IMPLEMENTATION GUIDE

JANUARY 2017

AMMONIA CODE OF PRACTICE
IMPLEMENTATION GUIDE

GENERAL COMMENTS

PERSON RESPONSIBLE

In many cases throughout this Code of Practice, someone must sign a letter assuring that certain protocols have been met. This would typically be the facility manager, however it may also be a person designated as the ammonia program co-ordinator, or the owner of the equipment. The term “person responsible” is intended to include all of these.

It is up to the “person responsible” to determine how he or she makes such assurances. They may rely on others to make these assurances. For example, a facility manager may ask an owner or service contractor to assure that all piping fittings are the correct materials and rating. However the current “person responsible” must still provide a letter making the assurance. Please note that a letter signed by a previous manager or person responsible is not acceptable for a Code audit. This imposes a duty on a new “person responsible” to assure themselves of compliance in whatever way they decide to.

CENTRAL RECORDS

Where maintenance or other records are kept at a central location, or some location other than the location being audited, a signed and dated letter from the current person responsible for the maintenance etc. will be acceptable for Code audit purposes.

SECTION A–SITING AND EXTERIOR REQUIREMENTS

A1 DISTANCE FROM PEOPLE

Application

Section A applies to sites where ammonia is kept. This is typically where there are fixed storage tanks such as at a fertilizer retail facility. It also applies to transload operations and storage of ammonia equipment; e.g., parking lots for nurse wagons or transport trucks. An ammonia transport trailer parked and used as a storage tank is also covered by this section.

Aggregate volume means the physical volume of the ammonia vessels, not the volume of ammonia present. So this section applies to a collection of empty nurse wagons or transport trucks (but not if they are emptied and de-pressured).

Introduction and Rationale

Risk management is based on risk reduction or avoidance, and risk mitigation. Anhydrous ammonia operations should be located an appropriate distance from people, to reduce the risk to people of an accidental release of the product.

Previous setback distances were based on dispersion modelling and risk analysis. A report was completed for the Canadian Fertilizers Institute (now referred to as Fertilizer Canada) in 1998 that combined probability of failure with risk to people to arrive at minimum setback distances. However, these distances were derived based on typical failure rates for normal, non-defective, properly operated equipment, and ignored human error. Practical experience indicates that human error plays a more significant role in incident frequency than equipment failure. Therefore, the distances in this standard are based on the original values, plus a safety factor to account for human or procedural error. The best practice of 3 kilometres from the boundary of a city, town, village or hamlet for new facilities is based on the standard employed by at least one company in Canada.

An example of a dispersion model for a hypothetical release of anhydrous ammonia is shown in Appendix A1. Note that this dispersion model reflects one case only and may not be representative of other situations.

Risk to the public depends on the exposure, which for ammonia includes distance from the potential hazard, and the number of people exposed. Additional emphasis is placed on locations near population concentrations, such as towns, hospitals, schools, senior

citizens homes, residential developments, etc. Therefore, an existing operation must have a thorough knowledge of the surrounding occupancies. This Code of Practice is structured such that risk management requirements increase as proximity to people decreases.

Note that Section G of this Code contains requirements for emergency planning, and contact with local emergency services. Those requirements are essentially regulatory requirements imposed by the Canadian Environmental Protection Act, and the associated Environmental Emergency Regulations.

Existing anhydrous ammonia storage and handling operations that are located closer than 500 metres to population concentrations should carefully consider the risk of continuing to operate in that present location. It is highly recommended that alternative locations be sought for the operation to decrease risk to people from an accidental release of ammonia.

Definitions

The following definitions are provided for this section:

Occupancy is defined as any residential, commercial, institutional or industrial building or structure normally occupied by people; e.g. for the purpose of this Code, a farmhouse is an occupancy, as is a small business occupied by people during the working day. A barn is not considered an occupancy.

Evacuation Sensitive Occupancy is defined as an occupancy where there are more than 10 people. This is an arbitrary number; however the intent is that rural residences and small businesses are not regarded as evacuation sensitive because smaller numbers of people are involved, but larger businesses, senior citizens homes, residential developments etc. are more sensitive due to the larger numbers of people there.

Environmentally Sensitive Area is a lake, stream, wetland etc. that contains some wildlife. Ammonia storage tanks ~~commissioned since January 2009~~certified underon or after January 1, 2011 must be at least 50 metres from an environmentally sensitive area. A ditch that tends to run wet or a dugout is not considered an environmentally sensitive area.

City, town, village or hamlet and townships–Cities, towns, villages, and hamlets are defined entities with boundaries that can be shown on a map. In some areas,

"townships" are defined more broadly than a conventional town or village etc., and their boundaries may abut.

Measurement of Distances–Distance is to be measured from

a) the nearest property line where the ammonia vessel(s) is (are) located to the official boundary of a city, town, village or hamlet;~~,~~ or

b) ~~-~~when applicable from the location of vessel (s) to the property line of ~~to~~ the nearest residential, commercial, institutional or industrial building. In the case where municipal areas abut (e.g. "townships"), distance should be measured to a point equivalent to a conventional boundary of a city, town, village or hamlet.

Grandfathered measurement techniques

Facilities certified to previous versions of this code (2012 or earlier) are exempted from meeting this criterion unless the site undergoes a significant renovation/expansion or the facility has lapsed certification (see Renovation of Certified Facilities and Lapsed Certification policies). Facilities that obtained certification prior to January 1, 2017 shall respect previous measurement techniques which are: Distance is to be measured from the ammonia vessel(s) to the official boundary of a city, town, village or hamlet, or when applicable to the nearest residential, commercial, institutional or industrial building. In the case where municipal areas abut (e.g. "townships"), distance should be measured to a point equivalent to a conventional boundary of a city, town, village or hamlet.

Satellite Site–Each fixed storage tank will be considered a separate site with its own Ammonia Code of Practice number and its own Code audit. "Satellite sites" where there is no storage tank such as nurse tank storage areas are regarded as linked to the main site, and are a part of the same audit. An operation that has no fixed storage tank such as a transport truck operation will be regarded as the 'main' operation and any other facilities such as parking lots would be satellites to that main location. A transload site will be treated in the same way as a fixed storage site.
Refer Appendix A1.

