



Fertilizer Safety & Security Council

Conseil de la sécurité en fertilisation

# Anhydrous Ammonia

## FARMER SAFETY PROGRAM



COURTESY OF:



## DISCLAIMER

### **Caring About Customers**

This anhydrous ammonia awareness material is intended to provide customers with helpful information regarding the safe handling, storage and use of this product. This material is not meant to be, nor is it a substitute for, a comprehensive training program - use of this material and any reliance on it is at the user's sole risk.

Specifications for anhydrous ammonia products and laws and regulations regarding these products and their use are subject to change without notice. Users are urged to check the most recent applicable specifications, laws and regulations prior to making any use of anhydrous ammonia products. Users are fully responsible for the safe and proper handling and application of any anhydrous ammonia product in accordance with all applicable laws.

***Contact your local dealer for more information about this booklet.***



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# INTRODUCTION

Anhydrous ammonia is considered a dangerous good under the *Transportation of Dangerous Goods Regulations*. Every person handling, transporting, or offering to transport anhydrous ammonia must be adequately trained and hold a valid training certificate.

Once you have knowledge of all aspects relating to your duties as an anhydrous ammonia handler, you **MUST** complete a training certificate for you and your employees. The training certificate is valid for 36 months, and must be kept with you when handling anhydrous ammonia. Contact your local dealer to receive the training and certification card.

Employers must sign off on their employees' training cards if they are deemed to be adequately trained.

**Producer certification cards contain:**

- Name
- Location
- Date of training
- Expires on
- Signature of employee
- Signature of employer

<b>PRODUCER ANHYDROUS AMMONIA CERTIFICATE OF TRAINING</b>	
NAME: .....	
LOCATION: .....	
DATE OF TRAINING: .....	
EXPIRES ON: .....	
_____ SIGNATURE OF EMPLOYEE	_____ SIGNATURE OF EMPLOYER
«CARDNUMBER»	



<p><b>CLASS &amp; DIVISION</b></p> <p>Current: 2.3 (8) UN: 1005</p>	<p><b>TRAINING RECEIVED</b></p> <ul style="list-style-type: none"><li>✓ Nature and characteristics</li><li>✓ Safety marking requirements</li><li>✓ Reporting requirements</li><li>✓ Emergency procedures</li><li>✓ Equipment operations</li><li>✓ Safety equipment use</li><li>✓ Equipment inspections</li><li>✓ Towing requirements</li></ul>
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*By participating in training every three years, viewing the CFI video, and reading this booklet, you will complete your overall requirement for application and handling of anhydrous ammonia.*

**Reverse of the card will clarify what you have been trained in:**

- Nature and characteristics
- Safety marking requirements
- Reporting requirements
- Emergency procedures
- Equipment operations
- Safety equipment use
- Equipment inspections
- Towing requirements

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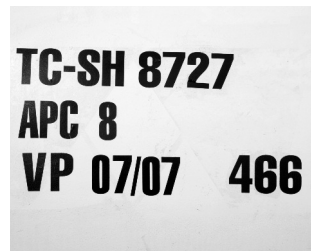
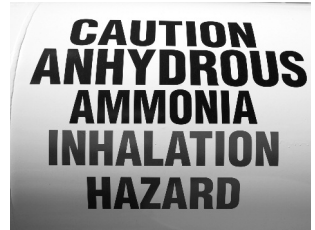
## TRANSPORTATION OF DANGEROUS GOODS INFORMATION

The Transportation of *Dangerous Goods Act* is designed to protect the public and the environment from hazards associated with shipping dangerous goods. The current anhydrous ammonia classification is 2.3 toxic gas (8). The (8) indicates a corrosive subclass.

The product identification number for anhydrous ammonia will remain as **UN 1005**.

All units carrying anhydrous ammonia must have proper safety markings. For anhydrous ammonia nurse tanks, this includes:

- Class 2.3 white and black border placards;
- The name of the tank owner;
- The words: "Caution (or Danger) anhydrous ammonia" on the sides;
- The words: "Inhalation hazard" displayed on the side;
- First aid procedures posted on the tank;
- A slow moving vehicle sign on the back of the vessel;
- A Max 40 KM/H decal on the front;
- Safe handling instruction decals; and
- Tank inspection markings.





