

# GUIDELINES TO KANSAS ANHYDROUS AMMONIA REGULATIONS AND INSPECTIONS

MAY 1, 1988

KANSAS DEPT OF AGRICULTURE  
PESTICIDE/FERTILIZER PROGRAM  
109 SW 9<sup>TH</sup> STREET  
TOPEKA, KANSAS 66612-1272  
785-296-3786

## NOTE OF EXPLANATION

This is a supplement to the Kansas regulations pertaining to anhydrous ammonia and applies to all equipment and tanks used to store, transport and apply anhydrous ammonia whether owned by dealers or are for the owner's own private use. By the use of diagrams and examples, it is hoped these guidelines will aid in the interpretation of the current regulations.

These guidelines are not meant to replace the use of the current regulations, but to clarify those issues most often causing confusion.

## DEFINITIONS

Some of the terms used in these guidelines are defined as follow:

1. Anhydrous ammonia storage facility and permanent storage installation may be used interchangeably and mean any assembly of equipment consisting of appurtenances, pumps compressors, interconnecting pipes, and at least one permanent storage container. In addition, the anhydrous ammonia storage facility includes the property on which a permanent storage tank is located.
2. Permanent storage container and storage tank are used interchangeably and mean a tank or container having a volume of not less than 3,000 water gallons which is used in the sale or dispensing of anhydrous ammonia. The permanent storage container or tank may be mounted on either piers or skids.
3. Nurse tank means any container having a capacity of 3,000 water gallons or less and is mounted on a farm wagon-type trailer which is used for transporting anhydrous ammonia from a source of supply to farms or fields.
4. Applicator tank means any container having a capacity of 3,000 water gallons or less and is mounted on an implement of husbandry or application unit which is used

for applying anhydrous ammonia into the soil.

## **REPORTING OF ACCIDENTS**

The anhydrous ammonia safety regulations require that all accidents and incidents involving anhydrous ammonia and its related equipment be reported to the Secretary of Agriculture.

An accident is any property damage or injury involving anhydrous ammonia or related equipment. An incident is any unplanned release of anhydrous ammonia to the atmosphere with or without injuries resulting.

Accidents and incidents must be reported by telephone to 785-296-3786 within 72 hours and in writing within 5 working days to:

Kansas Dept of Agriculture  
Pesticide/Fertilizer Program  
Anhydrous Ammonia Safety Program  
109 SW 9<sup>th</sup> Street  
Topeka, KS 66612-1279

The failure to notify the Secretary of Agriculture of any accident or incident involving anhydrous ammonia could be construed as impeding or preventing employees of the Dept of Agriculture in the performance of their duties. Failure to comply with the regulations issued under the Kansas Anhydrous Ammonia Law 2-1212 et. seq., may be punishable by a fine of up to five hundred dollars (\$500).

## **ANHYDROUS AMMONIA**

At 60<sup>0</sup> F., ammonia is a pungent, colorless gas. When pressurized or refrigerated in a storage tank or nurse tank, it is a colorless liquid. Released from its container, ammonia may form an expanding white cloud which is usually lighter than air and easily follows air currents.

With an expansion ration of 850 to 1, a given volume of liquid ammonia will expand 850 times to encompass a potentially extensive area. Because liquid ammonia boils at minus 28 degrees, the expanding gas has the potential to freeze anything in its path of release including human flesh and organs.

There are two basic means of exposure: spray and gas. A spray of an ammonia stream from a ruptured tank or line can be expected to cause primarily eye and skin damage, while a gas cloud will cause varying degrees of lung injury and, depending on the concentration, eye and skin damage as well.

Anhydrous ammonia is easily absorbed by water. One volume of water can absorb 1,176 volumes of ammonia, a factor that contributes to human toxicity, since ammonia will keep spreading across contacted skin until the chemical is diluted by skin moisture.

Anhydrous ammonia is an alkali. Compared to acids which tend to burn and seal off a wound, alkalis cause liquidization of tissue. Alkalis turn tissues into a sticky "goo" and mix with this tissue, causing further damage. As a result, anhydrous ammonia burns keep spreading until the chemical is diluted.

In addition to liquidization, super-cooled anhydrous ammonia spray causes a freeze dry effect like frost bite when it hits the skin. The spray is also capable of freezing clothing to skin so that, if the clothing is removed incorrectly, whole sections of skin can be torn off.

Anhydrous ammonia primarily affects three areas of the body: the lungs, eyes, and skin. In the lungs, anhydrous ammonia causes destruction of delicate respiratory tissue. The effect on the eyes depends on whether a spray or gas is involved, everything from mild irritation to eye destruction can occur. Skin damage depends upon the length and concentration of exposure and can range from mild irritation, to a darkened freeze-dry burn, to tissue destruction.