The following points are provided to clarify the requirements of the items in Section A1 in the Code:

A1.1 Siting Requirements for New Facilities

"New" is defined as ~~coming into operation~~ being certified under the Ammonia Code of Practice on or after January 1, 2017~~09~~.

Both distances apply. A ~~new ammonia~~facility that is seeking certification on or after January 1, 2017 ~~operation~~ must be 3.0~~1.5~~ kilometres from population concentrations as well as 500 metres from the nearest point of the storage vessel to the property line of an occupancy (or may have the potential of an occupancy) such as a rural residence, farmhouse or a small business. ~~a farmhouse or other small (non-evacuation sensitive) occupancy~~.

Property lines that are not surveyed or marked for a rural residence will be determined as the nearest part of the tank to the nearest physical point of the property, trees around the acreage, fenced area around the property etc). Where this is the case; **this will be determined in discussions with the land owner.** All new siting will be approved by the CFI Lead Auditor before they can be approved by the local Auditor).

While permissions from local authorities is a requirement for this section, local authority permission or an operating permit from a regulatory authority by itself does not constitute compliance with this section.

Grandfathered Siting Distances
Facilities certified to previous versions of this code (2012 or earlier) are exempted from meeting this criterion unless the site has undergoes a significant renovation/expansion or the facility has lapsed certification (see Renovation of Certified Facilities and Lapsed Certification policies). Facilities that obtained certification prior to January 1, 2017 shall respect previous siting requirements which are:

- *1.5 km from the boundary of a city, town, village or hamlet*
- *500m from any occupancy*
- *50m from an environmentally sensitive area*

Those facilities that were certified under the Ammonia Code of Practice prior to January 1, 2011 and did not meet the minimum distance requirements (stated above) shall be exempted from this criterion unless the site undergoes a significant renovation/expansion or the facility has lapse certification (see Renovation of Certified Facilities and Lapsed Certification policies).

A1.2 ALL OPERATIONS LESS THAN 500 METRES FROM POPULATION CONCENTRATIONS OR LESS THAN 100 METRES FROM ANY OCCUPANCY.

All anhydrous ammonia storage and handling operations located less than 500 metres from the boundary of a city, town, village, hamlet or from an evacuation sensitive facility (e.g. hospital, school or senior citizens home), or less than 100 metres from any occupancy (e.g. a rural residence).

A1.2(a) Pullaway Protection

The weakest link in ammonia pressure equipment is the hose. If a vehicle moves away before a loading or unloading hose is properly disconnected, the hose is likely to be ruptured and ammonia will be released. There are requirements for excess flow valves in Section B of this Code, however for operations close to people, it is prudent to install additional protection.

Pullaway protection is defined as emergency shutoff capability in the event of a pullaway. Examples include tripod couplers and wire actuated emergency shutoff devices, air actuated shutoff, electronic/wireless actuated shutoff, etc. Excess flow valves alone are not regarded as adequate for compliance with this section.

Most provincial regulations require check value in load in lines. The best practice is to include both liquid and vapour lines.

~~Note – Effective January 1, 2017 a~~All sites ~~will be~~are required to have pull away protection installed on both liquid and vapour hose connections ~~for~~ (both in load and out load). Best practice is to install and operate a remotely or automatically activated emergency shutdown system.

A1.2(b) Security Precautions

Ammonia is a target for criminals involved in the drug trade, and interference with ammonia equipment may result in a release of ammonia. For this reason it is prudent to take additional security measures for operations close to people.

The most effective form of security fencing is a six-foot high chain link fence topped with three strands of barbed wire leaning outwards. Note that statutory regulations in many areas require fencing around ammonia storage tanks. Compliance with this section of this Code is achieved when three strands of barbed wire are installed atop any fencing surrounding ammonia equipment.

A second precaution is to install some form of security lighting. This may take the form of motion-activated lighting, or dusk to dawn switches etc. For sites without power, a battery operated motion detector equipped lighting system would suffice. Note that operational lighting is required in Section A5 to enable safe operation during hours of

darkness. The same lighting can do double duty as security lighting for purposes of this section, with the addition of a motion detector switch or dusk to dawn switch.

A1.3 COMMUNICATION WITH LOCAL PEOPLE.

A1.3 (a) Annual Contact with people within 3.0 kilometres

Local residents, business, towns etc. should have some knowledge about the emergency response plan for the ammonia operation.

This communication will include information about the method of notification people will receive if there is an emergency incident at the operation, and emergency contact numbers.

This requirement applies to everyone within a 3 kilometre radius of the ammonia operation. Compliance with this requirement may be achieved by sending an annual letter containing the required information. The auditor will expect to see a list of the affected stakeholders, and a dated copy of the information package.

Note: “Contact with local people” does not mean that each individual must be contacted. Contact should be with appropriate representatives. So for a town it might be the Mayor or Reeve, for an evacuation sensitive facility it might be the manager, for a rural residence it might be the head of the family or equivalent.

A1.3 (b) Annual Contact with Local People within 1.5 kilometres

People living near an ammonia operation are entitled to know that the operation is there and what the hazard is in the event of an emergency. Section A1.3(a) of this Code requires that people within 3 kilometres be informed that the operation is there and deals with ammonia. The requirements of this section A1.2(b) are additional for people within 1.5 kilometres of the operation.

This requirement may be satisfied by sending an annual letter containing basic information on emergency contact numbers, an indication of the emergency response procedure including the potential to be asked to shelter in place etc., and a fact sheet about ammonia. Sample documents are available in Appendix A1.3.

“Contact with local people” does not mean that each individual must be contacted. Contact should be with appropriate representatives. So for a town it might be the Mayor

or Reeve, for an evacuation sensitive facility it might be the manager, for a rural residence it might be the head of the family or equivalent.

A1.3 (c) Annual Contact with Local People within 500 metres

This requirement is in addition to Section A1.3 (a & b). The ammonia operation must invite local people (occupancies within 500 metres) annually to participate in an emergency response preparedness session. This session must cover the essential elements of the operation's emergency response plan as it applies to the local people. Typical content would include awareness of the nature and properties of ammonia, type of incident that might occur, contact information in the event of an emergency, emergency measures, such as shelter, in place.

