

WORKING SAFELY WITH ANHYDROUS AMMONIA

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WHAT IS ANHYDROUS AMMONIA?

Anhydrous means “without water.” Anhydrous ammonia is “dry” ammonia or pure undiluted ammonia. For agricultural use, anhydrous ammonia is at least 99.7 percent pure ammonia.

At normal pressure and temperature, anhydrous ammonia is a colorless gas. It is stored and handled as a liquid under pressure. Anhydrous ammonia has a low boiling point of -28 degrees Fahrenheit. Consequently, when pressure in the storage container is released, the liquid evaporates, forming an invisible vapor or gas with a strong, pungent odor. Without protective breathing apparatus, ammonia concentrations of more than 500 parts per million (ppm) become unbearable to humans.

Anhydrous ammonia is classified as “non-flammable.” Ammonia gas at high concentrations of 16 to 25 percent by volume can be ignited, but an ignition source above 1,200 degrees Fahrenheit is needed to start such a reaction. Thus, anhydrous ammonia fires or explosions are not likely when used in normal agricultural operations. However, welding or cutting on metal containers of anhydrous ammonia should be prohibited unless the containers have first been purged and cleaned.

HUMAN EXPOSURE

Anhydrous ammonia is a strong alkali that can cause severe burns, and its gas can cause severe irritation of the outer tissues of the eyes, nose, throat, and lungs. Because of its low boiling point, anhydrous ammonia can cause severe burns by freezing action as well as by caustic action.

Ammonia is detectible by the nose at low concentrations. At large concentrations, ammonia

vapor can produce convulsions, coughing, and difficult and painful breathing. Injury is almost certain if concentrations reach 2,000 to 3,000 ppm. Prolonged inhalation of anhydrous ammonia can cause death by suffocation. For example, a single inhalation may be fatal if it clamps down the vocal cords (a reflex action which sometimes occurs as a result of breathing a violent irritant).

EYES

Anhydrous ammonia reacts most actively with moist, exposed areas of the human body. Injury to the eyes is the most serious hazard of ammonia. If washed immediately with water, the damage may only be temporary or none at all. Those victims unable to wash their eyes may suffer permanent injury and blindness.

Never wear contacts if the possibility of exposure exists. Anhydrous ammonia may get behind the contacts and cause permanent damage to the eyes before the contacts are removed and eyes washed out.

SKIN

Ammonia is caustic to the skin. Skin burns and blisters may develop from exposure to a 2 percent ammonia solution for 15 minutes or longer. Liquid anhydrous ammonia causes not only chemical burns but, because of the low temperature, causes the water in the skin to freeze and rupture the cells as it expands. These wounds can be deep and slow healing.

FIRST AID

First aid for exposure to anhydrous ammonia consists of immediate flushing with large quantities of water followed by flushing with more water. At

least 5 gallons of clean water should be stored in the vicinity of anhydrous ammonia containers.

In cases of severe exposure, follow with first aid treatment, and call a doctor immediately. Give the doctor as much information as possible about the extent of exposure.

INHALATION

- The victim should immediately get to or be assisted to an uncontaminated area.
- Get medical assistance if the worker has chest or breathing passage pains, or a persisting cough.
- If the exposure is severe, a physician should be called immediately and informed as completely as possible about the overexposure to ammonia.
- If available, oxygen can be administered by a trained individual to relieve pain and symptoms.
- If the victim is not breathing, artificial respiration should start immediately. Keep the victim warm and at rest.

EYE CONTACT

- Flush eyes with water for at least 15 minutes. Even a small amount of ammonia in the eyes can cause damage.
- Flush the entire eye surface and inner lining of the eyelids thoroughly. Because the eyelids close voluntarily, hold the eyelids open while flushing.
- If available, use a squeeze-type water bottle that will squirt water into the eyes.
- If medical help is not available after 15 minutes, continue flushing until you get medical attention.
- Another emergency eye flushing method is to duck your head in a bucket of clean water, and blink and move eyes around.

SKIN CONTACT

- Any portion of your body which is splashed with or exposed to anhydrous ammonia should be flushed thoroughly with water.

- If your clothes become saturated by liquid ammonia, they will probably freeze to your skin. Get under a deluge shower or other source of water immediately. Remove the clothes only after they have thawed and can be pulled freely from your skin.
- Do not apply salves or ointments to ammonia burns. Get medical attention as soon as possible.

SWALLOWING

- Though it is rare that anyone swallows anhydrous ammonia, the first aid treatment involves water.
- Call a doctor immediately.
- If the victim is conscious, he or she should swallow large amounts of water.
- If vomiting begins, place the victim face down with the head lower than the hips to prevent it from entering the lungs.
- If the victim is in shock or extreme pain, or is unconscious, do not try to give him or her water or induce vomiting.

PERSONAL SAFETY EQUIPMENT

Most anhydrous ammonia exposure accidents are completely preventable if personal protection equipment is used.

Goggles – Gas-proof goggles provide the greatest level of protection, because ammonia gas can dissolve in the tears and penetrate to the eye surface. In addition, when there is a risk of splashing, a full-face shield should be worn to prevent direct splashing of the face.

Gloves – Wear rubber or polyethylene gloves that are resistant to ammonia. Decontaminate gloves with water before they are removed.

Boots and Slicker – If it is necessary to clean up a spill or when there is a likelihood of contacting anhydrous ammonia, wear rubber boots and a slicker which covers your body. Decontaminate with water before removing garments.

Respirator – When exposed to anhydrous ammonia leaks, spills or releases, always wear respiratory protection, gas masks, or self-contained breathing apparatus rated to protect against ammonia exposure.

Make sure facepieces fit tightly. Check respirator for leaks around the edges. If you smell ammonia or your eyes, nose, or throat become irritated; if it becomes difficult to breathe; if the air you are breathing becomes unusually warm; or if you feel dizzy or nauseous, leave the contaminated area immediately and remove the respirator.

HANDLING AND STORAGE

If you are working with anhydrous ammonia in containers, use the following guidelines:

- Containers should never be subject to rough handling or to mechanical shock such as dropping or bumping.
- Use proper handling equipment suitable for platforms, boats, or cradles for unloading by cranes.
- Use hand trucks, roll platforms, fork trucks, or similar devices with the container securely fastened to transport them.
- Avoid dragging, sliding, or rolling them on the bottom edges as much as possible.
- Rack, block, or otherwise secure containers so that they are stored and used in a stable manner.
- Do not store containers near a source or potential source of heat, such as flammable substances in direct sunlight.
- Containers should never reach a temperature above 125 degrees Fahrenheit.
- Do not remove valve protection until you are ready to withdraw ammonia from the container.
- For empty containers, securely cap the opening, and mark or fasten an “EMPTY” tag on it. Store empty containers away from full containers.
- Always keep at least 5 gallons of clean water near anhydrous storage and handling facilities in case of emergency.

ADDITIONAL SOURCES

A Guide for Developing a Training Program for Anhydrous Ammonia Workers. National Institute for Occupational Safety and Health. 1978.

Safe Handling and Use of Anhydrous Ammonia. Montana State University. 1976.

Handling Anhydrous Ammonia with Care. Arizona Cooperative Extension Service. 1991.

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