

Compressed Gas Safety (Update Available)

Course Overview

Read the [Course Overview](#) .

Compressed Gas Safety

[1. Hazards](#)

[2. Cylinder Marking Requirements](#)

[3. Storage, Use, and Handling](#)

[4. Transportation Requirements](#)

Course Overview

Many industrial and laboratory operations require the use of compressed gases for a variety of different operations. Basic guidelines and rules must be followed to help ensure the safe handling and storage of compressed gas cylinders, as gases under high pressure present a number of hazards.

Mishandled cylinders may rupture violently, release their hazardous contents, or become dangerous projectiles. If the neck of a pressurized cylinder should accidentally break off, the cylinder could be propelled violently within the workplace.

This course is intended to provide you with the ability to recognize the potential hazards and safely store, use, and transport compressed gas cylinders.

Upon completion of this course, you will be able to

- identify the hazards associated with compressed gases
- identify cylinder marking requirements
- specify the special storage, use, and handling precautions necessary in order to control the hazards, and
- identify transportation requirements

The Occupational Safety and Health Administration, known as OSHA, requires employers to establish a safety program and train their employees in safe work practices. This includes all personnel working with, transporting, and handling compressed gas cylinders during their daily work routine. The OSHA standard applying to compressed gases is 29 CFR 1910.101.

Hazards

Learning Objectives

After completing this topic, you should be able to

- *identify the hazards associated with compressed gases*
- *identify characteristics of physical and fire hazards*
- *identify characteristics of oxygen displacement and oxygen enrichment hazards*

1. Identifying compressed gas hazards

Common hazards associated with compressed gas cylinders include

Graphic

A warning sign displays: Danger, compressed gas.

- oxygen displacement and/or oxygen enrichment
- fires and explosions
- toxic effects from release of contents, and
- physical hazards associated with pressurized systems

Oxygen displacement is a potential hazard associated with compressed gas cylinders. If a cylinder were to leak or rupture in a confined space, the contents of the cylinder would lower the amount of oxygen in the air. Asphyxiation could occur.

Graphic

A warning sign displays: Danger, confined space, hazardous atmosphere, check oxygen level before and during entry.

Some workplaces require continuous monitoring by detection systems and complete ventilation systems such as hoods, exhaust fans, and ductwork to provide acceptable ventilation. Others, which use small quantities of inert gases, might not need any ventilation system.

Oxygen enrichment is also possible with compressed gas cylinders or systems containing oxygen. An oxygen enriched atmosphere is extremely hazardous and will accelerate a spark or fire into an unmanageable fire situation.

Fires and explosions are always possible when dealing with compressed gas cylinders. If ignited, gas can catch fire or the tank could explode. Never apply direct heat to a cylinder, and never expose cylinders to temperatures above 125 degrees Fahrenheit.

Supplement

Selecting the link title opens the resource in a new browser window.

Job Aid

Access the job aid [OSHA Fatal Fact](#) to view an OSHA case study of an accident related to the use of compressed gas.

Toxic effects pose another hazard and will vary depending on the type of material in the cylinder. Serious hazards are possible if unprotected personnel are exposed to toxic gases.

Before using toxic, highly toxic, or corrosive gases, make sure you read the label and safety data sheet, or SDS, for the gas being used. A chlorine cylinder, for example, presents different hazards than compressed air. You must always know what type of material you are working with.

Physical hazards are present because the cylinders themselves are heavy and unwieldy and can cause physical injury if not handled properly.

Also, the content is under pressure and is dangerous, and could turn the cylinder into a makeshift rocket.

A seemingly harmless cylinder can become a jet-propelled piece of steel if it falls and hits the ground, causing injury to anyone in its path.

Question

Match the types of hazards to the corresponding description of each hazard.

Options:

- A. Oxygen displacement
- B. Toxic effects
- C. Oxygen enrichment
- D. Physical hazards
- E. Fires and explosions

Targets:

1. A cylinder is dropped on a foot or becomes jet-propelled
2. An oxygen cylinder leaks, and a spark initiates an unmanageable fire situation

3. Unprotected personnel are exposed to gas
4. A cylinder leaks in a confined space, lowering the oxygen in the air
5. Heat is directly applied to a cylinder

Answer

Physical hazards are those that cause physical injury to persons or things. Compressed gas can become a physical hazards because the cylinders it is stored in are heavy, unwieldy and under pressure.