*Owners of nurse tanks with a water capacity of more than 10,000 litres or 2,570 USWG are required to comply with additional regulations from Transport Canada.*

### **Anhydrous Ammonia Certification and Service**

All anhydrous ammonia nurse tanks must meet Transport Canada regulations. These regulations apply to all company owned vessels and those owned by the producers. Your local dealer will inspect and test your field tanks and apply certification markings as required. Contact your local dealer for more details.

It is the law that nurse tanks must have a valid certification in order to be filled.

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## SAFE TRANSPORTATION

Our commitment is to protect you, your family, our employees and the general public from the hazards of an accidental spill or leak. Dealers will ensure the equipment used to transport anhydrous ammonia is in good working condition. However, situations will occur on roadways and in the fields when handling anhydrous ammonia.



A number of rollovers have been reported due to turning too sharp in the fields. To avoid this situation we recommend additional headlands to eliminate the sharp turns. The second leading cause of incidents is the use of cellphones while operating farm equipment.

### **Other Common Incidents**

- Accidentally knocked a hose end valve open
- Moved a nurse tank without disconnecting the filling hose
- Continued use of worn-out hoses, which eventually rupture without warning
- Didn't bleed hose couplings before disconnecting
- Tanks are moved before the fill hose is disconnected
- Product discharge by not properly bleeding off system
- Operator not upwind when bleeding off lines
- Break away coupler is reconnected without properly bleeding the system
- Lack of personal protective equipment (always wear the equipment when handling anhydrous ammonia product).





***Look for any sign of damage or vandalism and report the findings immediately to the local authorities or local dealer.***

### **Daily Inspections**

Inspect equipment on a daily basis, including tires, hitch, lug nuts, gauges, hose, securing bolts, quick couplers, and securing chains. A quick visual inspection can prevent an incident from happening. *(See Nurse Tank Inspection Form in the Appendix).*

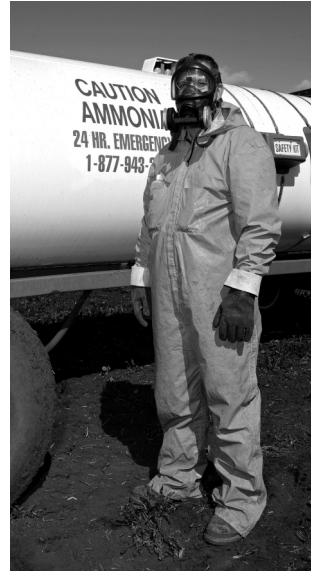
## PERSONAL PROTECTIVE EQUIPMENT

There are FOUR primary components to personal protective equipment:

- Full-face respirator APPROVED for anhydrous ammonia use.
- One/two piece anhydrous ammonia resistant suit.
- 14" *gauntlet style* neoprene gloves.
- Work boots with leather tongue, or rubber boots.

### Safety Tips

- Always have the cuffs on the gloves rolled up to prevent anhydrous ammonia from running onto your arms.
- Water is the only first aid treatment for anhydrous ammonia burns. All transports, delivery trucks, nurse tanks, and applicators must have a minimum of 20 litres (4.5 gallons) of fresh water in containers mounted high enough to provide gravity flow. Additional squeeze bottles of water should be kept in your pocket.
- Care must be taken to ensure that emergency water on anhydrous ammonia tanks does not freeze when working with anhydrous ammonia in the spring or fall. Additional 20 litres (4.5 gallons) gallons of water should be available in the tractor cab to prevent the water from freezing.

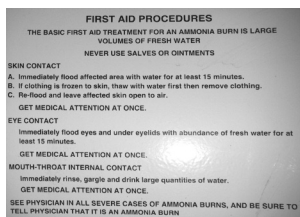


***Never wear contact lenses when working with anhydrous ammonia.***

***If anhydrous ammonia gets trapped behind your lenses, it is impossible to remove the anhydrous ammonia or the lenses.***



## FIRST AID MEASURES AND TREATMENT



*Seek immediate medical attention for any ammonia related injuries caused by exposure to ammonia.*

*Provide the doctor with the material safety data sheet. (See page 25.)*

Should exposure to anhydrous ammonia occur, the following first aid procedures will help address the emergency:

- When ammonia contacts the skin or the eyes, immediately flush the areas with water to draw out the ammonia. Continue for a minimum of 15 minutes. Keep the area moist with a wet towel. Seek medical attention.
- If ammonia burns are extensive, submerge the individual in a water tank, or place the individual in a shower if available. **Call 911 for medical attention and advise them of the ammonia related burn.**
- Due to the freezing action of ammonia, clothing may adhere to skin. Flush the area with water to thaw the clothing prior to removal.