As quickly as possible, decontaminate the victim. Starting with the eyes, the whole body or exposed area must be flushed with generous amounts of water; this includes the hair, ears, under chin and arm pits. Any water source is acceptable; such as showers, hoses or stock tanks. Contaminated clothing should be removed-but only after careful flushing and warming, to prevent the previously mentioned problem of skin sticking to the clothing.

A special point on skin burns, regardless of severity: creams, ointments, or jellies, should not be used. A physician should view any second or third degree freeze burns of the skin.

Training and prior planning are the keys to a successful emergency response, just as aggressive safety policies are the keys to prevention. It is important to train individuals handling ammonia on what to do if exposed to it, especially the need for quick and aggressive decontamination. It is equally important to plan escape routes and practice response procedures so that emergency personnel are not hampered in their actions and that they may safely and rapidly bring the emergency to an end.

## **LOCATION AND CONSTRUCTION OF ANHYDROUS AMMONIA STORAGE FACILITIES**

### **LOCATION:**

- 1) Before installing a new facility or relocating a stationary anhydrous ammonia container or permanent unloading facility, the owner must submit an application for the approval

of the site and a detailed drawing of the facility. The following criteria must be met:

- a) Storage containers or relocation expansion of existing facilities shall be located outside of municipalities or other densely populated areas unless the location has been approved in writing by the appropriate local governing body.
- b) Stationary containers must be not less than 50 feet from either any property line or from a source of drinking water.
- c) Stationary containers must be not less than 1,000 feet from any non-facility related business, public assembly area, hospital, nursing home, or home for the aged.
- d) The plant site must be large enough to permit an easy flow of traffic in and out of the plant, storage of implements of husbandry and adequate access for emergency personnel.
- e) Stationary containers used for storage of anhydrous ammonia must be located at least 50 feet from containers of petroleum products.

#### CONSTRUCTION:

Once a site has been selected and approved the facility must then be properly constructed. Each storage tank installed above ground must be set on reinforced concrete footings and foundations, or structural steel supports mounted on reinforced foundations. The reinforced concrete foundations or footings must extend below the established frost line and must be constructed with sufficient width and thickness to adequately support the total weight of the containers and their contents. If the tank is equipped with a bottom withdrawal valve, the tank's foundation must maintain the lowest point of the tank at not less than 18 inches above ground level. If the load-bearing surface of a skid assembly has sufficient area to properly support the skid-mounted tank, reinforced concrete footings or foundations are not required, but the skid assembly must still be set on a solid base to prevent settling.

Each horizontal above ground container must be mounted on its foundation in such a manner as to permit expansion and contraction. Also each container must be adequately supported in order to prevent the concentration of excessive loads on the supporting portion of the shell. Suitable corrosion prevention measures must also be utilized on any portion of the container which is in contact with either the foundation or saddles. A pad of bituminous impregnated material (such as those used for concrete expansion joints) can be used for this purpose. The pad minimizes the accumulation of water between the saddle and the tank and helps to prevent pitting and rust.

Since anhydrous ammonia is stored as a liquid it has a tendency to seek its own level. As a result, when two or more storage tanks are plumbed together and the liquid valves opened, the anhydrous ammonia level in them will equalize. Accordingly, if one storage tank is smaller in diameter and/or lower than the others the anhydrous ammonia will equalize and could overflow the lower storage tank and create a dangerous situation. In order to prevent this, either the tops of the storage tanks must be the same height or the storage tanks must be plumbed separately.

Only black steel pipe may be used to plumb an anhydrous ammonia storage installation. The pipe must be either ASME Schedule 80 if the joints are threaded or ASME Schedule 40 if the joints are welded. Any pipe joint compounds that are used must be ammonia resistant. All fittings must be made of material suitable for use with anhydrous ammonia and designed for 250-pounds minimum working pressure. Galvanized, cast iron, zinc, copper and brass bushings, plugs or pipe fittings may not be used.

All pipe lines must be installed as nearly as possible in a straight line with a minimum amount of pipe, and shall not be restricted by an excessive number of elbows and bends, and 90° turns must be avoided whenever possible. Adequate provision must be made to protect all exposed piping from settling. Short sections of flexible connections may be used to protect the piping from expansion, contraction, jarring, vibration and settling. Adequate guards must be used to protect exposed pipes, containers and appurtenances from damage by vehicles.