Compliance for the purpose of this Code will be demonstrated by dated letters inviting local people to such a program. There is no requirement to have everyone attend. While that is the ideal situation, the main point is that people be given the opportunity.

"Contact with local people" does not mean that each individual must be contacted. Contact should be with appropriate representatives. So for a town it might be the Mayor or Reeve, for an evacuation sensitive facility it might be the manager, for a rural residence it might be the head of the family or equivalent.

A2 DISTANCE FROM ANHYDROUS AMMONIA STORAGE AND HANDLING OPERATION TO ROADWAY OR RAILWAY

The anhydrous ammonia storage and handling operation complies with the setback distances as prescribed by provincial or federal Regulations.

Introduction and Rationale

Setback distances are specified for many reasons including future development, maintaining sight lines, safety of the occupants of the transport vehicles, and the danger of impact due to moving rail cars or vehicles.

The hazard for anhydrous ammonia operations near rail lines and highways is primarily related to

- Impact due to derailment, or
- Vehicle accident, which could come into contact with the storage vessel or equipment.

There have been a number of incidents within the anhydrous ammonia industry and other industries where trains and/or vehicles have inadvertently run into hazardous product storage vessels.

Federal, Provincial and Municipal Regulations contain requirements for set back distances to right of ways for roads, railways and other areas. The requirements are specified in the following:

- Canadian Transportation Act and Regulations
- Provincial Boiler and Pressure Vessels Codes
- Transportation of Dangerous Goods Act and Regulations
- Highway Traffic Act & Regulations
- Railway Safety Act
- Municipal Planning Acts
- Canadian Transportation Commission (CTC) General Order 33.

These requirements may apply to anhydrous ammonia operations, temporary anhydrous ammonia operations (e.g. transloads) and transportation (e.g. rail cars stored on a siding). If no licence or permit from the relevant authority is available, compliance will be demonstrated by documentation of the regulatory requirement and a physical inspection of the site, or drawings of the site.

A3 DISTANCE FROM ANHYDROUS AMMONIA STORAGE AND HANDLING OPERATION TO ENVIRONMENTALLY SENSITIVE AREAS

Anhydrous ammonia operations must have measures in place to prevent contamination of environmentally sensitive areas such as rivers, lakes, streams and wetlands.

Anhydrous ammonia is a contaminant of drinking water supplies and waterways. Precautions must be taken to prevent anhydrous ammonia from coming into contact with water wells, rivers, lakes, streams or other environmentally sensitive areas.

The primary intent of this measure is to prevent contamination from spills, leaks and incorrect disposal of anhydrous ammonia and ammonia solutions from operational or emergency activities.

Mitigation methods include:

- Appropriate site grading to divert contaminated site drainage from environmentally sensitive areas.
- Preparations for plugging of culverts with sandbags for containing water from emergency response activities.
- Berming of on-site water wells.
- Proper cleanup and disposal of spills.
- Proper inspection and maintenance program.
- Use of a bleed-off water containment system incorporating proper disposal methods.
- Identification on a site drawing of separation distance of operation from environmentally sensitive areas and the drainage path.

Federal and Provincial Regulations contain requirements for appropriate environmental precautions.

A4 SECURITY FOR ANHYDROUS AMMONIA STORAGE AND HANDLING OPERATION

The anhydrous ammonia storage and handling operation complies with the applicable requirements of the site security protocol.

Anhydrous ammonia is a hazardous chemical that provides significant risks to individuals who have not been properly trained. Anhydrous ammonia is also a theft target for criminal misuse in the illegal drug trade and for potential acts of terrorism.

A4.1 Access to Anhydrous Ammonia must be controlled at all times.

The Ammonia Code of Practice outlines important security requirements that agri-retailers are required to meet. Retail facilities must ensure that access to ammonia is controlled at all times to deter theft and vandalism. As outlined in Section A4.1 of the Ammonia Code of Practice, there are three acceptable ways to meet the security requirements.

1) **Fencing** with a 6 foot chain link fence topped by three strands of barbed wire is considered a best practice. While barbed wire is not mandatory, any fencing must be a minimum of six feet high. Page wire fencing must be topped with three strands of barbed wire to be compliant. Note that if fencing is used, there are emergency egress requirements.

2) **Valve and tank securement** is another option. It involves the locking of all valves and fittings which could provide access to ammonia, in addition to securing any portable tanks, such as using chains to lock nurse tanks to an immovable object. Valves are typically locked with chains or with special-purpose valve handle locks.

3) **Other physical means of security** such as professional security services with authorized and trained personnel to watch over the site is another acceptable way to comply. Agri-retailers can also have mobile equipment immobilized (e.g. secured with chain or steel cable to an immovable object) plus brightly coloured cable ties on all valves to indicate tampering. Cable ties must be installed such that operating the valve would break the cable tie. Another acceptable system could be to have mobile equipment immobilized plus a security system with the following minimum elements: intrusion detection system (e.g. motion detector, detector strip in driveway) and camera actuated by the detection system. Ammonia equipment must be in the camera's field of view. Other means of security can be used as long as the approach both provides a physical means of preventing or deterring unauthorized access to anhydrous ammonia and is in place for all vessels at the storage operation.

A site with a security system requires a full time power source. Gas powered generators are not acceptable for alarmed security system.

A4.2 Inspection of Unattended Sites

Unattended sites must be inspected every two weeks to detect signs of unauthorized access to ammonia. Evidence of unauthorized activity should be reported to your local police. Compliance will be satisfied by a dated check sheet signed by the person performing the inspection. Best practice is to have a written procedure listing inspection requirements including what sites are to be inspected, how often, what to look for, what to do in the event of unauthorized activity.

General Site Requirements

The general site requirements for ensuring the security of an anhydrous ammonia storage operation are

- Know your customer. All anhydrous ammonia customers must be validated prior to sale. Report any suspicious enquiries.
- Return all equipment to the storage compound after application season has ended. Do not leave mobile equipment in unsecured areas.
- Trim all trees that restrict the visibility of the operation from roadways and thoroughfares.

