Carbon Dioxide (CO2) Safety Training

Contact our Safety Specialist to learn more about available safety presentations, training resources, and our comprehensive line of safety equipment and Personal Protection Equipment (PPE).

(206) 423-1161

Topics we’ll cover…

- General properties and uses of CO2
- Potential risks of exposure and symptoms
- Handling, storage, and equipment safety features
- Safety considerations and precautions
- What to do in the event of an emergency

Carbon Dioxide (CO2)

- Inert gas, odorless, colorless, heavier than air
- Displaces oxygen
- Effective and preferred agent for Class “C” fires
- Effective agent for Class “B” fires
- Non-conductive, non-corrosive, leaves no residue

Earth’s atmosphere = 0.03% CO2 (300 ppm by volume)

Carbon Dioxide (CO2)

- Boiling Point @ 1 atm (sublimes)
  -109.3°F (-78.5°C)
- Freezing Point @ 76 psia
  -69.9°F (-56.6°C)

Uses for Carbon Dioxide (CO2)

- Liquid CO2: Used widely in the food industry to freeze...
  - meats
  - poultry
  - vegetables
  - fruits

- Solid CO2 (dry ice) used to...
  - cool meats prior to grinding
  - refrigerate meats during transit
Uses for Carbon Dioxide (CO2)

- Gas CO2: Used for carbonation
  - soft drinks, wines, and beers
- Gas CO2: Used for water treatment
  - to neutralize alkaline water

Carbon Dioxide (CO2) Safety

- Industrial uses of CO2
  - Liquid CO2 is used to increase recovery from oil and gas wells
  - Used for production of chemicals, plastics, rubber, metals, and electronic components

Exposure Reactions

- 1% Slight increase in breathing rate.
- 2% Breathing rate 50% above normal level. Prolonged exposure can cause headache, tiredness.
- 3% Labored breathing at 2 X normal rate. Weak narcotic effect. Impaired hearing, headache, increase in blood pressure and pulse rate.
- 4–5% Breathing at 4 X normal rate; evident symptoms of intoxication and slight choking

- 5–10% Characteristic sharp odor, very labored breathing, headache, visual impairment, and ringing in the ears; Judgment may be impaired, followed within minutes by loss of consciousness.
- 50–100% Unconsciousness occurs more rapidly above 10% level; Prolonged exposure to high concentrations may eventually result in death from asphyxiation.

Earth’s atmosphere = .03% CO2

NOTE: Release of CO2 displaces Oxygen in the air, presenting risk of asphyxiation.

NORMAL CO2 Levels:

Carbon Dioxide (CO2) Bulk Storage

- Can be stored as a bulk liquid with capacities up to 50 tons and larger
- Liquid in the tank is maintained between 245 psig and 305 psig
- Vessels/piping must meet ASME and DOT specification codes
- Insulated by polyurethane foam with vapor barrier to protect from weather
Carbon Dioxide (CO2) Bulk Storage
- Maintained below 305 psig by a refrigeration unit
- Maintained above 245 psig with a pressure buildup coil so that carbon dioxide can be stored for an indefinite period without venting

Carbon Dioxide (CO2) Cylinder Storage
- Smaller liquid quantities are stored and shipped in cryogenic liquid cylinders
  - provide capacity of 384 pounds (3352 standard cubic feet)
- Cryogenic liquid cylinders
  - are vacuum-jacketed and can hold product for long periods without venting
  - Can either supply liquid or gas and liquid

Carbon Dioxide (CO2) Safety Features
- Threaded neckring is secured to tapered end of the cylinder to allow a protective cylinder cap to be installed
- Cylinders are manufactured according to ASME and DOT specification codes
- Cylinders in service are hydrostatically tested upon manufacture, and every five years thereafter at 5/3 times the service pressure.

CO2 Gas Cylinder Valves
- Specifications for CO2 gas cylinder valves are defined by the Compressed Gas Association (CGA), and the American National Standards Institute (ANSI)
- Bulk liquid storage tanks are protected against excessive pressures by reseatable relief devices and burst discs
- Gas cylinders are protected from rupture due to fire by a frangible disc sometimes backed by a fusible metal with a melting temperature of about 212°F (100°C).
Gas Cylinder Identification
- Between neckring and shoulder:
  1. DOT specifications (3A, 3AA, etc.); followed by service pressure rating in pounds per square inch
  2. Container serial number
  3. Manufacturer's symbol and owner's symbol
  4. Month and year of container manufacture
  5. Month and year of subsequent 5-year retest of container.
- Emergency phone number and cylinder owner is disclosed on the label

Carbon Dioxide (CO2) Safety

Cryogenic Liquid Cylinder Identification
- Stamped permanently on the shoulder or top head of the jacket, on a permanently attached plate, or on the head protective ring.
  1. DOT-4L followed by the service pressure rating in pounds per square inch.
  2. Serial number and identifying symbol; location of the number to be just below or immediately following the DOT mark; location of the symbol to be just below or immediately following the number.
  3. Month and year of the container manufacture.