To further protect the anhydrous ammonia storage installation excess flow valves must be installed in all liquid withdrawal and vapor equalizing openings on the storage tank and at the points where the liquid and vapor fill hoses are connected to the piping. Back pressure check valves and shut off valves must also be installed at the tank car unloading riser and the transport truck unloading point as near as possible to the point where the liquid transfer hoses are connected to the piping. Also, excess flow valves must be installed at any point where the piping is reduced in size and relief valves installed anywhere liquid anhydrous ammonia can be trapped between two shut-off valves. In addition, the hose end valves must be locked to prevent tampering.

No anhydrous ammonia storage installation will be approved unless it is found to be safe and adequate, and unless the storage tank, system and appurtenances have been installed in accordance and comply with K.A.R. 4-10-1 et. seq.

## **USE AND INSPECTION OF PERMANENT STORAGE INSTALLATIONS**

The anhydrous ammonia regulations state that, from and after May 1, 1989, no person shall fill a permanent storage container with anhydrous ammonia from a transport truck or railcar, unless the storage container bears a Proof of Inspection Seal issued by the Dept. of Agriculture representatives, within the 12 previous calendar months (Effective May 1, 1989).

All storage containers within the permanent storage installation must meet minimum safety requirements. Storage containers not meeting minimum safety standards will not have a Proof of Inspection Seal affixed to the storage container and after May 1, 1989, may not be filled with anhydrous ammonia until the container is brought into compliance with the established criteria. In order to qualify for a Proof of Inspection Seal the storage container must have an inspection plate or, if a converted railroad tank car, have the information stamped on one end showing that the container is in compliance with the ASME code, have operational gauges, relief valves and excess flow valves and be properly installed.

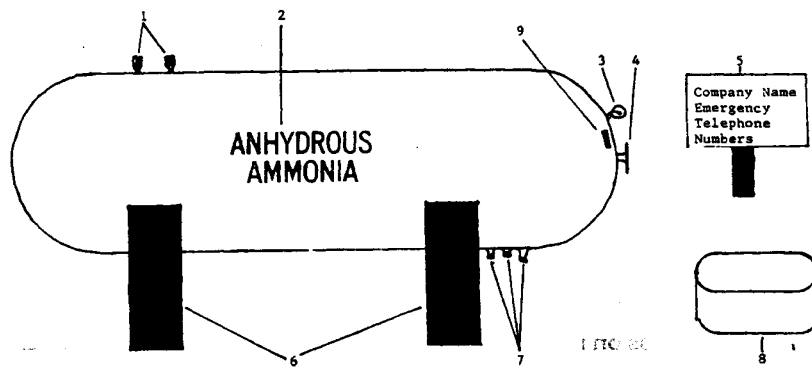
The following check list should be used for the visual examination of a permanent storage installation.

### STORAGE TANKS

	Yes	No
1. Are the tanks and piping free of rust and leaks?	_____	_____
2. Are the tank supports in good condition?	_____	_____
3. Is the paint in good condition?	_____	_____
4. Are "Caution Ammonia" or "Anhydrous Ammonia" markings (minimum of 6" lettering) in place?	_____	_____
5. Is dealers name, address and telephone number to contact in an emergency on display (after May1, 1989 must be in at least 2" lettering)?	_____	_____
6. Is the plant locked during non-business hours? (A) Main valves locked? (B) Hose end valves locked?	_____ _____ _____	_____ _____ _____
7. Are the storage tanks at least 1000 feet from the nearest public assembly area?	_____	_____
8. Are the storage tanks at least 50 feet from petroleum storage containers?	_____	_____
9. Does the container have a manufacturer's name plate showing it is a code container?	_____	_____
10. Are the vapor and liquid valves color coded or labeled (yellow for vapor and orange for liquid are the suggested colors)?	_____	_____
11. Are all hoses within their current service life?	_____	_____
12. Are the hoses marked for anhydrous ammonia use?	_____	_____
13. Do the hoses have cuts, soft spots or bulges, blistering, kinking or flattening, indicators that the hose may have been stretched, or slippage at the coupling?	_____	_____

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|---|-------|-------|
| 14. Are excess flow valves in place?  | _____ | _____ |
| 15. Does the storage tank have an operational pressure indicating gauge graduated from 0-400 psig?        | _____ | _____ |
| 16. Are automatic back-check valves installed?  | _____ | _____ |
| 17. Are relief valves installed?  | _____ | _____ |
| 18. Are relief valves installed at correct height?  | _____ | _____ |
| 19. Are rain caps on relief valves in place?  | _____ | _____ |
| 20. Is piping ASME schedule 80 (screw type) or ASME schedule 40 (welded)?                                 | _____ | _____ |
| 21. Is piping protected from vehicular damage?  | _____ | _____ |
| 22. Does the storage tank have an operational percentage fill gauge?                                      | _____ | _____ |
| 23. Are only approved NH <sub>3</sub> valves installed?   | _____ | _____ |
| 24. Safety water container of sufficient size to immerse an employee body or drench shower available?     | _____ | _____ |
| 25. Full face gas mask with a current ammonia canister or a self contained breathing apparatus available? | _____ | _____ |
| 26. Rubber or suitable plastic protective gloves available?   | _____ | _____ |
| 27. Rubber or suitable plastic protective boots available?  | _____ | _____ |
| 28. Rubber or suitable plastic protective rain suit, including both pants and coat, available?            | _____ | _____ |
| 29. Flexible fitting, splash proof pair of goggles available?   | _____ | _____ |
| 30. Does the storage facility have a valve suitable for venting ammonia from transfer hoses into water?   | _____ | _____ |