- A person who has ingested ammonia should drink large quantities of water or other potable liquids – **Do not induce vomiting.**
- Keep victim warm and at rest. Activity may aggravate respiratory problems. Watch for signs of shock.
- If breathing stops, begin artificial respiration. Be careful not to ingest ammonia while performing mouth-to-mouth resuscitation.
- **Do not use creams or salves of any kind to treat ammonia burns.**

People who have inhaled high concentrations of ammonia vapour should be observed by a doctor for a 24-hour period.

## CHARACTERISTICS OF ANHYDROUS AMMONIA

### Anhydrous Ammonia Tank Temperature and Pressure Relationship

TEMPERATURE ( °C)	TANK PRESSURE IN PSI
- 6.72	33.5
- 1.02	45.0
+ 10	74.5
+ 26	138.0
+ 42	217.0
+47.7	247.3

#### **Anhydrous ammonia:**

- Is a gas at atmospheric temperature and pressure.
- Has a strong, pungent odour. Even small concentrations can be irritating to the eyes, skin, and mucous membranes of the nose and mouth.
- Boils and turns into vapour at  $-33^{\circ}\text{C}$ .

#### **Anhydrous ammonia:**

- Is highly alkaline, and is extremely corrosive to human flesh.
- Is lighter than air when released into the atmosphere under normal conditions, and will dissipate rapidly. However, with high humidity the vapour will take on moisture and linger in low-lying areas.
- Has a high affinity for water and will often seek it out.
- Vapours will move with the wind direction. In the event of an anhydrous ammonia leak, move to an upwind position immediately.
- Is extremely corrosive to copper, zinc, brass, and galvanized steel. Use only black iron steel pipe and fittings or stainless steel on your tanks.

***As the anhydrous ammonia's temperature rises, so does the pressure of the tank.***

***Never fill a tank beyond the 85% liquid fill level.***



## BLEED OFF PROCEDURES

***Watch for vapours that may be released from the bleeders. If pressure is not relieved in a reasonable amount of time, close off bleeders and re-tighten hose end valves. Slowly open bleeders again.***

***Never open any valve until all pressure is released from the lines by using the bleed off valves.***

Follow all safety guidelines below to minimize the risk of incidents when bleeding off any anhydrous ammonia system.

1. Park upwind, and approach the tank from the upwind direction.
2. Close the main withdrawal valve on the bottom of the nurse tank.
3. Close the hose end valve on the end of the liquid line.
4. To drain the applicator, it is recommended that the producer pull the machine up the field for approximately two–three minutes with the flow control valve open and the shanks in the ground.
5. Lift the applicator out of the ground while turning the unit into the wind and the applicator should be empty of product.
6. Put on your personal protective equipment.
7. Open the bleeders on the breakaway coupler and the hose end valve.
8. Lift up the hose running from the breakaway coupler to the nitrolator to ensure any pooled anhydrous ammonia has been removed from the hose.
9. The system should now be completely empty of any and all product.

## EQUIPMENT MAINTENANCE

Regular maintenance is crucial to ensure that your system is operating properly. Have your local dealer do a pre-season inspection of your equipment. Should you have any questions about maintenance procedures, contact a trained individual from your local dealer.

*When unsure of this process, contact your local dealer for assistance.*

### Breakaway Coupler

Inspect breakaway couplers often to ensure proper functioning. Dateless breakaway couplers require regular maintenance. They are not maintenance free. Ensure the following steps are performed to ensure peak and safe performance:

Please refer to bleed off procedures before attempting any equipment maintenance.

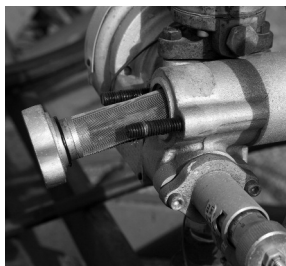
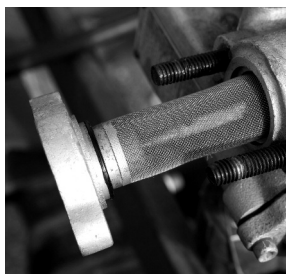
- Inspect hoses and breakaway couplers frequently. Look for worn O-rings and hoses on the nurse tank and applicator unit.
- The coupling bracket must swivel freely to allow easy turning of equipment.
- Make sure poppet valves inside the hose valve will depress and release freely. If not, have your dealer replace them immediately.
- Locking balls should move freely, and be clear and free of dirt.
- Lubricate the male and female breakaway couplers pre-season in spring and fall.