Oxygen enrichment occurs when the concentration of oxygen in the atmosphere is greater than normal, which would happen if an oxygen cylinder leaks.

Compressed gases can be toxic to the human body and workers must be sure to wear appropriate personal protective equipment when working around compressed gas.

When compressed gas other than oxygen leaks into the air in a confined space, the oxygen is displaced by the gas from the leaking cylinder, lowering the amount of oxygen in the already limited space.

When a compressed gas cylinder is heated, it can leak or rupture explosively, causing fire and damage due to explosion.

Correct answer(s):

Target 1 = Option D

Target 2 = Option C

Target 3 = Option B

Target 4 = Option A

Target 5 = Option E

Acetylene cylinders are used as a fuel gas for gas welding and cutting equipment. The interior is packed with a porous material that contains acetylene and a solvent. When the valve is opened, the acetylene comes out of the solution in a gaseous form.

Acetylene cylinders must always be kept upright and handled as a flammable gas container. Do not use them unless they have been in an upright position for at least 24 hours prior to use.

Otherwise the solvent (acetone) could be expelled with the acetylene gas, causing fires or explosions.

Hydrogen burns with a nonluminous flame, which is often invisible in daylight, unless colored by dust, particulate matter, or chemical vapors. Leaking or venting hydrogen occasionally self-ignites from static electricity.

Special precautions such as non-spark producing tools must be used for hydrogen fittings. All sources of

ignition should also be controlled when hydrogen is being used.

Frequent checks of hydrogen piping systems should be made to assure that leaks do not occur.

OSHA has additional requirements for gaseous hydrogen systems. These requirements are listed in 1910.103. The additional requirements cover the design of the containers and the system, the location of the system, operating instructions, and maintenance.

Graphic

A warning sign displays: Hydrogen, flammable gas, no smoking, no open flame.

Oxygen is extremely dangerous because it speeds up the burning of almost anything made of combustible materials or hydrocarbons. The slightest spark in the presence of pure oxygen can be extremely dangerous and cause uncontrollable fires. It is very important that all oxygen fittings and connections be free from oil or grease. Non-bulk quantities of oxygen in compressed gas cylinders should also be treated with the same care.

Pay particular attention to the safe handling of oxygen cylinders and potential ignition sources when oxygen is in use.

OSHA has additional requirements for oxygen systems that have more than 13,000 cubic feet of oxygen in them and sites that have more than 25,000 cubic feet of oxygen in any number of containers. These requirements are listed in 1910.104. The additional requirements cover the design of the containers and the system, the location of the system, operating instructions, and maintenance.

Question

Match each type of gas to its description.

Options:

- A. Oxygen
- B. Hydrogen
- C. Acetylene

Targets:

1. Extremely dangerous gas that speeds up the burning of anything made of combustible materials and the slightest spark can cause uncontrollable fires
2. A gas that burns with a nonluminous flame that is often invisible in daylight and requires special precautions such as non-spark producing tools
3. A container that should be handled as a flammable gas

Answer

Oxygen is an extremely dangerous gas and, because of this, it is very important that all oxygen fittings and connections are free from oil or grease. Non-bulk quantities of oxygen in compressed gas cylinders should also be treated with the same care

Hydrogen is a gas that burns with a nonluminous flame that is often invisible in daylight, unless colored by dust, particulate matter, or chemical vapors. Leaking or venting hydrogen occasionally self-ignites from static electricity. Therefore, special precautions must be taken when handling it.

An acetylene cylinder is packed with porous material that contains acetone, a liquid solvent. It must always be kept upright and be handled as a flammable gas.

Correct answer(s):

Target 1 = Option A

Target 2 = Option B

Target 3 = Option C

2. Summary

The hazards associated with compressed gas cylinders are oxygen displacement, oxygen enrichment, fires and explosions, the toxic effects of an accidental release of gas, and physical hazards associated with pressurized systems.

Acetylene, hydrogen, and oxygen cylinders must be stored and worked with correctly to prevent the unintentional release of gas, which may result in fires. Monitoring plays an important role when preventing hazards.

Cylinder Marking Requirements

Learning Objectives

After completing this topic, you should be able to

- *identify cylinder marking requirements*
- *identify proper placement of tags on gas cylinders*

1. Cylinder marking requirements

You should not rely only on the color of the cylinder to identify the content.

