

Safetygram-11

Emergency Action for Handling Leaking Compressed Gas Cylinders

General Precautions

Air Products takes every reasonable precaution to see that its products come to you safely. This concern for safety doesn't end with delivery, but should be continued by you and all other customers by following seven general precautions.

1. Know and Understand Gas Properties

Know and understand the properties, proper uses, and safety precautions of your gases before using them. Consult the Air Products Material Safety Data Sheets (MSDS) and/or Safetygrams for safety information about these gases.

2. Know and Understand the Gas Package

Know and understand the package for each of the gases you use. The package consists of two distinctive parts—the cylinder and the cylinder valve. Again, consult the appropriate MSDS materials and Safetygrams for your specific products. The following Safetygrams provide basic package information:

- Safetygram-10, "Handling, Storage and Use of Compressed Gas Cylinders"
- Safetygram-14, "Don't Turn a Cylinder Into a Rocket"
- Safetygram-15, "Cylinder Pressure-Relief Devices"
- Safetygram-23, "Cylinder Valves"

The Compressed Gas Association (CGA) also offers helpful publications such as the "Handbook of Compressed Gases" and Pamphlet P-1, "Safe Handling of Compressed Gases In Containers," which provide information on the safe handling of gases and their packages.

3. Check Your Equipment

Before lines and equipment are used, leak-check and evaluate their ability to contain full cylinder pressure. The leak check should be performed with an inert gas, and care should be taken not to overpressurize any components of the system. If the system is not rated for full cylinder pressure, a pressure-reducing regulator must be used and the system should be protected with a pressure-relief device. Leak-check the system at its working pressure. Be certain that materials of construction are compatible with the gases being used.

4. Develop Emergency Plans

Federal law requires that all facilities using hazardous materials develop emergency plans. Be aware of the potential hazards of the gases being stored and used, and plan for emergencies. Practice implementing emergency plans so that all contingencies are covered. Assign responsibilities and lines of authority. Coordinate with local hospitals and fire departments and inform them of the gases in use so they can be prepared with the needed expertise, equipment, and medical support if an emergency occurs.

5. Provide Personal Protection

It is necessary to define and provide personal protective equipment (PPE) for routine operations, as well as for emergencies. It is important to establish a policy that requires personnel to wear the proper PPE for each job. Gloves, face protection, and sensible work uniforms for routine tasks, as well as self-contained breathing apparatus (SCBA) and special protective clothing required for emergencies, should be made available. In addition, gas cabinets, eye washes, safety showers, and fire extinguishers should be considered when using hazardous materials.



Everyone involved must be trained in the proper use of all necessary PPE. Train personnel to recognize when that equipment is needed.

6. Follow the Regulations

Comply with all federal, state, and local regulations pertaining to the storage and use of compressed gases. CGA Pamphlet P-1 and the National Fire Protection Association (NFPA) codes provide excellent guidance.

7. When in Doubt

When in doubt about the handling or use of any Air Products' gases or equipment, or the hazards of a particular gas, contact your local sales office or call our Technical Information Center at +1 (800) 752-1597.

Leaks

Cylinder leaks usually occur at welded seams (on low-pressure cylinders) or at the cylinder valve. Proper quality control of materials and inspections, as required by the Department of Transportation (DOT), lessen the probability of cylinder leaks.

Compressed gas suppliers are required to inspect cylinders for visual damage each time the cylinders are filled. In addition, gas producers must make certain the cylinder closure is completely leak-tight, and that cylinders are internally inspected and hydrostatically tested at the prescribed time intervals. The purpose of these inspections is to verify that the cylinder is in sound condition and that it will be safe during transportation. In spite of such precautions, leaks can develop from handling in transit, during storage, and during use. The greatest leak potential is with the cylinder valve. There are four distinct areas where leaks at the cylinder valve can occur:

1. Valve Threads

Leaks are possible at the valve threads where the valve screws into the cylinder; these are commonly referred to as "neck leakers." These types of leaks cannot and should not be repaired in the field. To do so is a violation of a very important safety practice—NEVER repair equipment under pressure. Leaks of this nature should only be handled with the assistance of the supplier.