## Shank Outlets

1. Shank outlets will plug under certain soil conditions. Plugged shanks are identified by a lack of frost on the hose.
2. Before attempting to clear a plugged shank, make sure you are parked in an upwind position, and are wearing your personal protection equipment.
3. Turn off all liquid valves on the tank and applicator unit. Bleed down the entire system, using procedures on page 12.
4. Remove the anhydrous ammonia hose from the plugged shank.
5. Use a piece of wire or welding rod to unplug the outlet. Pay particular attention for broken parts leading to the shank. Reconnect the anhydrous ammonia hose.
6. Slowly reopen the withdrawal valves, starting from the nurse tank, and charge the system.
7. Resume application and watch for frosting on all the lines to ensure product flow.



## Flow Regulator

1. Occasionally the screen on the flow regulator will become clogged with dirt, restricting the flow of product.
2. **Close all valves and bleed the entire system before attempting to clean the screen.** (See bleed off procedures on page 12).
3. Remove the cap covering the flow regulator screen.
4. Remove the screen and clean any dirt on it.
5. Inspect the screen to ensure it is not excessively damaged.
6. Reinstall the screen and tighten the protective cap.

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## CONNECTING THE NURSE TANK TO THE APPLICATOR UNIT

Ensure you follow all listed safety guidelines to minimize the risk. Serious incidents can occur when connecting a nurse tank to the applicator.

1. Park in an upwind position from the nurse tank.
2. **Put on your personal protective equipment.**
3. Ensure the liquid withdrawal valve on the nurse wagon is closed (*Figure 1*).
4. Position the applicator unit and ensure the hitch pin is secured.
5. Ensure the safety chains are attached.
6. Standing upwind, open bleeder valve on the applicator's breakaway coupler to relieve any pressure.
7. Lift and shake the hose to ensure any pooled anhydrous ammonia is released (*Figure 2*).
8. Remove the protective cap on the breakaway coupler. Ensure the packing is in good condition and in place.
9. Remove the transfer hose from the nurse tank park plug. Handle by the valve body, not the valve wheel.



Figure 1



Figure 2





Figure 3



Figure 4

10. Attach the hose to the breakaway coupler on the applicator, and tighten securely (a pipe wrench is often used to secure the coupler **Figure 3**).
11. Ensure the bleed valves on the breakaway coupler and on the hose valve are closed (**Figure 4**).
12. Slowly open the hose end valve.
13. Slowly open the main withdrawal valve on the nurse tank – check for leaks. If a leak occurs, close off the nurse tank and re-tighten connections.
14. The system is now charged, and you are ready to apply anhydrous ammonia.

***If the product continues to leak after several attempts to tighten the fittings, contact your local dealer immediately.***

## DISCONNECTING THE NURSE TANK FROM THE APPLICATOR

Ensure you follow all listed safety guidelines to minimize risk of injury or incidents. Serious anhydrous ammonia burns may occur when disconnecting a nurse tank from the applicator without the appropriate personal protective equipment.

1. Park upwind, and approach the tank from the upwind direction.
2. Close the main withdrawal valve on the bottom of the nurse tank (*Figure 1*).
3. Close the hose end valve on the end of the liquid line (*Figure 2*).
4. To drain the applicator it is recommended that the producer pull the machine up the field for approximately two–three minutes with the flow control valve open and the shanks in the ground.
5. After two-three minutes of operation, lift the applicator out of the ground while turning the unit into the wind. The applicator should be empty of product.
6. **Put on your personal protective equipment.**
7. Follow bleed off procedures (*page 12*).
8. Open the bleeders on the breakaway coupler and the hose end valve (*Figure 3*).



Figure 1



Figure 2



Figure 3



Figure 4

***Never leave a charged applicator system unattended. Always close the nurse tank liquid withdrawal valve before leaving.***

9. Lift up the hose running from the breakaway coupler to the nitrolator. This will ensure pooled anhydrous ammonia has been removed from the hose (**Figure 4**).
10. The system should now be completely empty of any and all product.
11. Remove the hose from the cultivator and place the hose end on the nurse tank parking plug.
12. Place the caps on the breakaway coupler and close off bleed valves.
13. Remove safety chains from the applicator hitch.
14. Remove safety pin from nurse tank and applicator hitch. Secure the hitch so the unit does not fall on your leg or foot.

