

Workplace Health and Safety Bulletin



Ammonia at the Work Site

Ammonia presents a potential hazard to workers at the work site. Worker exposure to ammonia can occur during its manufacture or in its many industrial applications. To ensure protection against exposure to ammonia, both workers and employers must be aware of its properties, how it affects the body and what to do in emergency situations.

Uses of ammonia

Ammonia is used as a fertilizer and in commercial refrigeration and ice-making systems as a heat transfer agent. It is also used as an ingredient in household cleaners and in making blueprints. Large quantities of ammonia are used as a raw material for making other chemical products. Such products include fertilizers, pharmaceuticals, synthetic resins and fibres, paper products, photographic film.

Properties of ammonia

Ammonia is a colourless gas at room temperature and has a very unpleasant, irritating odour. The gas can be made into liquid form by compression or by cooling. This makes it easier for shipping and storage. Ammonia gas and the pure condensed liquid are called “anhydrous ammonia” (which means without water). “Aqueous” ammonia is a solution of ammonia gas dissolved in water.

Ammonia gas is flammable and may burn if the concentration is between 16 and 25 percent of gas by volume in the air and an ignition source is present. The fire hazard may increase if ammonia gas is mixed with oil or other combustible materials. Ammonia is difficult to ignite in open air, but workers should not underestimate the risk if ammonia is released in an enclosed space or building. Severe explosions and fires have resulted. If the gas is burned, toxic by-products, such as oxides of nitrogen, may be formed.

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Anhydrous and aqueous ammonia are strongly alkaline and may react explosively when mixed with acids. Explosive compounds may be formed if ammonia is mixed with mercury, silver oxide and oxidizers such as chlorine, bromine and iodine. Ammonia is a corrosive chemical and may attack such materials as copper, silver, aluminum, zinc and their alloys.

Effects on the body

Ammonia can affect the body if it is inhaled, or if it comes in contact with the skin or eyes. Both anhydrous and aqueous ammonia are highly alkaline materials and will react with body moisture on direct contact. Ammonia is therefore very corrosive and irritating to the skin, eyes and lung tissues.

Acute health effects

Table 1 summarizes the acute (short-term) health effects from exposure to ammonia.

Table 1: Acute Health Effects from Ammonia Exposure

Ammonia Concentration (parts per million)	Health Effect
1-5	Range of odour threshold
50	Irritation to eyes, nose and throat after 2 hours exposure
100	Rapid eye and respiratory tract irritation
250	For most persons, 30-60 minutes exposure is tolerable
700	Immediately irritating to eyes and throat
>1500	Pulmonary edema, coughing
2500 – 4500	Fatal (30 minutes)
5,000 – 10,000	Rapidly fatal due to airway obstruction

Skin damage may occur from repeated or prolonged contact with anhydrous or aqueous ammonia. Direct contact with highly concentrated ammonia gas or the pure condensed liquid can result in severe skin burns and blisters. Liquid ammonia can produce frostbite in addition to corrosive damage.

Direct eye contact with liquid ammonia or the highly concentrated gas may result in severe eye injury and, if not treated right away, may lead to blindness.

Chronic health effects

Fortunately, ammonia provides a warning of its presence because of its very sharp odour. Workers are therefore given the opportunity to escape before serious injury can result. However, workers exposed to ammonia for long periods of time may lose their ability to notice its presence at airborne levels approaching the Alberta Occupational Exposure Limits (OELs).

Regulatory requirements

The Alberta *Occupational Health and Safety (OHS) Act* lays out the employer's responsibilities to ensure the protection of workers at the work site.

The Alberta OHS Code provides requirements for various health and safety issues at the work site, including requirements relating to the control of chemical hazards. The OHS Code lists OELs for various chemicals. OELs represent minimum standards for worker protection. All efforts should be taken to keep ammonia levels as low practicable/achievable. It may be necessary to routinely monitor the air to ensure that airborne levels do not exceed the OELs.

To protect workers from the hazards of ammonia, the employer is required to implement controls. These may include “engineering out” the hazard or using administrative controls. Administrative controls involve approaches such as safe work procedures, job rotation, work assignment or time periods away from ammonia. The method(s) used will depend on the conditions at the work site. If engineering and/or administrative controls are inadequate to protect workers from exposure to ammonia, or in the event of an emergency, respirators and other personal protective equipment must be provided. If personal protective equipment is used, it must be properly selected, fitted and cared for. Workers must also be trained in its use.

Employers must inform their workers of the ammonia hazards, how to protect themselves from exposure and how to react in an emergency. The Alberta OHS Regulation and Code provide specific requirements for worker training.

Workers responsibilities

The Alberta *OHS Act* also places responsibilities on the worker for health and safety at the work site. The *OHS Act* and OHS Code require workers to take reasonable care of themselves and others at the work site. This includes co-operating with the employer for the purpose of protecting themselves and others.

The worker must:

- be aware of the hazards of ammonia and must follow work practices and procedures developed by the employer;
- wear protective equipment supplied by the employer and follow instructions on correct use, care and maintenance.

In case of emergency

Part 7 of the OHS Code provides the requirements for emergency preparedness and response.

The employer must:

- have emergency procedures developed to deal with potential emergencies such as spills or fires;
- ensure that workers are aware of the procedures, are trained and are adequately supervised in an emergency;
- ensure that only designated workers equipped with the necessary PPE respond to emergencies.

For more information:





<http://employment.alberta.ca/SFW/307-html>

Occupational Health and Safety Act, Regulation and Code

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<http://employment.alberta.ca/whs-ohs>

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