2. Pressure-Relief Device

Leaks can occur at two points on the pressure-relief device—around its threads or through its relief channel. Again, leaks at the pressure-relief device cannot and must not be repaired in the field. To attempt field repair is a violation of two very important safety practices. NEVER attempt to repair equipment under pressure and NEVER tamper with pressure-relief devices. Tampering with the pressure-relief device compromises the safety of the cylinder. Leaks through the pressure-relief channel can become severe, and all personnel must be evacuated from the immediate area. Contact your supplier for immediate assistance. See Air Products' Safetygram-15, "Cylinder Pressure-Relief Devices."

3. Valve Stem

Leaks can occur along the valve stem through the packing or diaphragms. Leaks of this type can be stopped by closing the valve and venting any pressure from the outlet. Leaks of this type should be reported to your supplier so they can advise you if that particular valve design will allow a packing adjustment to correct the problem or if arrangements must be made for a safe and proper return of the cylinder. Diaphragm valves cannot be repaired or adjusted in the field. See Air Products' Safetygram-23, "Cylinder Valves."

4. Valve Outlet

Leakage can occur at the valve outlet, due to leak-through at the seat. Many times this can be corrected or prevented by using proper valve operational techniques, which can be found in Safetygram-23, "Cylinder Valves." When proper closing procedures fail to completely stop leakage, a pressure-tight outlet seal can be installed to stop the leak.

Leaks in the valve area are generally very small and do not normally change in size when the product in the cylinder is an oxidant, inert, or flammable compressed gas, or a mixture of these gases. When the leak involves a corrosive product, however, the leak will generally worsen because the corrosive material attacks the leak point.

Any hazardous material that is being released to the atmosphere in an uncontrollable manner requires that proper actions be taken to minimize exposure to personnel and equip-

ment. The following emergency procedures—though general—are extremely important in reducing the dangers of exposure to a hazardous materials leak.

Before any action can be taken, you must first properly identify the hazards. This is not always simple since most products have more than one hazard. Remember, the DOT shipping classification is of limited value because it may not define all of the hazards of a particular product. Anhydrous ammonia is an excellent example. In the United States, anhydrous ammonia is shipped as Nonflammable Gas, Class 2.1. However, anhydrous ammonia is also toxic, corrosive, and flammable. The best available reference for the quick identification of any product's hazards and properties is the MSDS sheet. In the event of a leak, the MSDS sheet will provide enough information for you to take the appropriate actions to immediately stabilize the situation. The final resolution of the problem should involve the supplier. No one knows a product and its package better than its supplier; the supplier has ultimate responsibility for the product and the package.

Inerts

An inert gas is one that exhibits great stability and extremely low reaction rates under normal temperature and pressure conditions. Two principal hazards exist in dealing with inert gases: asphyxiation and pressure. Inert gases, when released in sufficient quantity, can displace the oxygen in the atmosphere and introduce the potential hazard of asphyxiation. OSHA sets a minimum limit of 19.5% oxygen for work areas. Working in concentrations below this level requires use of a supplied air source. Consult Air Products' Safetygram-17, "Dangers Of Oxygen Deficient Atmospheres."

Second, compressed gas cylinders represent a potential hazard due to the energy they contain at pressure. Improper handling can result in a high-pressure energy release. Isolate any leaking cylinders of inert gases in a well-ventilated area. Move leaking cylinders only if it can be done safely. Once the leaking cylinder is isolated, contact your supplier for help in resolving the problem. Clearly identify the problem and return all problem cylinders to the supplier for proper repair.

Flammables

Flammable gas as defined by the DOT is any compressed gas that either forms a flammable mixture with air at a concentration of less than 13% by volume, or has a flammable range in air wider than 12%, regardless of the lower explosive limit (LEL). Flammable gases have the potential for the same hazards as the inert gases, for example, pressure and asphyxiation, plus the potential for fire and/or explosion. If it can be done safely, move and isolate any problem cylinder in a well-ventilated area free from any ignition sources. Post prominent signs in such an area that warn of potential fire hazards and the need for elimination of any ignition sources.

If ignition takes place at the source of the leak, do not try to extinguish the flame unless the supply of flammable gas can be stopped. Extinguishing a fire without eliminating the flammable gas supply can result in an accumulation of the gas and a possible explosion. If the flammable gas source cannot be stopped, action must be taken to cool and to protect nearby equipment and cylinders from the fire. Contact your supplier immediately for support.

Oxidants

Oxidants are substances that support combustion and enhance the combustibility of other materials. The principal emergency action to take with oxidizers is isolation of the leaking cylinder in a well-ventilated area free from any combustibles and ignition sources. The area should then be posted to prevent access and to alert personnel to the hazard. As always, contact your supplier for help and to advise them there is a problem with one of their products.