A5 OPERATIONAL LIGHTING

The anhydrous ammonia storage and handling operation is equipped with sufficient lighting to allow for the safe transfer of anhydrous ammonia during night time operations and deter unauthorized access to the anhydrous ammonia operation.

Appropriate lighting is required for safe operation so that work can be performed safely and warning signs can be read when the operation is being actively operated during hours of darkness. A dedicated lighting system, beyond lights attached to vehicles, must be in place for use when load and unloading

Some key points to consider when developing a lighting plan for the operation are:

- Electrical equipment located within the distance specified in the Electrical Code of Canada must conform to the Electrical Code Classification requirements.
- Copper in electrical fittings deteriorates rapidly in the presence of anhydrous ammonia. Consideration needs to be given to proper weather proof enclosures and inspection/maintenance of wiring.
- Lighting must illuminate all transfer points on the vessel.
- Lighting must be securely mounted independent of the vessel. Welding on pressure vessels to mount fittings is not permitted.
- Options include dusk to dawn lighting or motion activated lighting as a security enhancement.
- A gas generator or another non-full time power supply source (i.e. solar) is sufficient for lighting for protocol A5.

A6 EMERGENCY EGRESS

The storage vessel area is constructed in a manner to provide adequate emergency egress for personnel in case of a release of ammonia.

All fencing must provide means of emergency egress in the event of an anhydrous ammonia release. Exits must be locked when site is not in use and unlocked when site is in use. In addition, emergency exits shall be located to provide options for escape regardless of wind direction. Paths to emergency exits must be kept clear at all times.

Note that “crash bars” on emergency exits are not required, and in fact may be a security liability since they can be opened fairly easily from the outside.

(Appendix A6)

A7 FACILITY SIGNAGE

The anhydrous ammonia storage and handling operation is equipped with required warnings and emergency response signage.

A7.1 Caution/Danger Anhydrous Ammonia (Appendix A7.1)

- Signage must be present to warn of the presence of anhydrous ammonia. Its location depends on the configuration of the anhydrous ammonia site. For example, an isolated fenced storage vessel shall have this signage on the fence near the entrance. A multi-purpose site shall have the sign on the entrance and/or the storage area.

A7.2 Appendix A7.2

A7.3 No Smoking or Open Flames (Appendix A7.3)

- While anhydrous ammonia is flammable, ignition of anhydrous ammonia is unlikely. A greater hazard is damage to pressure vessels or piping due to a conventional fire from other combustible material such as wood, plant matter, diesel fuel, etc. In any case, smoking is not permitted in most Codes and regulations within 15 feet of the anhydrous ammonia vessel. Both no smoking and no open flame statements must be present on signs.

A7.4 and A7.5 Emergency Contact Signage (Appendix A7.4 and A7.5)

The intent is that adequate emergency response contact information is provided. The key elements are:

- 24 hour contact for the company
- 24 hour contact for emergency services
- Location of a publically available phone
- Located at the entrance to the storage operation

A company may have the company contact be a local manager, or a centralized 1-800 number, or some other 24 hour contact arrangement.

A8 HOUSEKEEPING

An operation dealing with hazardous materials should have a housekeeping program. The purpose is to eliminate hazardous conditions and to help create the level of operational discipline necessary to avoid incidents. A housekeeping program means scheduled inspections of operational areas for hazardous conditions. It is not an audit.

The program must specify what locations are included. Example: "Entire site within the fenceline." "Includes all off-site nurse wagon storage areas."

The program must specify who is responsible for doing housekeeping inspections, and how often they are to be done. Example: "Annually," "monthly," "before Spring season." Frequencies might be different for different locations or parts of locations depending on the nature of the facilities and the business.

An inspection checklist should be provided. Refer to the sample in the Appendices. The goal of a checklist is to serve as a reminder of what to look for.

Detecting a hazardous condition is pointless unless there is follow-up to correct it. The housekeeping program must have some means of doing this. It could be as simple as having a column on the inspection record form noting what the corrective actions was, and another column with 'completed' signatures to show that the corrective action has been done. Please refer to the sample form in the Appendices.

SECTION B–STORAGE VESSEL AND EQUIPMENT

B1 STORAGE VESSEL DESIGN AND CONSTRUCTION

The anhydrous ammonia storage vessel has been designed, constructed, operated and maintained in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

B1.1 Design and Construction Requirements

General Requirements
The intent of these requirements is to prevent failures of pressure equipment and subsequent release of the product. Unless otherwise noted, this commentary applies to all fixed anhydrous ammonia pressure vessels and pressure containing equipment.

Anhydrous ammonia pressure vessels and pressure equipment are regulated in Canada by provincial boiler and pressure vessel authorities. All Provinces require that anhydrous ammonia pressure vessels, fittings and piping conform to CSA B51. This Code requires that vessels be constructed in compliance with the ASME Boiler and Pressure Vessel Code. It also requires compliance with ANSI K61.1 Safety Requirements for the Storage and Handling of Anhydrous Ammonia and CSA B620.

In general, this means

- Anhydrous ammonia equipment must be designed AND constructed to the ASME Code, and must have a nameplate with the ASME stamp.
- The design must be approved by a professional engineer and the Provincial authority.
- Anhydrous ammonia equipment must be inspected and maintained according to regulatory requirements.
- Any work on anhydrous ammonia pressure equipment must be performed by appropriately qualified personnel as required by Provincial Regulations. For example:
    * Welding must only be done by a welder holding a current provincial certification for the type of welding being done.
    * Workers performing work on other devices, such a pumps, must have basic anhydrous ammonia safety training and be competent to do the work.
- The ASME Code is a construction Code and says nothing about repairs and modifications. However, regulations generally require that all repairs and modifications comply with the design Code.

- Piping components, fittings, and instruments must comply with the Code, or if not covered by the Code, must be designed and constructed for the pressure, temperature and service.

Canadian Registration Number (CRN)

All anhydrous ammonia storage vessels must have a valid Canadian Registration Number (CRN) issued by Provincial Boiler and Pressure Vessel officials. The CRN indicates that the design of the vessel has been reviewed by the regulatory authority and complies with pressure vessel Code requirements.