# STORAGE TANK REQUIREMENTS



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|--|--|
| 1) Safety relief valves with manifolds   | 6) Reinforced footings and foundations   |
| 2) "CAUTION AMMONIA" or "ANHYDROUS AMMONIA" visible on two sides (at least 6" lettering)                           | 7) Excess flow valves installed and liquid and vapor valves labeled or color coded |
| 3) Fully operational pressure gauge  | 8) Emergency safety water (sufficient size to immerse body or a drench shower)     |
| 4) Fully operational percentage fill gauge   | 9) Inspection plate showing that the container is in compliance with the ASME code |
| 5) Ownership identification with emergency contact telephone numbers (on May 1, 1989, must be at least 2" letters) |  |

## MARKING OF PORTABLE CONTAINERS

All anhydrous ammonia nurse tanks and applicator tanks must be marked with 4 inch "Caution Ammonia" ("Anhydrous Ammonia" may be used instead) signs on two sides and the rear; a safety instruction decal; the owners name, address and telephone number; and an alphabetical or numerical identification. In addition the liquid and vapor valves must be labeled or color coded. Facilities on or near the State line will also have to have the nurse tanks and applicator tanks marked with green non-flammable gas placards in accordance with Department of Transportation (DOT) requirements in addition to the marking required by the State of Kansas. Any time a nurse tank or applicator tank crosses the State line DOT considers them to be engaged in interstate transportation and, as a result, they must meet DOT requirements as well as the requirements of the State that they are operating in.

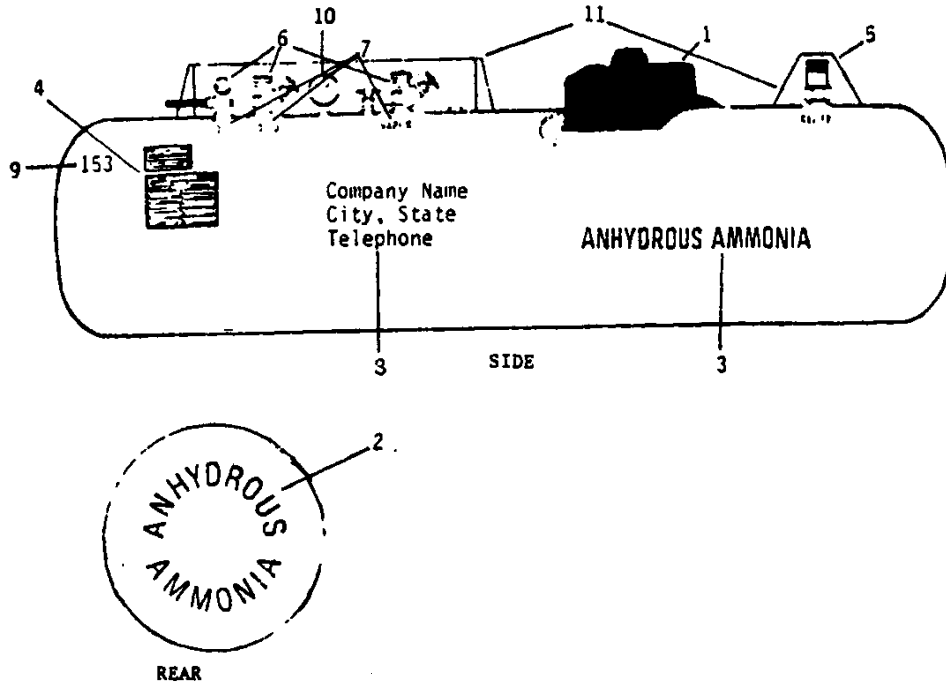
### NURSE TANKS

	Yes	No
1) Are the container, valves and gauges free of rust and leaks?	_____	_____
2) Are "Caution Ammonia" or "Anhydrous Ammonia" markings (minimum 4" markings) in place on both sides and rear?	_____	_____
3) Is a tank identification number or letter evident?	_____	_____
4) Is the paint in good condition?	_____	_____
5) Does the tank have the dealers name, address and phone number (We recommend 2" lettering be used)?	_____	_____