The markings should be located on the shoulder of the cylinder. They should not be readily removable and must be either stenciled, stamped, or labeled.

If there is any doubt or conflict about the content, do not use the container.

Any person handling a container of compressed gas or cryogenic liquid must be sure of the content before connecting it to a system. Discharging a gas or cryogenic liquid into a system not intended for the material could cause a fire, explosion, equipment failure, gas leak, or other hazard resulting in a serious or fatal injury.

Before connecting a container to a system, make sure that you are trained in proper connection procedures and know how to use the product, container, fittings, and equipment.

Question

Which statements about cylinder markings are **true**?

Options:

1. You can rely on the color of the cylinder to indicate the content
2. Markings should not be readily removable
3. Markings should be located on the bottom of the cylinder
4. Markings should include either the chemical or trade name of the gas
5. If there is any doubt about the contents, do not use the cylinder

Answer

Cylinder markings should not be readily removable, should include either the chemical or trade name of the gas, and should not be used if there is any doubt about its content.

Option 1: *This option is incorrect. You should never rely on the color of the cylinder to determine its content. Cylinders are reusable and, while some vendors may standardize color, it is not required.*

Option 2: *This option is correct. Markings must be visible on the tank at all times, so it is important that they be difficult to remove.*

Option 3: *This option is incorrect. Markings should be easily visible. If you have to lift a cylinder to find the markings, it is clearly **not** easily visible.*

Option 4: *This option is correct. Markings should make it clear what the content of the cylinder is.*

Option 5: *This option is correct. You must know what the content of the cylinder is so you can tell if it's safe to work with for the job you are doing and you know what you need to do to work with it safely.*

Correct answer(s):

2. Markings should not be readily removable
4. Markings should include either the chemical or trade name of the gas
5. If there is any doubt about the contents, do not use the cylinder

Question

What should you do if there is any doubt concerning the contents of a compressed gas cylinder?

Options:

1. Do not use the cylinder
2. If it is the right color, go ahead and use it
3. If the connections match, go ahead and use it
4. Sample the gas with a compressed gas meter

Answer

Compressed gas cylinders should be legibly marked with either the chemical or trade name of the gas in order to identify the gas content. If there is any doubt as to its content, do not use the cylinder.

Correct answer(s):

1. Do not use the cylinder

It's important to ensure that

- the cylinder is clearly and properly marked or labeled
- the cylinder has the proper outlet connections for its contents
- the connections on the cylinder and the system fit together properly (not too loose or too tight) – a proper connection will go together smoothly without using adapters or extra force, and
- leak tests have been performed

2. Summary

Compressed gas cylinders should be marked clearly so that the gas content can be identified by either its chemical or its trade name. Only trained personnel should handle a compressed gas cylinder. The cylinder must have the correct outlet, connections must have been tested, and a leak test must have been performed.

Storage, Use, and Handling

Learning Objective

After completing this topic, you should be able to

- *identify proper storage precautions for gas cylinders*

1. Storage precautions for gas cylinders

You should secure cylinders at all times to a fixed location (a wall or the support post, for example), at a point approximately 2/3 of the cylinder height. Use appropriate material, such as chains, plastic coated wire cables, or commercially available cylinder straps.

As with any hazardous material, do **not** store gas cylinders in hallways, aisles, walkways, exits, or other unprotected areas.

Cylinders must be stored in upright positions and immobilized by chains or other means to prevent them from being knocked over.

Empty cylinders should be isolated from filled cylinders and kept segregated by hazard class.

Mark empty cylinders "empty" or "MT."

Graphic

In this case, a cylinder is labeled "Empty cylinder, do not use."

Keep cylinders away from radiators and other sources of heat. Store cylinders inside buildings in a well protected, well-ventilated, dry location. Cylinders must be at least 20 feet from highly combustible materials such as oil.

Store acetylene cylinders valve end up. Make sure empty cylinders have their valves closed.

If a cylinder is designed to accept a valve protection cap, it must always be in place, hand-tight, except when the cylinder is in use or connected for use.

Additional storage precautions include segregating cylinders in hazard classes while in storage:

- oxidizers, such as oxygen, must be separated from flammable gases
- corrosives must be separated from flammables
- full cylinders must be separated from empties, and
- all cylinders must be separated from corrosive vapors

Question

Which statements about cylinder storage are true?