Note that the CRN should be visible on the nameplate of the vessel. If it is illegible, documentation of the CRN for that vessel is acceptable for the Code audit. However, the local Boiler & Pressure Vessel authority may require that the CRN is visible on the nameplate.

Once the tank design was approved, the design was given a CRN. These numbers have a decimal place followed by one or more numbers. The numeral 1 after the decimal place denotes B.C., 2 denotes Alberta, 3 for Saskatchewan, 4 for Manitoba, 5 for Ontario, 6 for Quebec and so on. For example, a .234 would indicate the tank was approved for use by Alberta, Saskatchewan, and Manitoba.

Note that the CRN must be valid for the province in which the tank is being used. A tank moved from one province to another might require a review and re-issue of the CRN by the applicable Provincial Boiler & Pressure Vessel Authority.

B1.2 Storage Vessel Support Foundations

Foundations and supports for anhydrous ammonia storage vessels must be appropriately designed for:

- Adequate support of the vessel, without imposing undue stresses on the vessel.
- Ground conditions. Settling can stress the vessel and piping, causing failures.
- Seismic, wind or other loads as required by local regulations. E.g., some provinces require vessels to be secured from floating off their supports in a flood.
- Non-combustible.

Best practice is to mount vessels on steel saddles, which rest on concrete pedestals on an appropriate foundation. Saddles should be designed to prevent corrosion between the saddle and the pressure shell.

Use of combustible railway ties as a fixed based is acceptable if covered with a layer of gravel so the ties are not exposed.

B1.3 Maintenance

Stationary vessels must be maintained, inspected and tested regularly ~~in accordance with~~as per regulatory requirements. Tests may include:

- Visual inspection
- Internal Testing and Inspection (Non Destructive Testing) (Appendix B1.4)
- Leak testing
- Pressure testing

Requirements vary by jurisdictions.

For ammonia vessels with manways, regular scheduled inspection, repairs if required, and subsequent testing shall be in accordance with provincial pressure vessel authority requirements. Verification for Code audit shall be through examination of routine inspection results and records and approval documentation from the provincial authority for any repairs.

Note that testing intervals may change if repairs are necessary.

Vessels without manways cannot be inspected internally, however all other inspection and testing are still required.

B2 STORAGE VESSEL VALVES, PIPING AND GAUGES

All valves, piping and gauges at the anhydrous ammonia storage and handling operation have been designed, constructed, operated and maintained in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

Valves on Storage Vessel

B2.1 Emergency Shut-off Valve

Anhydrous ammonia vessels must be equipped with an emergency shut-off device. An emergency shut-off device must be able to be operated remotely and must provide immediate shut-off of flow from the vessel to liquid discharge. Manual operation is required. Best practice is to have both automatic and manual operation. Excess flow valves alone may not prevent a release if flow is below the valve's shut-off point.

Remote operation means operation at some distance from the actual shutoff valve. The reason is that in an emergency where product is released, the valve itself may not be accessible. A typical arrangement is to run a cable from the shutoff valve to another location. Best practice is to run such cables along each side of a vessel so that operation of the shutoff valve can be accomplished from multiple different locations around the tank.

B2.2 Excess Flow Valves

All anhydrous ammonia storage vessels must be equipped with excess flow valves. Some recommendations for ensuring the proper selection and installation of excess flow valves are:

- Excess flow valves must be appropriately designed for the application in accordance with the manufacturer's recommendations.
- Excess flow valves must be matched to the designed flow rate. For example, a 3 inch excess flow valve will not operate correctly when connected to a 1-¼ inch hose.
- Note that excess flow valves are not 100% reliable. Best practice is to provide a mechanically activated shut-off device.

B2.3 Anhydrous Ammonia Valves

Some materials are not suitable for anhydrous ammonia service such as brass, copper, zinc, cast iron and non-anodized aluminium. Forged carbon steel, ductile iron, and stainless steel are suitable materials. The pressure rating of the valve must be suitable for the service.

B2.4 Hose-End Valves

Some of the most serious injuries to workers have occurred due to accidental opening of hose-end valves while handling. Therefore, it is critical that all hose-end valves be equipped with a device that prevents accidental operation of the valve while handling the hose. Several approaches are available to prevent accidental opening. This can include devices that lock the hand wheel on the valve or hand wheel guards to prevent inadvertent contact with the hand wheel.

B2.5, B2.6, B2.7–Safety Relief Valves

All pressure vessels must be equipped with pressure safety relief valves to protect the vessel from overpressure. Overpressure can occur if the vessel is over-filled, or is subjected to heat (e.g. a fire). The relief valves should be attached directly to the vessel. There should be no valve or other means of isolating the safety valve from the vessel with the following exception. A best practice is to install two safety valves on a specially designed valve manifold. This enables one valve to be isolated for maintenance, while ensuring the other valve is not isolated from the tank.

Safety valves must be suitable for anhydrous ammonia service and sized in accordance with the design of the vessel. The set point must be correct for the vessel (typically 250 psi). Safety valves should be equipped with standpipes to elevate any release of anhydrous ammonia away from personnel. Safety valve standpipes should be equipped with raincaps to prevent ingress of water or debris and corrosion or blockage of the safety valve, without obstructing discharge from the valve. Maximum length of standpipes should be 36 inches. Longer standpipes may be damaged by wind. Safety relief valves are equipped with a small drain hole at the lowest point to drain any water, leakage, or condensation. This weep hole needs to be inspected and cleaned regularly.

Safety valves have expiry dates and must be changed out prior to the expiry date. Statutory codes typically allow valves to be tested and re-installed by an authorized agency, although this may prove more expensive than replacement. Documentation of changeouts is required for audit.

B2.8 Hydrostatic Relief Valves

Hydrostatic relief valves are designed to prevent localized pressure build-up in lines where liquid may be present the piping system. Hydrostatic relief valves must be designed and installed in accordance with manufacturer’s requirements and specifications.

- Hydrostatic relief valve outlets should be pointed down or away from people.

