



# Anhydrous Ammonia

## Introduction

Anhydrous ammonia is a gaseous form of ammonia. “Anhydrous” comes from the Greek word for “without water.” Interestingly, more than 1% of the world’s energy production is dedicated to the manufacturing of ammonia.

## Hazards

The main safety hazard of ammonia is that it is extremely corrosive to the skin, eyes, and respiratory tract. Because it does not contain water, it will absorb moisture from any source, potentially causing severe burns. In some cases, these burns may be fatal, especially if they affect the lungs/respiratory tract. The hazards of anhydrous ammonia are increased by two other factors:

- **Pressurization.** Ammonia boils and becomes a gas at temperatures of about 28 below zero F at standard atmospheric pressure. In order to remain liquid ammonia is stored at low temperature and high pressure (approx. 200 psi). So when a leak/release develops, it may expand rapidly and can spray operators and others in the area.
- **Gas.** When ammonia changes from liquid to gas it expands in volume by nearly 700 times. The high volume of gas generated makes it much more likely to be inhaled into the respiratory tract/lungs, where injuries will be much more serious.

## OSHA regulations

OSHA regulates the storage and handling of anhydrous ammonia in 29 CFR 1910.111. Sections (g) & (h) pertain to the use of anhydrous ammonia in agricultural settings.

## Personal Protective Equipment (PPE)

Employees involved in handling anhydrous ammonia, especially during the transfer process, must wear appropriate PPE. At a minimum, this includes:

- Tight-fitting eye protection (splash-proof goggles).
- A face shield is strongly recommended in addition to goggles.

- Chemical-resistant gloves
- Long-sleeved shirt & long pants
- Leather work shoes/boots.

29 CFR 1910.111(b)(10)(ii) also states that at least two full-face respirators approved for ammonia must be provided in readily accessible locations at all stationary storage installations.

## Eyewash and showers

In the event of an exposure (i.e., a chemical splash), affected parts of the body must be immediately drenched with copious amounts of clean water until the employee reaches a medical center. For this reason, ample amounts of clean water must be available at all times and in affected areas.

Stationary storage locations must be equipped with an ANSI-approved eyewash and shower. All nurse tanks and applicator tanks must carry at least one five-gallon container of clean water. This must be changed daily.

All exposures to anhydrous ammonia require immediate medical treatment, no matter how minor the exposure appears to be.

## Flammability

Anhydrous ammonia is not considered a flammable gas. Nevertheless, welding on ammonia containers, piping, transfer equipment, etc. is not permitted, except by suitably qualified personnel (certified welders holding a R-stamp or U-stamp). This is especially true of closed containers, or surfaces that may be contaminated with residual ammonia.

## Tanks and other equipment

All storage, handling, transfer, and other equipment must be approved for such use. Unapproved equipment may utilize materials or appurtenances (gages, valves, hoses, etc.) incompatible with ammonia or the working pressures involved. Consequently, unapproved equipment may fail, causing releases and injuries.

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When towing, use a proper trailer hitch, safety chains (crisscrossed), and slow moving vehicle sign. Hitch pins must be locked securely. Tanks should always be painted white or silver to reflect heat. Tanks may never be filled to greater than 85% capacity.

Equipment must be inspected frequently. Inspection checklists should be available from the supplier. Transfer hoses and relief valves are the two most important parts of an inspection program.

- Make sure that relief valves are not beyond their replacement date, stamped on the valve body itself.
- Hoses must be free of cuts, nicks, bulges, worn spots, etc. Hoses must be marked with “anhydrous ammonia” and with the year of manufacture and expiration date. Make sure hoses are not expired. Make sure all connections are clean, free of dirt, debris, etc and in good condition.

## Valve operation

Valves may only be operated after the tank is secured in place, so that connections are not accidentally broken. The tank must be located where there are no barriers to emergency escape from the area in the event of a leak. Employees must be able to travel upwind of the equipment, without having to climb over fences, etc.

Manual valves are to be opened wide when transferring liquid. Employees should stay clear (upwind) of valves and hoses while transfer in progress.

All employees involved in the process must read and understand the Operator’s/Owner’s manual. This must be documented.

## Methamphetamine manufacturing

Ammonia is an important component in the illegal manufacturing of methamphetamine. Small amounts are commonly stolen by those operating meth labs. Evidence of tampering may include footprints, stained soil near the tank, valves that are not tightly closed, items left near the tank such as hoses, duct tape, propane tanks, etc. Placing

brightly colored nylon ties on valves can help to identify when/if valves have been tampered with. Locking devices on tank valves are an effective and simple means to prevent theft.

Keep tanks in secure, well lit areas. If possible, position tanks where they may be seen from public roads, residences, etc. The most important portion of the tank to be kept visible is the valve.

Schedule deliveries so they arrive as close to the time of application as possible, and return tanks immediately after application has ended. Access roads that lead to the storage area should be secured or barricaded to prevent theft of the entire tank. “No Trespassing” signs will help in the event of a liability case. Never confront or attempt to detain anyone you suspect of stealing ammonia. Call the police immediately.

## Training

All employees who are potentially exposed to ammonia, either under normal conditions or foreseeable emergencies, must be trained. Training must occur at the time of assignment, whenever hazards, conditions, or procedures change, and at least annually thereafter.

At a minimum, training must consist of the hazards of anhydrous ammonia, the general safety precautions, and procedures to follow in the event of an emergency, etc. This fact sheet may be used as a component of this training. All training must be adequately documented.

## Questions

If you have questions on this topic, please contact University Health and Safety at (612) 626-6002.