Options:

1. Secure cylinders at all times to a fixed location, at a point approximately 2/3 of the cylinder height
2. Isolate empty cylinders from filled cylinders and keep them segregated by hazard class
3. Keep cylinders at least 20 feet from highly combustible materials such as oil
4. Open the valve of empty cylinders in the storeroom to ensure all gas can escape before they are destroyed
5. Only empty cylinders need to be restrained in an upright position, filled cylinders pose no risk of being knocked over

Answer

A cylinder needs to be secured to a fixed location at a point approximately 2/3 of its height and never be stored within 20 feet of highly combustible materials. Empty cylinders need to be kept separate from filled cylinders and they must be segregated by hazard class.

Correct answer(s):

1. Secure cylinders at all times to a fixed location, at a point approximately 2/3 of the cylinder height
2. Isolate empty cylinders from filled cylinders and keep them segregated by hazard class
3. Keep cylinders at least 20 feet from highly combustible materials such as oil

Prior to using any cylinder, you should read the marking on the cylinder to verify the correct content will be used for the task, make sure the cylinder is equipped with the correct regulator, and place the cylinder so that the valve handle at the top is easily accessible.

Never use grease or oil on the regulator or cylinder valves. These substances may cause a dangerous reaction within the cylinder, especially if it contains oxygen.

You should also follow these general rules when working with compressed gas cylinders:

- open the valve slowly, and only with the regulator in place
- never leave the valve open when the equipment is not in use, even when empty – air and moisture could spread through an open valve, contaminating the cylinder
- perform leak checks on all connections before use, and
- if using a toxic or irritating gas, make sure there is proper ventilation and respiratory protection available, and that other personnel in the area are aware of the hazard

Safety precautions when using or handling compressed gas cylinders can become so routine that they are easily forgotten, which may lead to fire, explosion, injury, or worse.

Keep the following in mind throughout your work day:

- keep cylinders clear of all sparks, flames, and electrical circuits
- wear appropriate safety equipment for the material you are using, and
- be aware that nitrogen, liquid oxygen, and carbon dioxide lines can be cold enough to freeze unprotected skin

Additionally:

Make sure appropriate fire extinguishers are available for the type of flammable or combustible gas in the cylinder.

Avoid taking compressed gas cylinders into confined spaces.

Don't heat cylinders to raise the gas pressure.

And finally:

Never refill a cylinder with a different type of gas than what the cylinder was designed to contain. Mixing of residual gases in a confined area may result in a serious reaction.

Don't use oxygen in place of compressed air - they aren't the same thing. Oxygen gas is highly flammable, while compressed air – which does contain some oxygen in addition to other gases commonly found in the air – is not flammable.

Don't use copper fittings or tubing on acetylene tanks – explosion may result.

Don't use a hammer to open or close a valve.

Whenever you work with compressed gas cylinders, follow appropriate safety guidelines. You should

- never move a cylinder by rolling it
- never lift a cylinder with a magnet
- never mix gases in a cylinder
- never use the valve to carry a cylinder
- never locate leaks with a flame
- never discard them in ordinary trash
- never leave an unsecured cylinder, or
- never force attachments on the valve

In addition, you should

- never use grease or oil on oxygen cylinder fittings
- never open a cylinder and leave it unattended, or
- never attempt to refill an empty cylinder

Question

Which options describe proper ways to use and handle compressed gas cylinders?

Options:

1. Keep cylinders clear of all sparks, flames, and electrical circuits
2. Heat cylinders to raise the gas pressure
3. Refill a cylinder
4. Wear appropriate safety equipment for the material you are using
5. Use oxygen in place of compressed air

Answer

Proper ways to store, use, and handle compressed gas cylinders include keeping cylinders clear of all sparks, flames, and electrical units and wearing appropriate safety equipment for the material you're using.

Correct answer(s):

1. Keep cylinders clear of all sparks, flames, and electrical circuits
4. Wear appropriate safety equipment for the material you are using

2. Cylinder leaks

Leaking cylinders are a threat that may be so serious that entire facilities have to be evacuated and outside help called to assist. Leak detection procedures should be implemented prior to using any system utilizing compressed gas.

Leak detection can be accomplished by applying specific solutions to suspected leak areas on the cylinder. For a flammable gas, a soapy water solution, a 50% glycerin-water solution, or a flammable gas detector may be used.

You should remember, however, that some flammable gas detection instruments are not rated to detect hydrogen.