All hydrostatic relief valves are marked with a five-year expiry date or date of manufacture, and must be replaced before expiry. Some hydrostatic relief valves are designed to re-seat once they have operated. Others are not designed to re-seat, and the manufacturer recommends they be replaced if they have operated or ‘popped.’ The reason is that the spring may have been weakened and the relief valve may not operate at the correct pressure. Therefore valves must be replaced before their expiry date, and should be replaced if they are leaking or not operating correctly. Valves that have operated may be detected by a visual inspection of the outlet with a mirror. If they have released, corrosion is usually visible on the disk. Do not look directly into the outlet.

The following industry best practices are recommended for the installation of hydrostatic relief valves:

- Standardize on 350 psi rating for hydrostatic relief valves to ensure that the hydrostatic relief valve releases prior to damaging piping or hoses.
- Best practice is for hydrostatic relief valves to have their outlets tubed to bleed-off water tanks.

Piping on Storage Vessel

B2.9 Piping Material

Schedule 40 or 80 piping is acceptable for anhydrous ammonia vessel piping systems. However, all connections on Schedule 40 piping must be welded and cannot be threaded. Threads on Schedule 40 piping results in reduced wall thickness and increased risk of cracking. Piping materials shall be suitable for anhydrous ammonia service.

It is a recommended best practice to standardize on minimum Schedule 80 piping for all anhydrous ammonia pressure piping, whether welded or threaded. This will reduce risks to the operation due to incorrect connections if Schedule 40 piping is used.

B2.10 Pipe Fittings

Incorrect selection and installation of pipe fittings can provide significant risks of a major failure in the piping system. Anhydrous ammonia, by its nature, is corrosive to materials such as brass, copper, galvanized metals and zinc. Therefore, it is critical that the piping system utilize forged steel, stainless steel, or malleable iron fittings.

Best practice is to standardize to one type of approved fitting to eliminate the possibility of installing inadequate components in the pressure piping system.

B2.11 Pipe Colour-Coding

Standardized colour-coding enables operators and emergency responders to quickly identify lines and valves. Yellow for vapour lines and orange for liquid lines have been the standard for many years.

Approved colours are safety blue, safety red and safety orange. Consult your local paint supplier for “safety colours.”

Spray fill lines are used for liquid but end in vapour space. Best practice is to label them as spray fill to eliminate confusion, regardless of their colour.

Shut-offs for all emergency shut-off systems must be colour-coded blue to allow easy identification by emergency responders.

The entire line must be painted since it may need to be traced. Safety is paramount and the lines on a pumping station, and to the vessel, need to reflect whether they are liquid or vapour lines so they can be identified and traced easily by an employee or emergency responder.

B2.12 Pull Away Protection

One of the most serious events that can occur at an anhydrous ammonia storage operation is a pull away that results in the potential for an immediate release of anhydrous ammonia. Therefore, it is critical that an emergency shut-off system be installed to mitigate the consequences of such an event. The recommended devices are:

- Hose equipped with a wire cable that actuates a spring shut-off valve (e.g. “snappy joe”).
- Tripod type safety coupler.
- Cable actuated shut-off device to ISC valves
- A “smart hose” can be obtained that has the wire cable internally, and a shut-off device at both ends of the hose.

Excess flow valves are required by most jurisdictions; however excess flow valves alone are not sufficient to satisfy this section.

Check values are an acceptable form of pull away protection on in load lines only.

B2.13 Flex Connectors for Differential Movement

Flex connectors are sometimes required to absorb differential movement. This differential movement must be in a lateral direction only since flex connectors are not designed to stretch or compress axially. Rubber connectors deteriorate with time and must be tested annually, in the same way that anhydrous ammonia hoses must be tested. Stainless steel flex connectors are available and do not have to be tested annually. Stainless steel flex connectors must be visually inspected annually to ensure movement does not exceed the manufacturer's recommended maximum, and that the external braided sheath has not suffered any damage.

Gauges on Storage Vessels

B2.14 Gauges Suitable for Service

Blank

B2.15 Level Gauges

Level gauges are required to ensure that tanks are not over-filled. Level gauges are not sufficiently accurate to use for trade. Note that some jurisdictions require more than one level device to be installed. A variety of level gauges are available including:

- Magnetic float type. Advantage: Relatively accurate, no leakage of product. May be damaged by vigorous filling when tank is empty.
- Recommended best practice is to use this type.
- Rotary type. Disadvantage: Releases product near operator. Gland is subject to leakage.
- Fixed liquid level gauge. Disadvantage: Only indicates 85% level. Releases product.

B2.16 Pressure Gauges

Blank

B3 STORAGE VESSEL HOSES

All hoses at the anhydrous ammonia storage and handling operation have been installed and tested in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

Please note: Any equipment removed from service during the off-season must be available for inspection during an audit.

B3.1 Approval for Service

All hoses used for handling anhydrous ammonia must be marked as suitable for anhydrous ammonia service by the manufacturer. Hoses are constructed with nylon or stainless steel reinforcement. Both are acceptable, however many prefer stainless steel reinforced hoses due to longer service life.

B3.2 Maximum Allowable Working Pressure (MAWP)

All hoses must be clearly marked with their maximum allowable working pressure (MAWP) or they must be removed from service. Hoses must be rated for a minimum MAWP of 350 psi (2410 kPa).

B3.3 Remove from Service Date

All hoses must be marked with a clearly visible “remove from service” date by the manufacturer. If the date cannot be read the hoses must be removed from service. All hoses that have exceeded the “remove from service” date must be discarded.

B3.4 Hose Couplings

All couplings must be suitable for anhydrous ammonia service as determined by the manufacturer. Couplings can be either crimped or bolted type. However, the recommended best practice for anhydrous ammonia hose couplings is the bolted type since industry experience has shown the crimped connections cannot be re-used if the hose has to be shortened and the coupling re-attached.

B3.5 Inspection and Hydrostatic Testing of Hoses

All hoses must be hydrostatically tested annually to identify any potential problems. In addition, hoses must be inspected annually for erosion, kinks, cracking, blistering and soft spots. Damaged or suspect hoses, altered hoses or hoses where fittings have been replaced must be hydrostatically tested before being returned to service. When not in use, hoses should be racked off the ground or removed and properly stored. Hose

testing requirements are listed in CSA B620 (Section 7), including documentation requirements.

