

Dry Ice Safety

Carbon Dioxide (CO₂)

Dry ice is made of frozen CO₂ gas. Carbon dioxide is naturally occurring in the air (0.04%) and is required for life. In the human body, it acts as an acid and is part of a critical pH buffering system. Concentrations of CO₂ in the body are tightly control through respiration.

As a gas, CO₂ is heavier than air and will tend to settle if undisturbed. At concentrations above that normally found in air, it will displace oxygen from the environment potentially causing asphyxiation. Exposure to toxic levels of CO₂ will cause shortness of breath and headache as the initial symptoms and can cause death. At levels too low to cause asphyxiation (> 0.5%), carbon dioxide can still be toxic, and cause acid-base disruption of the body.

Carbon dioxide is not removed from inspired air by N95 or N100 respirators or by PAPRs.

Carbon dioxide should not be confused with carbon monoxide which is a highly toxic gas that binds with hemoglobin blocking hemoglobin's ability to carry oxygen in the blood. Both carbon monoxide and carbon dioxide are released by combustion of organic compounds.

Dry Ice

The temperature of dry ice is approximately -78 degrees C (-109 F). Unless it is maintained in an environment colder than that, it will sublime (go directly from solid to gas). One pound of dry ice will produce 250 liters of carbon dioxide gas at atmospheric pressure. In a sealed container (e.g., portable freezer), the gas can create pressures high enough to rupture the vessel or explode. Normal freezers cannot keep the dry ice frozen. Rate of sublimation will depend on the ambient temperature. It can be stored in a container that vents such as Styrofoam. The intense cold will destroy some types of containers (glass, plastic).

Contact with the skin will cause immediate burns (thermal tissue destruction). Burns should be treated like burns due to excessive heat.

Procedures

- A. Dry ice should be transported in Styrofoam containers, not in electronic freezers or refrigerators.
- B. Dry ice must be handled with thermal gloves. Gloves such as neoprene can freeze to the skin and be very difficult to remove. If special gloves are not available, leather gloves or oven mitts (cloth) can be used.
- C. These are the gloves purchased by the State of North Dakota for use with dry ice.

Cryogenic Gloves Waterproof Low Temperature Resistant LN2 Liquid Nitrogen Protective Gloves Cold Storage Safety Frozen Gloves

- D. Dry ice must be stored in a well-ventilated area. Do NOT store dry ice in
 - a. Walk in freezers or refrigerators
 - b. Closed rooms without good ventilation
 - c. Hallways
 - d. Closets
 - e. Cars or vans
- E. A person must not stick their head in a deep chest to retrieve dry ice.
- F. Do NOT put dry ice in plastic or glass. Do NOT store in metal containers not rated for dry ice use.
- G. Do NOT put dry ice in sealed containers of any kind. Dry ice can cause vessel rupture or explosion.
- H. Dry ice must be disposed of in a secure area where it can sublimate into outside air or a well-ventilated space.
- I. Do NOT dispose of dry ice in a sink, toilet or drain. It can destroy plumbing.
- J. Do NOT dispose of dry ice in a garbage can.
- K. Oxygen monitors can detect risk of asphyxiation but levels of carbon dioxide below asphyxiation levels can still be toxic. Carbon dioxide monitors can be used in conjunction with oxygen monitors, but no monitor is a substitute for safe procedures.