The typical process of leak detection is to spray the areas of the cylinder thoroughly where connections are made or where there are sealing surfaces. These areas would include the connection between the valve and the cylinder, the pressure gauge and cylinder, and the connection made at the valve outlet. Other places where leaks could occur are at the outlet of the valve (when closed), the valve stem, and where physical damage is noted.

For temperatures at or below freezing, the 50% glycerin-water solution should be used.

For systems where toxic or corrosive gases will be used, first test the system with an inert gas before introducing the hazardous material.

If a leak is detected, consider the following options.

If the cylinder contains a flammable, inert, or oxidizing gas, remove it to an isolated area. Trained

personnel should do this. Allow it to remain isolated until the gas has discharged. Make certain that appropriate warnings have been posted.

If the gas is corrosive, the cylinder should be moved to an isolated, well-ventilated area, but only if personal safety can be maintained.

For massive leaks, call for a general evacuation of the facility. Only trained emergency response personnel with protective apparel and self-contained breathing apparatus, commonly referred to as SCBAs, should approach the cylinder.

If the leak is at the junction of the cylinder valve and cylinder – do not try to repair it. Contact the supplier and ask for response instructions.

Question

Which statements about testing for leaks are true?

Options:

1. Use a soapy water solution, a 50% glycerin-water solution, or a flammable gas detector to test for a flammable gas
2. Know that some flammable gas detection instruments are not rated to detect hydrogen
3. Use the 50% glycerin-water solution for temperatures at or below freezing
4. Use an inert gas to test a system for leaks before you introduce toxic or corrosive gas to it
5. Wear the right personal protective equipment if you decide to continue to work with a cylinder leaking nontoxic gas
6. Replace the cylinder valve if you discover a leak at the junction of the cylinder valve and the cylinder

Answer

It's important to test cylinders for leaks using the method appropriate for the conditions.

Correct answer(s):

1. Use a soapy water solution, a 50% glycerin-water solution, or a flammable gas detector to test for a flammable gas
2. Know that some flammable gas detection instruments are not rated to detect hydrogen
3. Use the 50% glycerin-water solution for temperatures at or below freezing
4. Use an inert gas to test a system for leaks before you introduce toxic or corrosive gas to it

3. Cylinders no longer needed

After a cylinder is no longer needed, never completely empty it. Always leave a residual gas pressure of 30 pounds per square inch, or psi. If the cylinder still contains hazardous material, it should be returned to the supplier, submitted for disposal, or arrangements made for its transfer to an organization that will use it.

Do not keep hazardous materials in the work area past the time they are needed.

Cylinders have a finite life expectancy. This is especially true for cylinders containing corrosive materials. If you are not using it – get rid of it properly.

If the cylinder is empty, replace the cap and move it to the empty cylinder storage area. Mark it or label it clearly.

Graphic

A cylinder carries the label "Empty cylinder, do not use."

Remember, the greatest physical hazard presented by the compressed gas cylinder is the tremendous force that may be released if it is knocked over.

4. Summary

When storing compressed gas cylinders, you should secure them individually and away from radiators. Ensure the valve is closed or the valve protection cap is on, unless the cylinder is in use. Do not mix cylinders from different hazard classes. Perform safety procedures before and when using a cylinder. Always use the right safety equipment for a particular gas and always keep the appropriate fire extinguishers close by. Never refill an empty cylinder. Know how to detect and respond to a leak. Dispose of empty gas cylinders correctly.

Transportation Requirements

Learning Objectives

After completing this topic, you should be able to

- *identify requirements for safely transporting containers and cylinders*
- *identify safe handling techniques for poison inhalation hazard materials and cryogenic gas containers*

1. Transportation and handling techniques

It is required that, when transporting and handling compressed gas cylinders, steel-toed shoes, protective gloves, and safety glasses be worn.

Smoking, matches, and open flames are **not** allowed within 25 feet of flammables, oxidizers, or explosives.

During transportation, valve protection devices, such as cylinder caps, are required on flammables, toxics, and corrosives.

Also, valve protection devices should be affixed to all cylinders designed to accept a cylinder cap.

Question

Which general safety rules describe the correct transportation requirements?