Once a hose has successfully passed the annual visual inspection and hydrostatic test, the test date and tester initials shall be marked on the hose. It is a recommended best practice to use a metal or plastic tag attached to the hose rather than painting or other less durable methods of marking.

Recommended test pressure is 120% of MAWP. Note that industry experience is that a test pressure of 150% of MAWP may damage hose and fittings.

B3.6 Securing of Hose-End Valves

Hose-end valves must be secured when the site is left unattended to prevent unauthorized access. This can be accomplished through a variety of methods. The recommended best practice is to lock hose-end valves in metal lock boxes when not in use. For facilities with fencing, a lock box is not necessary,

Best practice is to remove hoses in the off-season and store away from the sun and exposure to the elements, or damage from snow removal, etc.

B4 STORAGE VESSEL TRANSFER PUMPS OR COMPRESSORS

The transfer pump or compressor on the anhydrous ammonia storage vessel has been designed and approved for use with anhydrous ammonia.

B4.1 Approval for Service

Pumps and compressors used in anhydrous ammonia service must be designed and approved by the manufacturer for anhydrous ammonia service. Relief valves shall be equipped with piping to direct releases away from personnel.

B4.2 Guarding of Transfer Pumps or Compressors

All transfer pumps or compressors have been equipped with guards to prevent contact with moving parts. Guards shall be constructed of non-combustible material or materials that will not react when contacted by anhydrous ammonia. In addition, the guards must be constructed to withstand the rigors of the anhydrous ammonia operation. No where should anyone be able to come in contact with the pulleys or the belts which includes the top, bottom, and sides.

B4.3 Mounting of Transfer Pumps or Compressors

All transfer pumps or compressors must be securely bolted to their respective mounts to prevent detachment during operation. In addition, the mounts must be constructed of non-combustible material.

B5 VESSEL LABELS AND MARKINGS

The anhydrous ammonia storage vessel has the required labels and markings.

Signage on an anhydrous ammonia storage vessel is critical to ensure that the hazards of the product contained within the vessel are communicated to personnel and emergency responders.

B5.1 There have been several different warnings applied to anhydrous ammonia storage tanks including “Danger Ammonia” or “Caution Ammonia” as determined by provincial requirements. Refer to Provincial Boiler and Pressure Vessel regulations to determine specific requirements.

B5.2 The primary risk with anhydrous ammonia is the inhalation hazard. Therefore, it is a requirement to mark all anhydrous ammonia storage vessels with “inhalation hazard” on the basis that this best describes the hazard presented by anhydrous ammonia.

B5.3 In order to provide an effective and universal communication tool for emergency responders, the correct Transportation of Dangerous Goods (TDG) placards must be located on the two long sides of the vessel. Stationary storage vessels are regulated by Provincial Boiler and Pressure Vessel authorities and the Workplace Hazardous Materials Information System (WHMIS), not by the TDG Regulations. However it is both permissible and desirable to have TDG placards on fixed tanks. This provides emergency responders with instant product recognition, and enables delivery personnel to confirm that they are loading into the correct tank. Transport Canada permits TDG placards to be used on fixed tanks provided the placard is the correct current placard.

B5.4 Stationary storage vessels are regulated by Provincial Boiler and Pressure Vessel authorities and the Workplace Hazardous Materials Information System (WHMIS), so WHMIS requirements apply. In this case, supplier labels are required.

B5.5 and B5.6 In order to reinforce safe handling and first aid procedures, transfer procedures and first aid procedures must be mounted at all transfer points on the storage vessel.

Other Information

The standard colour for anhydrous ammonia storage tanks is white on the basis that solar heat input is minimized. ANSI K61.1 recommends white as the primary colour for anhydrous ammonia storage tanks. There are no restrictions listed in regulations for decals or trim colours. Heat transfer calculations indicate that such minor additions on the exterior of the vessel have no significant effect on the interior temperature and pressure of the vessel.

B6 BLEED-OFF ~~VAPOUR~~ CONTAINMENT

A system for containing anhydrous ammonia vapour and liquid produced during uncoupling and bleed-off operations has been installed on the anhydrous ammonia storage vessel.

B6.1/B6.2 Design and Construction Requirements

Anhydrous ammonia is considered an atmospheric pollutant and must be contained. Venting anhydrous ammonia into the atmosphere presents hazards to personnel and the environment and should be avoided. Some jurisdictions have environmental reporting requirements for emissions.

The use of a bleed-off water tank is an effective method for capturing vented anhydrous ammonia. The design of a bleed-off water system must follow these requirements:

- The tank is at least 25 gallons in size.
- The tank is constructed of material compatible for use with anhydrous ammonia. Preference is given to poly tanks.
- Lines from all liquid and vapour bleed-off locations are routed and plumbed into the tank in order to ensure contact with water. ~~Best practice is to have both liquid and vapour lines routed and plumbed into the tank.~~
- The tank must be clearly labelled as bleed-off water etc. to distinguish it from emergency water.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

B6.3 Disposal of Contaminated Bleed-off Water

Contaminated bleed-off water from the bleed-off water tank can be applied utilizing good agronomic practice as an aqueous fertilizer provided the concentration of anhydrous ammonia in the solution has not exceeded 6%. Concentrations over 6% will damage crops and pastures. Concentrations over 10% are regulated as a hazardous product under the Transportation of Dangerous Goods Act.

Aqua Ammonia Test Kit Procedures

1) Obtain testing kit, items in the kit contain the following:

- Hydrometer – density reading device for solution testing.
- Thermometer – solution temperature reading.
- Plastic fill container – aqua ammonia solution holding container.
- Aqua Ammonia Concentration chart – determines level of ammonia solution by cross referencing density and temperature.

2) Using personal protective equipment (PPE), collect sample of aqua ammonia and place in the plastic fill container. Fill container to the 230 mL level. This will allow room for the hydrometer.

3) Place thermometer in aqua solution for one minute (or) until thermometer reading stops. Record the temperature. Remove the thermometer and wipe thermometer off. The thermometer is rated for -20 to 150ºC.