In many cases, oxidant materials may also be corrosive and/or toxic. The following sections address these hazards.

Corrosives

Corrosives are substances that erode and deteriorate materials on contact, including metals, fabrics, and human tissue. As mentioned, leaks from cylinders containing corrosives may escalate because the corrosive material may attack the leak point, making it larger. Corrosives are generally toxic, so follow the precautions cited in the following section on toxics.

The initial stabilization for a leaking cylinder containing corrosives is isolation in a well-ventilated area. Move the cylinder only if it can be accomplished in a safe manner. Contact the supplier before taking any steps such as disposal, or containment and diversion. Specific PPE, including acid suits and self-contained breathing apparatus (SCBA), may be required if the cylinder must be approached. Do not use any of this equipment unless you are trained in its use. Further steps to collect and direct the escaping gas to a disposal medium will limit exposure of people and equipment to the product. Steps should also be taken to eliminate moisture from the leak point. Take such action only with supplier assistance.

Toxics and Poisonous Materials

Leaks involving toxics and poisonous materials also require immediate evacuation of the contaminated area. Isolate the cylinder in a well-ventilated and secure area. However, move the cylinder only if it can be done in a safe manner. Direct escaping gas to either an appropriate disposal unit or a forced ventilation system where it can be safely diluted and remotely vented. Personnel working with toxic and/or poisonous gases should have self-contained breathing equipment available and must be trained in its proper use. Many poisonous gases also have other hazardous properties, for example, corrosivity and flammability. It is important to recognize all the hazards of a material so that proper action can be taken without risk to anyone.

The above procedures describe the type of action to take when the leak is of a minimal size and corrective action can be taken without risk to personnel. Leaks of a large nature require more sophisticated response efforts. Emergency plans must be based upon the nature of the product and should include:

- Evacuation of personnel.
- Rescue of injured people by crews equipped with the necessary PPE for their own protection and who have been trained in the proper use of PPE.
- Corrective action to minimize the leak or at least minimize exposure to people and equipment.
- Assuring that all necessary resources are available for the final resolution of the situation. These may include the deployment of customer teams, police, fire departments, and supplier assistance.
- Fire-fighting action.
- Decontamination.
- Written documentation and critique.

What Is an Emergency?

An emergency is any actual or potential release of a hazardous material that cannot be stopped by closing the product's cylinder or container valve.

The Air Products Emergency Response System

The Air Products Emergency Response System was created to provide quick, efficient emergency assistance to our customers through trained technical personnel. You can activate the Air Products Emergency Response System by calling our toll-free emergency numbers: +1 (800) 523-9374 in the continental U.S. and Puerto Rico, or +1 (610) 481-7711 elsewhere. These numbers are staffed 24 hours a day, 365 days a year. An operator will ask for specific information regarding the incident. Based on this information you will be connected to a technical coordinator who is a specialist with that particular product and package. This specialist can supply technical information on the product and package and can offer resolution options and ideas. If necessary, the coordinator can dispatch any of the Air Products emergency response teams strategically located throughout the world.

Emergency Response System

- Call: **+1 (800) 523-9374** (Continental U.S. and Puerto Rico)
- Call: **+1 (610) 481-7711** (Other locations)
- 24 hours a day, 7 days a week
- For assistance involving Air Products and Chemicals, Inc. gases and equipment.

Product Safety Information

- For MSDS and Safetygrams:
www.airproducts.com/productstewardship
- Fax-on-Demand:
Call: **+1 (800) 245-2746**
- Enter MSDS Index No. 1000 for a complete list of available safety literature.
- 24 hours a day, 7 days a week

Technical Information Center

- Call: **+1 (800) 752-1597** (U.S.)
- Call: **+1 (610) 481-8565** (Other locations)
- Fax: **+1 (610) 481-8690**
- E-mail: **gasinfo@apci.com**
- Monday–Friday, 8:00 a.m.–5:00 p.m. EST

Information Sources

- Compressed Gas Association
1725 Jefferson Davis Highway, Suite 1004
Arlington, VA 22202-4102
Phone: +1 (703) 412-0900
- National Fire Protection Association
1 Batterymarch Park, P.O. Box 9101
Quincy, MA 02269-9101
Phone: +1 (800) 344-3555