equipment maintenance can prevent hazardous conditions in the workplace.

Ensure that maintenance personnel:

- Know the possible hazards of the materials they may encounter and any special procedures and precautions before they begin to work.
- Carry out repairs to equipment properly, using equipment suitable for the contents of the compressed gas cylinder.
- Avoid forcing connections, using homemade adaptors or tampering with cylinders in any way.
- Comply with applicable regulations and contact the gas supplier for advice.

What should I know about Personal Protective Equipment?

If other methods, such as engineering controls, are not available or effective in controlling exposure to compressed gases, wear suitable personal protective equipment (PPE). Choosing the right PPE for a particular job is essential. Material Safety Data Sheets (MSDSs) should provide general guidance. Also obtain help from someone who knows how to evaluate the hazards of the job and how to select the proper PPE.

Avoid Skin Contact

When using gases that are harmful by skin contact, wear protective gloves, aprons or other clothing depending on the risk of skin contact. Choose clothing made of materials that resist penetration or damage by the chemical. The MSDS should recommend appropriate materials. If it does not, contact the gas supplier for specific information.

Protect Your Eyes and Face

Always wear eye protection when working with compressed gases. Avoid ordinary safety glasses. Use chemical safety goggles instead. In some cases, you should also wear a face shield (with safety glasses or goggles) to protect your face. The current CSA Standard Z94.3, “Eye and Face Protectors,” provides advice on selection and use of eye and face protectors.

Avoid Breathing Harmful Gases

If respirators must be used for breathing protection, there should be a written respiratory protection program to follow. The current CSA Standard Z94.4, “Selection, Care, and Use of Respirators,” gives guidance for developing a program. Follow all legal requirements for respirator use and approvals. These may vary between jurisdictions in Canada.

Sorbents in air-purifying respirator cartridges and canisters must be compatible with the chemical they are supposed to protect against. For example, oxidizable sorbents, such as activated charcoal, may not be acceptable if high concentrations of oxidizing gases are present. A hazardous reaction might occur. Keep in mind that air-purifying respirators do not protect against oxygen-deficient environments.

Know and be familiar with the right PPE for use in emergencies as well as during normal operations.

Wear the PPE needed for doing a particular job. It cannot provide protection if it is not worn.

What should I do in an emergency?

Act fast in emergencies such as chemical fires or gas cylinder leaks.

- Evacuate the area at once if you are not trained to handle the problem or if it is clearly beyond your control.
- Alert other people in the area to the emergency.
- Call the fire department immediately.
- Report the problem to the people responsible for handling emergencies where you work.
- Obtain first aid and remove all contaminated clothes if you have been exposed to harmful chemicals.

Note: All major compressed gas suppliers have emergency response teams. These teams can be activated by calling the telephone number that is usually printed on the shipping documents and MSDSs.

Locate emergency eyewash stations and safety showers wherever accidental exposure to gases that can damage skin or eyes is possible.

Only specially trained and properly equipped people should handle emergencies. Nobody else should go near the area until it is safe.

Planning, training and practicing for emergencies help people to know what they must do.

What are basic safe practices when working with compressed gases?

Following these basic general safe practices will help protect you from the hazards of compressed gases:

- Read the MSDSs and labels for all of the materials you work with.
- Know all of the hazards (fire/explosion, health, chemical reactivity, corrosivity, pressure) of the materials you work with.
- Know which of the materials you work with are compressed gases and check

the label, not the cylinder colour, to identify the gas.
- Store compressed gas cylinders in cool, dry, well-ventilated areas, away from incompatible materials and ignition sources. Ensure that the storage temperature does not exceed 52°C (125°F).
- Store, handle and use compressed gas cylinders securely fastened in place in the upright position. Never roll, drag, or drop cylinders or permit them to strike each other.
- Move cylinders in handcarts or other devices designed for moving cylinders.
- Leave the cylinder valve protection cap in place until the cylinder is secured and ready for use.
- Discharge compressed gases safely using devices, such as pressure regulators, approved for the particular gas.
- Never force connections or use homemade adaptors.
- Ensure that equipment is compatible with cylinder pressure and contents.
- Carefully check all cylinder-to-equipment connections before use and periodically during use, to be sure they are tight, clean, in good condition and not leaking.
- Carefully open all valves, slowly, pointed away from you and others, using the proper tools.
- Close all valves when cylinders are not in use.
- Never tamper with safety devices in cylinders, valves or equipment.
- Do not allow flames to contact cylinders and do not strike an electric arc on cylinders.
- Always use cylinders in cool well-ventilated areas.
- Handle “empty” cylinders safely: leave a slight positive pressure in them, close cylinder valves, disassemble equipment properly, replace cylinder valve protection caps, mark cylinders “empty” or “MT,” and store them separately from full cylinders.
- Wear the proper personal protective equipment for each of the jobs you do.
- Know how to handle emergencies such as fires, leaks or personal injury.
- Follow the health and safety rules that apply to your job.

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