



Coffee Break Training - Fire Protection Series

Hazardous Materials: Cryogenic Fluids

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Learning Objective: The student will be able to summarize the physical characteristics of cryogenic fluids.

Cryogenic liquids are liquefied gases that are kept in their liquid state at very low temperatures. The word “cryogenic” means “producing, or related to, low temperatures,” and all cryogenic liquids are extremely cold. Cryogenic liquids are classified in the model codes as fluids with a boiling point lower than -130 F (-90 C) at an absolute pressure of 14.7 pounds per square inch (101.3 kilopascals).



These vessels contain carbon dioxide, a gas that is commonly stored as a cryogenic fluid.

All cryogenic liquids are gases at normal temperatures and pressures. These gases must be cooled below room temperature before an increase in pressure can liquefy them. Different cryogens become liquids under different conditions of temperature and pressure, but all have two properties in common: They are extremely cold, and small amounts of liquid can expand into very large volumes of gas.

Each cryogenic liquid has its own specific properties, but most cryogenic liquids can be placed into one of three groups. The table summarizes some of the differences.

Category	Characteristic	Examples
Inert gases	Do not react chemically to any great extent	Nitrogen, helium, neon, argon and krypton
Flammable gases	Produce gases that can burn in air	Hydrogen, methane and liquefied natural gas
Oxygen	Accelerates combustion, can cause organic materials to react explosively	Oxygen

Cryogenic liquids and their vapors have other effects as well. Contact can affect skin similar to a thermal burn. Brief exposures that would not affect skin on the face or hands can damage delicate tissues, such as the eyes. Prolonged exposure of the skin or contact with cold surfaces can cause frostbite. There is no initial pain, but there is intense pain when frozen tissue thaws.

Unprotected skin can stick to metal that is cooled by cryogenic liquids. The skin can then tear when pulled away. Even nonmetallic materials are dangerous to touch at low temperatures. Prolonged breathing of extremely cold air may damage the lungs.

When cryogenic liquids form a gas, the gas is very cold and usually heavier than air. This cold, heavy gas does not disperse very well and can accumulate near the floor, resulting in potential asphyxiation hazards.

Liquid carbon monoxide can release large quantities of carbon monoxide gas, which can cause death almost immediately. Refer to the Material Safety Data Sheet for information about the toxic hazards of a particular cryogen.

For more information and guidelines on cryogen response, planning and prevention tools, refer to <http://www.usfa.fema.gov/downloads/pdf/publications/hmep9-1801.pdf>.



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