Options:

1. Workers should wear steel-toed shoes, gloves, and safety glasses
2. Cylinder caps are not required if transport vehicle bed is enclosed
3. Cylinder caps are required on flammables, toxics, and corrosives
4. Respiratory protection is always required
5. Green cylinders can never be loaded with black cylinders
6. Smoking, matches, or open flames are not permitted within 25 feet of flammables

Answer

General safety rules include wearing steel-toed shoes, gloves, and safety glasses and ensuring that cylinder caps are on flammables, toxics, and corrosives. Smoking and the use of matches or open flames is not permitted within 25 feet of flammables.

Correct answer(s):

1. Workers should wear steel-toed shoes, gloves, and safety glasses
3. Cylinder caps are required on flammables, toxics, and corrosives
6. Smoking, matches, or open flames are not permitted within 25 feet of flammables

In addition, never accept a leaking container for transport. For cryogenic containers, **venting** is a normal occurrence and not considered a leak.

When venting occurs, a low temperature hazard exists for the venting gas and, except for oxygen, an asphyxiation hazard exists for the air displaced during venting.

Drivers should open the doors of an enclosed vehicle used to transport compressed gases. Allow the cargo space to ventilate before entering.

General requirements for orientation and securing of containers include the following:

- Cryogenic containers must be secured in an upright position. Liquefied petroleum gas, also called LPG, and acetylene cylinders should not be shipped in a horizontal position.
- Cylinders must be properly blocked, braced, and secured.
- Cylinders on pallets should be treated as one unit. Pallets should not be broken apart.

In addition, individuals responsible for shipping and loading of compressed gases must be familiar with the requirements in "The Segregation Table for Hazardous Materials (49 CFR 177.848)."

Question

Identify the safe handling techniques for poisonous inhalation hazard materials and cryogenic gas containers.

Options:

1. Cryogenic containers must be secured in an upright position
2. LPG and acetylene cylinders should not be shipped in a horizontal position
3. Cylinders must be properly blocked, braced, and secured
4. Drivers should ventilate the cargo space of an enclosed vehicle used to transport compressed gases before entering
5. Each cylinders on a pallet should be treated as one unit
6. Cryogenic containers should not be allowed to vent under any circumstance while being transported

Answer

Some of the safe handling techniques are to secure cryogenic containers in an upright position, to block, brace, and secure cylinders, not to ship LPG and acetylene cylinders in a horizontal position, and to ventilate the cargo space used to transport compressed gases before entering.

Correct answer(s):

1. Cryogenic containers must be secured in an upright position
2. LPG and acetylene cylinders should not be shipped in a horizontal position
3. Cylinders must be properly blocked, braced, and secured
4. Drivers should ventilate the cargo space of an enclosed vehicle used to transport compressed gases before entering

Markings on containers may supply additional information regarding

- orientation
- toxicity
- whether the material is a hazardous substance, and
- whether it meets or exceeds its reportable quantity – or RQ

RQ is the minimum quantity, in pounds, that must be reported to the EPA in the event of a spill.

Shippers must offer the appropriate placards for the materials offered for transportation.

Graphic

Some examples of placards include flammable liquid, spontaneously combustible, non-flammable gas, and poison gas.

Follow these general recommendations for shipping terminals and interim storage:

- use cylinder carts to move individual cylinders
- use a hand truck to move liquid containers
- store compressed gases that are considered poison inhalation hazards outside or in a well-ventilated area, and
- restrain cylinders in an area away from forklift and pedestrian traffic – if a cylinder begins to fall while being handled, let it go or you might be injured

You should

- never roll a liquid container or move it by the sight glass
- never lift cylinders with a magnet, or
- never break down pallets of cylinders assembled by the shipper

What happens if there is an accident or spill?

Appropriate emergency response information must accompany the shipment of hazardous materials. An Emergency Response Guidebook, safety data sheet, or product information on the shipping paper will fulfill this requirement.

The carrier must report all unintentional releases of a product to the appropriate regulatory authority. Suspected leaks or incidents must be reported immediately to the shipper for assistance in determination of proper clean-up techniques.

2. Summary

A number of requirements are associated with the transportation of compressed gas cylinders.

Appropriate personal protective equipment, such as steel-toed shoes, protective gloves, and safety glasses, must be worn. Smoking and the use of matches and open flames is not allowed within 25 feet.

Cylinders should be transported in the upright position, depending on the make of the gas, and they should be properly secured and correctly marked. Valve protection devices need to be in place. When venting occurs, the cargo space must be properly ventilated.

General recommendations on the way cylinders may and may not be moved need to be followed. A full set of emergency response information needs to be readily available and any accidents or leaks must be reported.