- 6) Does the tank have an operational fixed liquid level gauge? \_\_\_\_\_
- 7) Does the tank have an operational liquid level float gauge? \_\_\_\_\_
- 8) Does the tank have an operational pressure indicating gauge with a dial graduated from 0-400 psig? \_\_\_\_\_
- 9) Is the filling connection fitted with an approved combination back-pressure check valve and excess-flow valve or an internal excess flow valve? \_\_\_\_\_
- 10) Does the tank have an approved vapor return valve? \_\_\_\_\_
- 11) Does the tank have acme caps on vapor or liquid valves not in use? \_\_\_\_\_
- 12) Is the hose within the service life for that type of hose? \_\_\_\_\_
- 13) Does the hose have cuts, soft spots or bulges, blistering, kinking or flattening, indications that the hose may have been stretched, or is there slippage at the coupling? \_\_\_\_\_
- 14) Are the valves labeled or color coded to indicate liquid or vapor? \_\_\_\_\_
- 15) Is there a safety relief valve? \_\_\_\_\_
- 16) Is the safety relief valve rusty or in need of replacement? \_\_\_\_\_
- 17) Is the rain cap in place on the safety relief valve? \_\_\_\_\_
- 18) Have means to secure both ends of the hose during transit to prevent damage to either hose or connections been installed? \_\_\_\_\_
- 19) Has a decal been applied with the safety information detailed in the Anhydrous Ammonia Safety Regulations section 4-10-6(d)(2)? \_\_\_\_\_
- 20) Is the tongue of the trailer straight and in good condition? \_\_\_\_\_
- 21) Are safety chains installed and of correct size? (5/6" if not more than 1000 gallons, 3/8" if more than 1000 gallons) \_\_\_\_\_
- 22) Is a five gallon container of fresh clean water attached to the nurse tank? \_\_\_\_\_
- 23) Are any tanks parked within 50 feet of public streets? \_\_\_\_\_
- 24) Are people engaged in handling anhydrous ammonia wearing appropriate safety equipment? \_\_\_\_\_
- 25) Is an adequate area allocated for parking nurse tanks \_\_\_\_\_

assigned to this location? \_\_\_\_\_

## NURSE TANK MARKING REQUIREMENTS



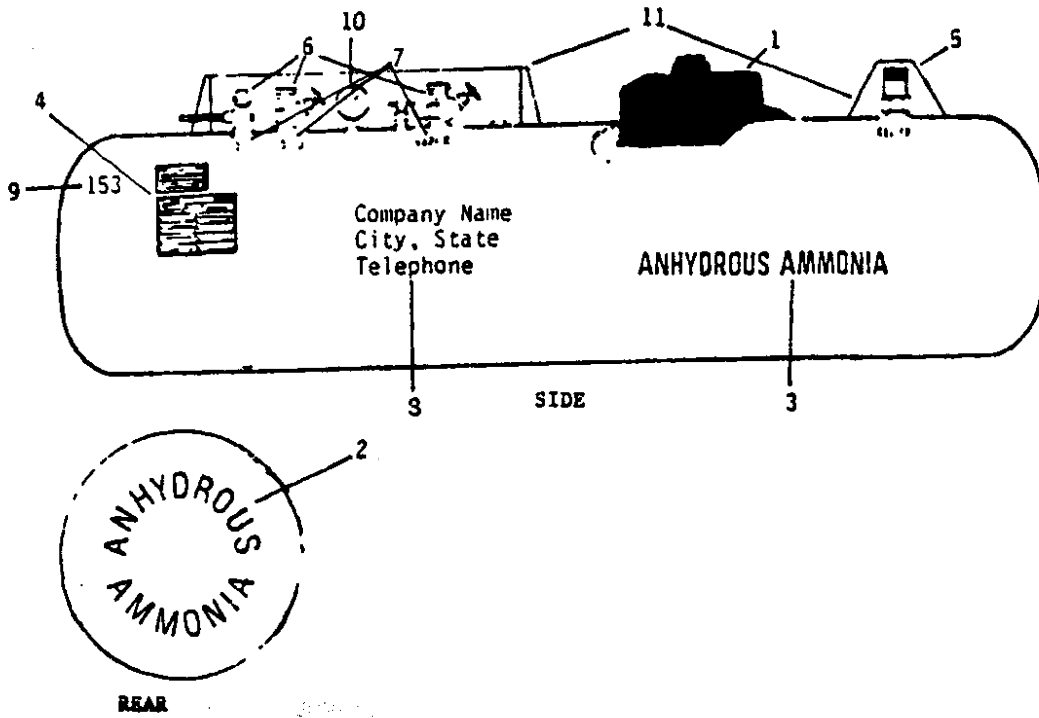
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| <ol style="list-style-type: none"> <li>1) Safety Water Container (5 gals. fresh, clean water)</li> <li>2) "CAUTION AMMONIA" or "ANHYDROUS AMMONIA" (Minimum 4" markings or rear)</li> <li>3) "CAUTION AMMONIA" or "ANHYDROUS AMMONIA" (Minimum 4" markings on both sides)</li> <li>4) Warning and first aid decal</li> <li>5) Safety relief valve (must be kept capped)</li> </ol> | <ol style="list-style-type: none"> <li>6) Vapor and liquid valves</li> <li>7) Vapor and liquid valve markings (labeled or color coded)</li> <li>8) Ownership identification (We recommend that at least 2" letters be used)</li> <li>9) Tank identification number</li> <li>10) Pressure Gauge (must be fully operational)</li> <li>11) Roll bar and relief valve guards</li> </ol> |
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## APPLICATORS

