Safety Meetings are important!
They: get your employees actively involved
encourage safety awareness
help identify problems before they become accidents
motivate employees to follow proper safety procedures
We are happy to provide you with a monthly topic for your agenda.

ROUTE TO:

- ☐ General Manager
- ☐ Safety Coordinator
- ☐ Supervisor Dept. _____
- ☐ Other _____
- ☐ Date of Meeting _____

September 2021

Carbon Dioxide Exposure and Asphyxiation

Carbon dioxide (CO_2) is a colorless, odorless, non-flammable gas that is 1.5x heavier than air at normal atmospheric temperatures. CO_2 can accumulate in low lying areas and confined spaces. Because of these properties it is considered to have NO Warning Properties!

ROUTES OF CARBON DIOXIDE EXPOSURE

Inhalation
Low concentrations are not harmful. Moderate concentrations will affect cognitive abilities. Higher concentrations can affect respiratory function and cause excitation followed by depression of the central nervous system and death. Extremely high concentration will also displace oxygen in the air, causing an oxygen-depleted atmosphere after death has occurred from the toxicity. Symptoms occur more quickly with physical effort.

Skin Contact
Direct contact with the liquefied gas or solid can chill or freeze the skin (e.g., frostbite).

Eye Contact
Gas may cause mild irritation. Direct contact with the liquefied gas can freeze the eye. Permanent eye damage or blindness can result.

Ingestion; Injection; Skin & Ocular Absorption
Not relevant routes of exposure.

Note. Adapted from "Carbon Dioxide," OSH Answers Fact Sheets, by CCOHS, 2017.

Concentration	Effects
5,000 ppm (0.5%)	OSHA Permissible Exposure Limit (PEL) and ACGIH Threshold Limit Value (TLV) for 8-hour exposure
10,000 ppm (1.0%)	Typically, no effects, possible drowsiness
15,000 ppm (1.5%)	Mild respiratory stimulation for some people
30,000 ppm (3.0%)	Moderate respiratory stimulation, increased heart rate and blood pressure, ACGIH TLV-Short Term
40,000 ppm (4.0%)	Immediately Dangerous to Life or Health (IDLH)
50,000 ppm (5.0%)	Strong respiratory stimulation, dizziness, confusion, headache, shortness of breath
80,000 ppm (8.0%)	Dimmed sight, sweating, tremor, unconsciousness, and possible death

Safety precautions to protect against carbon dioxide asphyxiation?

- Employees should receive training and be knowledgeable of the potential sources and symptoms of exposure to CO2.
- Dry ice and liquid CO2 can cause tissue damage, proper PPE should be worn when handling dry ice or filling CO2.
- If you are working near any sources of dry ice or CO2 filling and develop any of the symptoms of exposure, move to an area of fresh air immediately, and report the incident to your supervisor. (Fresh air or oxygen is the primary remedy for CO2 exposure.
- If you are pregnant consult with your supervisor and your physician about limiting exposure to CO2.
- Do not stand directly next to open bins that contain dry ice or in vapors from these bins. Do not touch dry ice or a bin containing dry ice.
- Additional caution should be taken when filling or emptying dry ice bins as high concentrations of CO2 will be trapped in the bottom of the bin.
- CO2 cylinders should be vented in a secured position, in an open area (preferably outdoors).
- Employees should never place themselves directly in front of a venting CO2 valve (for asphyxiation and pressure hazards are present in the gas stream).

Drivers have additional exposure to the hazards of CO2 and a customer site survey may be necessary to facilitate a safe delivery. Customer site hazards may include:

- Basement deliveries. This may be considered a confined space and again a customer site survey may be necessary to develop a safe delivery plan. Also consider reviewing the GAWDA safe practice for stair delivery (2012-02_ CYLINDER DELIVERY AT LOCATIONS WITH STAIRS AND OR RAMPS, rev.2018).
- Any area that may be deemed a confined space should be equipped with a CO2 detector and alarm system.
- An interior installation of a CO2 system should have all venting, relief devices and discharge vents should be piped outdoors.
- Fill connections should be situated on the exterior of the building.
- Signage should be installed on entry doors to the storage area.

Resources:

1. OSHA.gov
2. Staub, Fred D. "Toxic Carbon Dioxide Exposures, the Unacceptable Risk." Professional Safety Journal, July 2021, p.24-36.
3. Compressed Gas Association, Inc. (CGA) pamphlets should be consulted. These pamphlets are designed to assist personnel involved in transferring liquid carbon dioxide, designers, engineers, safety and training personnel, distributors, restaurant personnel, other users, inspectors, and all interested parties.

   CGA G-6.5-1992, Standard for Small Stationary Low Pressure, Carbon Dioxide Supply Systems
   CGA G-6.4-1992, Safe Transfer of Low Pressure Liquefied Carbon Dioxide in Cargo Tanks, Tank Cars, and Portable Containers
   CGA G-6.3-1995, Carbon Dioxide Cylinder Filling and Handling Procedures
   CGA G-6-1984, Carbon Dioxide
   CGA G-6.2-1994, Commodity Specification for Carbon Dioxide
   CGA G-6.6-1993, Standard for Elastomer-Type Carbon Dioxide Bulk Transfer Hose
4. GAWDA.org
5. Dodd, Michael, "Carbon Dioxide Asphyxiation." GAWDA Safety Topic, August 2017.

If you have any questions, please feel free to contact:

Marilyn Dempsey
GAWDA DHS/EPA/OSHA Consultant
Safety Dragons Workplace Consultants, LLC
940-999-8466
Marilyn@SafetyDragons.com