Workplace Safety
- An emergency response plan shall be developed and implemented wherever compressed gases are used, handled or stored.

HAVE A PLAN IN PLACE!

Carbon Dioxide (CO2) Safety

Cryogenic Liquid Cylinder Identification
- Identification stamped permanently on one of the following:
  - the shoulder, or
  - top head of the jacket
  - permanently attached plate
  - head protective ring

Workplace Safety: Building
- Provide adequate ventilation.
- The atmosphere in areas in which carbon dioxide gas may be vented and collected should be tested with a portable or continuous monitoring carbon dioxide gas analyzer to insure ventilation is adequate.
Carbon Dioxide (CO2) Safety

Personal Precautions
- Avoid breathing gas.
- Store and use with adequate ventilation.
- Do not get liquid in eyes, on skin or clothing.
- Use hand truck for large cylinder movement.
- Close gas cylinder valves after each use and when empty.

Carbon Dioxide (CO2) Safety

General Gas Cylinder Safety
- Do NOT deface or remove identification labels applied by the gas manufacturer.
- Do NOT accept a compressed gas cylinder for use that does not legibly identify its contents.
- NEVER rely on the cylinder color for identification.
- Never smoke around compressed gas cylinders or bulk gas storage tanks.

Carbon Dioxide (CO2) Safety

Hazards Identification
- Inhalation: CO2 is an asphyxiate; concentrations of 10% or more can produce unconsciousness or death.
- Eye Contact: Contact with liquid or cold vapor can cause freezing of tissue.
- Skin Contact: Contact with liquid or cold vapor can cause frostbite.

See Material Safety Data Sheet (MSDS) for Carbon Dioxide

Carbon Dioxide (CO2) Safety

EMERGENCY RESPONSE: First Aid
- Inhalation
  - Victim may not be aware of asphyxiation; observe for increased respiration and headache symptoms.
  - Remove victim to fresh air.
  - If victim is not breathing, give artificial respiration.
  - If breathing is difficult, give Oxygen.
  - Keep victim warm and rested.
  - Call 911.

DO NOT ENTER EFFECTED AREA FOR RESCUE WITHOUT SELF-CONTAINED BREATHING APPARATUS (SCBA)!

Carbon Dioxide (CO2) Safety

EMERGENCY RESPONSE: First Aid
- Skin or Eye Contact
  - Immediately flush eyes thoroughly with water for at least 15 minutes.
  - In case of frostbite, spray with water for at least 15 minutes.
  - Apply a sterile dressing.
  - Call for medical assistance.

ALWAYS USE TEPID – NOT WARM – WATER WHEN FLUSHING EFFECTED AREA!

Carbon Dioxide (CO2) Safety

EMERGENCY RESPONSE: Accidental Release
- Personal precautions
  - Evacuate area. Use protective clothing and wear self-contained breathing apparatus entering area unless atmosphere is proved to be safe. Ensure adequate air ventilation.
  - Environmental precautions
    - Try to stop release. Prevent from entering sewers, basements and workspits, or any place where its accumulation can be dangerous.
  - Clean up methods
    - Ventilate area.

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM
EMERGENCY RESPONSE: Exposure to Fire

- Fire fighting measures
  - Exposure to fire may cause containers to rupture/explode. (Contents are non flammable.)
  - If possible, stop flow of product and move container away or cool with water from a protected position.
  - In confined space, use self-contained breathing apparatus (SCBA).

  Insure adequate ventilation. Protect eyes, face and skin from potential liquid splashes.

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM

EMERGENCY RESPONSE: Checklist

✓ Evacuate area in case of spill or spontaneous venting of gas
✓ Put on Self Contained Breathing Apparatus (SCBA) and skin protection BEFORE entering an affected area to provide rescue
✓ Call 911
✓ Ventilate affected area

REMEMBER: CO2 IS HEAVIER THAN AIR. EVACUATE ALL LOW LYING AREAS, WHERE CO2 MAY ACCUMULATE!

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM

EMERGENCY CONTACTS

- Central Welding Supply - 1 800 697-0128
  For questions or concerns about potential leaks (non life threatening)
- Chemtrec – 1 800 424-9300
  For emergency situations; Chemtrec will dispatch the appropriate local authorities
- Call 911
  Medical emergencies, ie. unable to resuscitate exposed victim

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM

BE PREPARED!

- Have a plan
- Education employees regarding potential risks and hazards
- emergency response
- Have necessary safety equipment on-hand
  - self-contained respirator
  - protective clothing for skin

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM

SAFETY RESOURCES

CALL TO REQUEST OUR SAFETY CATALOG!

Our Safety Specialist can be helpful in assessing the hazards in your workplace and recommend compliant solutions.

Call to schedule a walk-through or to learn more about the products and services available through our Occupational Safety Division.

SAFETY SPECIALIST CONTACT:
(206) 423-1161

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