



The U.S. Chemical Safety and Hazard Investigation Board has published a Safety Bulletin on nitrogen asphyxiation. This brochure summarizes that material.

Data sources for the CSB review of nitrogen asphyxiation incidents include regulatory agencies, media reports, technical publications, and contacts with safety personnel; however, only those incidents that were reported and accessible are evaluated. Although the summary data are not all-inclusive, the numbers clearly indicate that nitrogen asphyxiation presents a serious hazard in the workplace.¹

¹ Statistical analysis is based on available, limited information.

For additional information or to view the entire Safety Bulletin, please contact:

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Nitrogen- Enriched Atmospheres Can Kill!



NITROGEN makes up 78 percent of the air we breathe. It is a colorless, odorless gas that is safe only when mixed with an appropriate amount of oxygen. These two gases cannot be detected by the sense of smell. A nitrogen-enriched environment, which depletes oxygen, can be detected only with special instruments. Oxygen deficiency has a range of effects and can be fatal if concentrations fall below 10 percent.

Nitrogen is widely used commercially to keep material free of contaminants, including oxygen—which can corrode equipment or present a fire and explosion hazard when in contact with flammable liquids or combustible solids. Good practices must be followed to prevent nitrogen asphyxiation, as highlighted below.

Facts About

Nitrogen Asphyxiation

- ▶ Eighty-five nitrogen asphyxiation incidents from 1992 to 2002 resulted in 80 deaths and 50 injuries.
- ▶ The majority of incidents occurred in manufacturing and industrial facilities, but other settings included laboratories and medical facilities.
- ▶ Most incidents occurred in and around confined spaces, though several incidents occurred in “open” areas, including inside buildings and outside in the vicinity of equipment.
- ▶ Almost half of the incidents involved contractors, including construction workers.
- ▶ Among the causes of death and injury were failure to detect an oxygen-deficient atmosphere in and around confined spaces, using nitrogen instead of breathing air, and inadequately preparing for rescue.

Good Practices

Prevent Nitrogen Asphyxiation

- ❑ **Implement warning systems and continuously monitor** enclosures and areas where additional amounts of nitrogen can be expected to enter, *recognizing that the atmosphere may change over time.*
- ❑ **Ventilate with fresh air** before and during work in areas that could contain elevated levels of nitrogen.
- ❑ **Implement a system for confined space entry and safe rescue of workers**, including having personnel wear a harness and lifeline attached to a mechanical retrieval system, having standby personnel available at all times to communicate with personnel inside confined spaces, and ensuring that rescuers are properly trained and equipped.
- ❑ **Ensure the uninterrupted flow and integrity of breathing air** by verifying the oxygen concentration of supply air, routinely inspecting air supply equipment such as hoses and compressors, and continually monitoring the air supply system for contaminants.
- ❑ **Prevent the inadvertent mix-up of nitrogen and breathing air** by ensuring that incompatible fittings and clear labels are in place on cylinders, piping systems, and supply lines.
- ❑ **Develop and implement a comprehensive training program** that covers proper use of ventilation systems, safe practices for confined space entry and rescue, unique connections and fittings on cylinders containing different gases, and proper use of air supply equipment.