Workplace Health and Safety
Bulletin
WORK SAFE ALBERTA

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.

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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.

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 form 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 hr. 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.

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 Occupational Health and Safety (OHS) Code provides standards respecting various safety aspects at the work site. The OHS Code covers requirements relating to the control of chemical hazards. The Code lists Occupational Exposure Limits (OEL's) for various chemicals.

It is important to note that OELs represent minimum standards for worker protection. All efforts should be taken to keep ammonia levels as low as possible. It may be necessary, in some instances, to routinely monitor the air to ensure that airborne levels do not exceed the OELs.

To protect workers from the hazards of ammonia, there are several control options available to the employer. These may include "engineering out" the hazard, putting safe work procedures in place or using administrative controls. Administrative controls involve such

approaches as job rotation, work assignment or time periods away from ammonia. The method(s) used will depend on the conditions at the work site. If such measures 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 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 Occupational Health and Safety Regulation and Code provide specific requirements for worker training.

Workers responsibilities

The Alberta *Occupational Health and Safety (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 themself and others at the work site. This includes co-operating with the employer for the purpose of protecting themselves and others.

The worker must:

- become aware of the associated hazards and must follow work practices and procedures developed by the employer;
- wear protective equipment supplied by the employer to ensure protection and follow instructions on correct usage.

In case of emergency

Workers and employers both have responsibilities in emergency situations.

The employer must:

- have emergency procedures developed in advance of any potential emergency involving ammonia or spills;
- ensure that workers are aware of the procedures, are trained and are adequately supervised in an emergency;

- workers should not attempt to respond to the emergency unless they have been trained to respond to an ammonia release, are provided with full face piece, positive pressure self contained breathing apparatus (SCBA) and appropriate protective clothing to prevent contact with the liquid or gas.

In the event of an emergency, workers should evacuate the premises to a prearranged assembly point cross wind or upwind of the source of release and notify local authorities and the 24-hour emergency response number on the MSDS sheet so that technical specialists can safely assist in the response. In the event of a large release, measures may need to be taken by civil authorities to warn or evacuate adjoining work sites or the nearby community.

The worker must:

- avoid breathing ammonia while quickly leaving the area for fresh air (if available, quickly put on nearest respirator);
- immediately wash off skin with plenty of water and flush eyes for at least 30 minutes with water, but preferably 60 minutes in case of contact;
- seek medical attention right away if ammonia has been breathed in or if ammonia comes in contact with skin or eyes;
- not re-enter an ammonia-filled area of unknown concentration unless equipped with full face piece positive pressure self contained breathing apparatus (SCBA), appropriate protective clothing, and training in responding to an ammonia release;
- be prepared to assist fellow workers, while making sure the correct emergency procedures are followed. It is important not to take unnecessary risks when rescuing or assisting a fellow worker.

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Web Site

www.worksafely.org

Getting copies of OHS Act, Regulation & Code:

Queen's Printer

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Workplace Health and Safety

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