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## RECOUPLING THE BREAKAWAY COUPLER

If the nurse wagon and applicator are accidentally uncoupled, the excess flow valve on the nurse tank will automatically close preventing the release of anhydrous ammonia. When this happens the hose will be pressurized. The applicator will most likely be depressurized. Make sure the entire system is bled down before attempting to reconnect.

1. Make sure you are working from an upwind position, and are wearing your personal protective equipment.
2. Close the liquid withdrawal valves on the nurse tank and then the hose end valve.
3. Follow bleed down procedure on page 12.
4. Open the bleeder valves on the hose end and bleed the line completely. All ammonia pressure from the lines **MUST** be relieved before attempting to connect the breakaway coupler.
5. Remove the male end of the breakaway coupler from the hose end valve. Inspect for damaged fittings and components.
6. Grasp the hose from the back of the breakaway coupler that runs from the flow control valve.
7. Push and pull the hose in order to release the grab jaws in the breakaway coupler.
8. Insert the male end of the breakaway coupler into the female end of the breakaway coupler.
9. Close the bleeder valves on the breakaway coupler and hose ends.
10. Reattach the acme fitting from the nurse tank to breakaway coupler.
11. The excess flow valve on the nurse tank will reset after a few minutes. You will hear a "click."
12. Slowly open the liquid withdrawal valve on the nurse tank. Pay attention for leaks.
13. Contact your local dealer if the coupler continues to leak.

***Inspect and maintain your breakaway coupler regularly to ensure that it is functioning properly.***



## ANHYDROUS AMMONIA INCIDENT REPORTING

Anhydrous ammonia can cause serious injury to humans and the environment. Do your part to prevent ammonia incidents. Make sure you:

- **Understand the product and its characteristics**
- **Know your equipment and its limitations**
- **Train yourself and your employees**
- **Ensure all anhydrous ammonia equipment is well maintained**
- **Always wear your personal protective equipment**

*Ask your local dealer if they have an Emergency Technical Advisor who can assist you in the dangerous goods occurrence and reporting requirements under the TDG or environmental regulations.*

### Reporting Incidents

Everyone handling, transporting, or offering to transport ammonia must comply with the *Transportation of Dangerous Goods Regulations*. *The Transportation of Dangerous Goods (TDG) Act* and regulations is federal legislation which places legal responsibilities on suppliers of anhydrous ammonia. **This same regulation also applies to farm producers, the end user of anhydrous ammonia.**

Reporting is required for **company owned** or **customer owned** nurse tanks if:

- The tank is damaged and is in danger of leaking;
- The tank is leaking (spilling) and could pose a danger to public safety;
- The tank continues to leak (spill) for more than 10 minutes;
- Damage to the vehicle or tank requires trained personnel to transfer the anhydrous ammonia to another tank;
- The nurse tank has rolled on a roadway or in the field.

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## EMERGENCY RESPONSE



In the event of an incident such as a spill, leak, or rollover, your first priority is the safety of yourself, your employees, and your neighbours. All spills, leaks, and rollovers **MUST** be reported to ensure compliance with environmental and other government regulations.



### **Anhydrous Ammonia Emergency Procedure**

In any incident where anhydrous ammonia product is involved, take the following steps:

- Face the tractor upwind, proceed upwind and call for assistance.
- Evacuate immediate area or downwind residence.

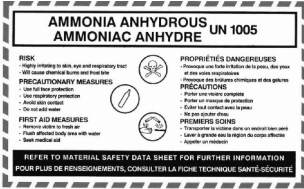
- Contact (911) Police and Fire Department. Ambulance must also be contacted if serious injuries are sustained.
- Contact the Emergency response line listed on the side of the tank or documents provided from your local dealer.

**In most cases, technical advisors will assist you in the dangerous goods occurrence and reporting requirements under the TDG or environmental regulations.**

**If product is escaping from the tank, do not attempt to shut off the valves. Wait for assistance from a safe distance.**



## WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)



*To obtain a copy of an MSDS, contact your local dealer.*

WHMIS provides information to workers about the hazards and characteristics of products found at their work site. WHMIS is a federal Act, but is administered provincially by Occupational Health and Safety. It is separate from the TDG Act and regulations; however, it concerns a number of agricultural products – including anhydrous ammonia.