	Yes	No
1) Is the tank free of rust and leaks?	_____	_____
2) Is the paint in good condition?	_____	_____
3) Are "Anhydrous Ammonia" or "Caution Ammonia" signs of 4" height installed on both ends and the rear of the applicator tank?	_____	_____

- 4) Is an identification number or letter evident? \_\_\_\_\_
- 5) Does the tank have the dealers name, address and phone number? (We recommend 2" lettering be used) \_\_\_\_\_
- 6) Has a decal been applied with the safety information detailed in Kansas Anhydrous Ammonia Safety Regulations 4-10-7(f)(3)? \_\_\_\_\_
- 7) Is the filling connection fitted with either an approved combination back pressure check valve or a positive shut off valve? \_\_\_\_\_
- 8) Does the tank have an operational pressure indicating gauge with a dial graduated from 0-400 psig? \_\_\_\_\_
- 9) Does the tank have an operational fixed liquid level gauge? \_\_\_\_\_
- 10) Does the tank have an operational liquid level float gauge? \_\_\_\_\_
- 11) Does liquid level gauge indicate product? (Vehicles used for application of anhydrous ammonia shall not be used for the transportation of the product on roads or highways). \_\_\_\_\_
- 12) Is a five gallon container of fresh clean water attached to the nurse tank? \_\_\_\_\_
- 13) Does the anhydrous ammonia hose on the applicator tool bar have cuts, soft spots or bulges, blistering, kinking or flattening, or slippage at the coupling? \_\_\_\_\_
- 14) Has the applicator tool bar been equipped with a breakaway coupler? \_\_\_\_\_
- 15) Has the breakaway coupler been properly maintained? \_\_\_\_\_

## APPLICATOR TANK MARKING REQUIREMENTS



- 1) Safety Water Container (5 gals. fresh, clean water)
- 2) "CAUTION AMMONIA" OR "ANHYDROUS AMMONIA" (Minimum 4" markings on both ends)
- 3) "CAUTION AMMONIA" OR "ANHYDROUS AMMONIA" (Minimum 4" markings on rear)
- 4) Warning and first aid decal
- 5) Safety relief valve (must be kept capped)
- 6) Vapor and liquid valve markings (labeled or color coded)
- 7) Ownership identification (We recommend that at least 2" letters be used)
- 8) Tank identification number

## CONVERSION OF ANHYDROUS AMMONIA NURSE TANKS AND APPLICATOR TANKS TO OTHER SERVICE

Anhydrous ammonia containers of 3,000 gallon water capacity or less may not be used to store or transport any other commodity. Anhydrous ammonia nurse tanks and applicator tanks may be converted to use for other commodities using the following guidelines:

- 1) Transfer all liquid anhydrous ammonia to other containers.

- 2) Vent the ammonia vapors remaining in the container into an adequate portable supply of fresh water, taking steps to dispose of the water properly (aqua ammonia solutions may not be emptied into sewers, drainage ditches or streams).
- 3) After the container pressure is reduced to atmospheric, remove all liquid, vapor and safety relief valves before water is started into the container.
- 4) Fill the container with water to overflowing.
- 5) Drain or pump all water from the container.
- 6) Dispose of the aqua ammonia solutions properly (they must be spread over soil).
- 7) Replace the liquid, vapor and safety relief valves and fittings with valves and fittings that are approved for use with the product which the container will contain.
- 8) Remove all anhydrous ammonia markings.

Any container of 3,000 gallons or less water capacity that is used for storing or transporting any commodity other than anhydrous ammonia may be converted to anhydrous ammonia use only if all of the requirements of the regulations are met.