Under WHMIS, any person handling a controlled product must obtain proper training that includes understanding the supplier label and Material Safety Data Sheet (MSDS), product characteristics, and storage procedures.

To comply with the regulations, all manufacturers of a WHMIS – regulated product must prepare an MSDS and a supplier label to inform consumers of the product hazards.

**The Material Safety Data Sheet** identifies: product information; hazard ingredients; physical data; fire, explosive, and reactivity limits; toxicological properties; preventative measures; first aid procedures; and preparation information.

**The Supplier Label** must: identify the product and supplier; refer to the MSDS; have a hazard symbol that identifies the product characteristics; detail the safety precautions; and provide first aid information.

## CHEMICAL PROPERTIES

<b>CATEGORY</b>	<b>CHARACTERISTIC</b>
Chemical Designation	NH <sub>3</sub>
Fertilizer Label Guarantee	82-0-0
Density	Liquid = 0.63249 Kg/l at 15.6°C Vapour = 0.597 Kg/L
Odour	Pungent
Colour	Colorless
Physical State	Atmosphere = gas Under pressure = liquid
Boiling Point	-33.3°C
Freezing Point	-77.7°C
Affinity for Water	Very High
Corrosiveness	Very corrosive to living tissue, copper, zinc, brass, and galvanized steel
Explosive Limit	12-25% by volume
Auto Ignition Temperature	651°C
Expansion Ratio	500:1





## ANHYDROUS AMMONIA SECURITY

### Important Phone Numbers

Local Dealer:

.....

Police :

.....

*If you suspect your equipment has been tampered with, call your local dealer and the local police.*

Incidents of vandalism and theft are on the rise. Take extra precautions when storing nurse tanks. Leave your equipment in an area that minimizes the risk of tampering and theft.

- Store equipment in the off season out of sight of the general public.
- Always watch for tampering on hoses, withdrawal valves, and bungs.
- Do not leave equipment unattended for extended periods of time.
- Arrange for prompt pickup of nurse tanks from the dealer you deal with.

### Locking Devices

Locking devices are available to secure the valves from theft and vandalism. Contact your local outlet for more information.

### Securing Nurse Tanks at Farm Locations

- Nurse or applicator tanks must have main access valves secured while they are stored overnight at a farm location or in a field.
- Storing a vessel inside a locked building is prohibited unless the vessel has been cleaned and purged of product.
- Nurse tanks that remain in the field overnight should be positioned to discourage tampering.

# APPENDIX

## Anhydrous Ammonia Nurse Wagon Inspection Checklist

Each time a nurse tank is filled, the following inspection must be completed. Actions must be taken immediately to repair/address any problems noted on this inspection form. All completed forms must be filed for future reference. CHECK BOX IF EACH INSPECTION ITEM IS SATISFACTORY.

Inspected by: .....	TANK #	TANK #	TANK #	TANK #	TANK #	TANK #	TANK #	TANK #
Date: MM: ..... DD: ..... Year: .....								
<b>Nurse Tank:</b> <ul style="list-style-type: none"> <li>Inspect condition of valves and clamps/hoses for cuts or scrapes.</li> <li>Push on tires to check wheel bearings and tire inflation.</li> <li>Check tightness of wheel nuts, pedestal bolts and reach bolts.</li> <li>Check welds on hitch are not cracked and safety chains are attached.</li> </ul>								
<b>Water Supply:</b> <ul style="list-style-type: none"> <li>5 gallon water tank is securely attached and full of clean water.</li> <li>Flush tubes are reachable, free of dirt and not damaged/broken.</li> </ul>								
<b>Safety Kit:</b> <ul style="list-style-type: none"> <li>Water bottle is in the safety kit and the bottle is full of clean water.</li> <li>Rubber gloves are free of cracks and are in the safety kit.</li> <li>Clean safety goggles are in the safety kit.</li> </ul>								
<b>Safety and the Farmer:</b> <ul style="list-style-type: none"> <li>The farmer has been given a copy of the anhydrous ammonia safety guidelines. The guidelines have been reviewed with the farmer with special attention paid responding to an emergency situation.</li> </ul>								
<b>Equipment Safety:</b> <ul style="list-style-type: none"> <li>Show breakaway coupler, main valve, safety kit, and water supply.</li> <li>Ask the farmer to regularly check, reach and pedestal bolts, hitch/pin.</li> </ul>								









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Conseil de la sécurité en fertilisation



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