### **CONVERSION OF OTHER ANHYDROUS AMMONIA CONTAINERS TO OTHER SERVICE**

Container of more than 3,000 gallons water capacity used for the storage or transportation of anhydrous ammonia must be vented and purged prior to being used for any other product. Conversely, equipment used for other than anhydrous ammonia, must be vented and purged prior to being filled with anhydrous ammonia.

The following guidelines are suggested:

- 1) Transfer all liquid ammonia to other containers
- 2) Vent the ammonia vapors remaining into an adequate supply of fresh water, taking steps to dispose of the water properly (aqua ammonia solutions should not be emptied into sewers, drainage ditches or streams).
- 3) After the container pressure is reduced to atmospheric, open all top valves or remove the safety valves before water is started into the container.
- 4) Fill the container to overflowing.
- 5) Open all valves and let water flow through all valves, piping, and hoses.

- 6) Drain or pump all water from the container.
- 7) Dispose of aqua ammonia solutions properly (they should be spread over soil)
- 8) If the tank is not immediately returned to service following purging, it and all appurtenances should be thoroughly dried to prevent rusting by shutting valves and adding a dry inert gas or a small amount of the product that it will contain.
- 9) Use and install only those valves and piping approved for the product to be stored or transported.
- 10) All anhydrous ammonia markings must be removed if the container is being used to store or transport any commodity other than anhydrous ammonia.

## **VENTING PROCEDURES**

Anhydrous ammonia vapors may not be discharged into the air. Persons venting hoses and tanks must vent them into an adequate supply of fresh water. For regulatory purposes, the quantity of five (5) gallons of water per each one (1) gallon of liquid anhydrous ammonia is required. (Any substantial reduction in water quantities will result in a super-saturated liquid which will in turn result in the  $\text{NH}_3$  vaporizing, thereby reducing the effect of using the water). The water should be changed regularly to prevent super saturation. All water used to absorb anhydrous ammonia shall be treated as fertilizer and should be spread over the soil. A chart has been provided showing the conversion of vapor volume to liquid volume and the water required to safely absorb those quantities of anhydrous ammonia.

## **PERSONAL SAFETY EQUIPMENT**

The regulations require each anhydrous ammonia storage facility, transport truck and portable reactor unit to have as a minimum the following personal safety equipment for emergency and rescue purposes:

- 1) An approved gas mask with current ammonia canisters having intact seals which cover the entire face.
- 2) One pair of rubber or suitable plastic protective gloves.
- 3) One pair of rubber or suitable plastic protective boots.
- 4) One rubber or suitable plastic protective slicker or rubber or suitable plastic protective rain suit, or both.
- 5) A flexible-fitting, splash-proof pair of goggles.

The gloves and goggles are to be worn anytime an operator is handling the anhydrous ammonia hoses and operating the valves.

Saranex Tyvek, Chemrel or PVC coveralls may be substituted for the rain suit. Saranex Tyvek and Chemrel are light protective materials and are meant to be worn one or more times and are disposable. They are lightweight and easy to store and can be used as a part of an emergency response kit including the coveralls, one pair of PVC overshoes, one pair of gloves, a gas mask and a roll of duct tape to be used to seal openings in the protective clothing.

Gas masks and other personal safety equipment should be kept at a location away from the storage tanks to allow easy access in case of a leak. Canister type gas masks are usable only in ammonia concentrations of 3 percent or less by volume. A good rule to use would be if a white vapor cloud can be seen only a self-contained breathing apparatus should be used.

Canisters generally have a three (3) year life span. Not only do the chemicals deteriorate over-time, but the heat and relative humidity will affect the life span of the canister. Canisters must be disposed of if the seals have been broken or removed, or upon the expiration date.

Dealers should conduct regular safety meetings for their employees to instruct them in the proper use of personal safety equipment and what to do in case of an emergency.

## **WATER REQUIREMENTS**

### **FACILITIES:**

The regulations require an adequate supply of fresh water in a container large enough to totally immerse a person's body in case of an emergency. A fifty-five (55) gallon drum is not considered an adequate supply of fresh water. An open topped container of the facility operators choice, that contains an adequate supply of water, an operational hydrant and hose, or drench shower available within a few feet of the facility, are acceptable water sources. If a hydrant and hose are used, the hose must be attached to the hydrant at all times when the anhydrous ammonia storage facility is being operated and the hydrant must be accessible.

### **NURSE TANKS AND APPLICATOR TANKS:**

A minimum of five (5) gallons of fresh water is required on nurse tanks and applicators. A top mounted water container allowing access from either side of the equipment is preferable. This type of container allows the fresh water to flow to the affected area in case of an emergency. Containers that must be removed from a rack and poured onto the affected area are cumbersome to use. Other types of five (5) gallon water containers meet

the minimum requirements as long as they can be mounted on the nurse tank or applicator tank. All water containers must be properly maintained.

## **COLOR CODING OF VALVES**

OSHA requires liquid valves to be painted orange and vapor valves yellow. Many facilities use red for liquid valves and green for vapor valves. Either of these color combinations are acceptable. No matter what colors are used to identify liquid and vapor valves and lines, there should be a readily visible color key at the storage facility to interpret colors used.

In lieu of color coding the valves may be labeled liquid and vapor. However, whichever method is used all valves must be identified.

## **PAINTING OF ANHYDROUS AMMONIA EQUIPMENT**

White is the recommended color for anhydrous ammonia tanks. Any color other than white that is used, must be light enough to reflect light. In no case will dark colors be acceptable. The painted surface must be maintained in good condition and substantially free of rust.

## **SAFETY RELIEF VALVES**

Each anhydrous ammonia container must be equipped with one or more safety relief valves of a spring loaded or equivalent type. The relief valves must be arranged to minimize the possibility of tampering and the discharge directed upward and away from the container and shall flow in an unobstructed manner into the open air at least seven feet above the working area. A variance to this requirement may be granted where the venting of safety relief valves as previously described is hazardous, economically unfeasible, structurally unsound or for other just cause.

Because of the nature of its function there must not be any shut-off valve between the safety relief valve and the tank or piping. To provide for a means of replacing relief valves without taking the storage tank out of service, a manifold arrangement with a shut-off mechanism may be used. In such cases, the manifold has two or more relief valves, and only one can be shut off at a time. Relief valves may then be easily replaced when due for replacement or when they go bad, but they should never be turned off otherwise.

All safety relief valves must have suitable rain caps that will keep water and dirt out and allow free discharge of anhydrous ammonia vapor. Despite precautions the spring in the safety relief valve may eventually weaken or the relief valve may rust. As a result, in order

to prevent any problems the safety relief valves should be replaced five (5) years from the date of manufacture.

## **EMERGENCY PROCEDURES**

The wide range in size, arrangement and location of anhydrous ammonia installations precludes the inclusion of detailed provisions completely applicable to all installations. Provisions in this section are subject to verification or modification through analysis of local conditions.

The planning for effective measures for control of inadvertent anhydrous ammonia release shall be coordinated with the local emergency preparedness coordinator and rescue units, fire and local police departments. Such measures require knowledge and training not commonly present in the training programs of emergency response agencies. Planning shall consider the safety and training of emergency personnel.

The mode of protection and procedures shall be arrived at through competent safety analysis of local conditions of the hazard within the anhydrous ammonia facility, exposure to or from other properties, the water supply and probable effectiveness of emergency and fire rescue units.

The first consideration for an emergency should be the in-plant development of a written operational plan for an emergency situation to be prepared and posted at each permanent location. The plan should provide for each employee's responsibilities to include:

- a) The evacuation of persons not required to deal with the emergency.
- b) The use of suitable respiratory protection
- c) The use of gauntlet gloves or rain suits in heavily contaminated areas
- d) Knowing the location of appropriate valves
- e) Knowing of where and how to cut off electric power to pumping motors
- f) Knowledge of how to notify local fire and rescue units

Emergency procedure planning should include a program to be held with local fire and rescue units to include:

- a) Education on the properties of anhydrous ammonia
- b) Familiarization with the location of appropriate valves and how to shut them off
- c) Instructions on the location of electric power source in order to shut off motors on pumps or compressors
- d) Provision of an adequate water supply

Suitable roadways or other means of access for emergency equipment must be provided.

Emergency controls shall be conspicuously marked and controls shall be located so as to be readily accessible in emergencies.

## NH<sub>3</sub> CONVERSION TABLE

The following table is to be used when purging pressure vessels\*, hoses or piping, or to determine the amount of water necessary to safely absorb the anhydrous ammonia. This table is based upon the assumption that all liquid has been removed from the pressure vessel being purged and only vapor remains. The table establishes the amount of liquid contained in the vapor, based upon 60° F. temperature.

Pressure (lbs. per sq. in.)	Pounds of NH <sub>3</sub> (Per one thousand gallons of storage)	Gallons of NH <sub>3</sub>	Gallons of Water Required
200	69	13.4	67
175	54	10.49	52
150	45	8.74	44
125	36	6.99	35
100	27	5.24	26
75	18	3.50	18
50	9	1.75	9

(Based upon 5.15lbs  
NH<sub>3</sub> per gallon at 60° F)

\*Note: To determine larger quantities of volume, multiply by the number of one thousand gallons the container is rated to hold.