4) Place the hydrometer in the plastic fill container solution. As you place the hydrometer in the solution spin the hydrometer with the index finger and thumb. This action allows the air bubbles to release from the hydrometer to obtain a more accurate reading.

5) Allow the hydrometer to stop/float in the plastic fill container. Obtain the increment reading on the hydrometer at the solution water level. The hydrometer readings range from .900 /1.100 specific gravity levels. Reading the hydrometer accurately is important to obtain the concentration level for disposal methods.

How to read the Hydrometer:

Example, the hydrometer stops at 60 at the solution level, starting at the top of the hydrometer the reading is .900 and increases to the greater increment. Your actual reading will be .960 specific gravity in the solution.

6) Using the Aqua Concentration by Density and Temperature chart. Cross reference the density and temperature reading. The density readings displayed on the left side of the chart and temperature reading on the top. Record the percentage number indicated on the chart. The highest reading (in orange) indicates 42.4 to the lowest reading (in yellow) at 1.03. **The goal for safe disposal is six (6) per cent concentration and lower.**

7) Levels higher than **6 .00** concentration level must be diluted with water and re-tested following procedures 2-6 in this section.

B6.4 Vented Lid for Tank

The bleed-off water tank must be equipped with a vented lid in order to prevent pressure build up and inappropriate access to ammoniated water. There should be no risk of confusion with safety water troughs. Venting should be adequate to prevent the build up of a flammable vapour concentration (16%-25% anhydrous ammonia in air).

A best practice is to have the mounting platform for the bleed-off water tank raised to assist in the disposing of the contents of the tank.

B7 PERSONAL PROTECTIVE EQUIPMENT

The anhydrous ammonia storage and handling operation is equipped with the required personal protective equipment.

Generally, Occupational Health and Safety Regulations require that all reasonable precautions be taken to protect the health and safety of workers. The following are the minimum standards for worker personal protection equipment when handling anhydrous ammonia.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

B7.1 Full Face Respirator Complete With Cartridges

Anhydrous ammonia presents a significant contact risk for eyes and an inhalation risk for the respiratory system. Therefore, wearing a full-face cartridge style respirator complete is mandatory for all personnel working at the anhydrous ammonia operation. The full-face respirator also allows personnel to escape concentrations of anhydrous ammonia that may be accidentally released. The respirators must be inspected and cleaned regularly to ensure proper operation. Cartridges must be changed in accordance with manufacturer's specifications.

B7.2 One or Two-Piece Anhydrous Ammonia Resistant Suit

Direct contact with anhydrous ammonia on the skin will lead to severe burns. Therefore, a one or two-piece anhydrous ammonia resistant suit that covers the neck to ankle area is the minimum requirement to prevent accidental contact with skin. This excludes slickers, wraps, smocks and aprons. The anhydrous ammonia resistant suits also allow personnel to escape concentrations of anhydrous ammonia that may be accidentally released. The anhydrous ammonia resistant suits must be inspected and cleaned regularly to ensure proper functioning.

B7.3 Gauntlet Style Anhydrous Ammonia Resistant Gloves

To prevent additional risk of skin contact with anhydrous ammonia, all personnel working at the anhydrous ammonia operation must be equipped with minimum 14 Inch–gauntlet style anhydrous ammonia resistant gloves. The cuffs of the gloves must be rolled outward to prevent anhydrous ammonia from running down the gloves and onto the skin of a worker's forearm. Note that some people have experienced cracking of PVC and/or 'green' gloves. Neoprene is a recommended material although some people have had success with other grades of PVC.

B7.4 Safety Boots

All personnel working at the anhydrous ammonia operation must be equipped with CSA approved safety boots. The boots must be equipped with a minimum 6 inch upper to prevent contact with anhydrous ammonia and a worker's ankle area. Leather is a satisfactory material for boots. Rubber is also resistant to anhydrous ammonia, however some other materials are not. The pant legs of the anhydrous ammonia resistant suit must not be tucked inside the footwear to ensure spilled anhydrous ammonia does not run inside of the safety footwear.

B7.5 Individual Emergency Water Bottle

Contact between anhydrous ammonia and a worker's eyes can lead to significant irreparable damage to the eyes. Therefore, it is imperative that all workers at the anhydrous ammonia operation carry an individual water bottle of clean, fresh water that can be used to immediately flush eyes with water should they come in contact with anhydrous ammonia. The water in the individual water bottle must be changed regularly to ensure it is fresh.

B8 EMERGENCY EQUIPMENT

In addition to all personal protective equipment, the anhydrous ammonia storage operation is equipped with the required emergency equipment.

It is critical that all emergency response activities be conducted by individuals who have been properly trained and equipped to respond to the emergency presented. This is especially true for individuals responding to unplanned releases of anhydrous ammonia. The equipment and training required to safely enter an area contaminated with high concentrations of anhydrous ammonia requires many hours of classroom and practical training. Therefore, it is highly recommended that the emergency response plan be focused on evacuation from the affected area, not responding to the source of the leak. Operations to address the source of the leakage must be left to individuals who have been properly equipped and trained to respond. This general philosophy will guide the type of emergency equipment required at the operation.

Note:

Any equipment removed from service during the off-season must be available for inspection during an audit.

Emergency equipment must be designated as emergency equipment and not used for day to day operation.

B8.1 Respiratory Protection

As per the general emergency response philosophy, the respiratory protection should be used for evacuation from the contaminated area only. This equipment must be designated as emergency response equipment only and must be stored in a readily accessible location. The required respiratory protection for this purpose is

- Two anhydrous ammonia full-face respirators complete with at least one extra cartridge/canister for each respirator. Cartridges or canisters are acceptable.
- The expiry date on anhydrous ammonia cartridges and canisters must not be exceeded. If cartridges/canisters are open to the atmosphere, they will last 1 year from the date they are opened. Otherwise, the cartridges and canisters have a limited shelf life.
- Full-face respirators and cartridges/canisters must be clean and in good working order with all straps and attachments intact.
- Full-face respirators and cartridges/canisters must be stored in order to prevent weathering and/or damage.

B8.2 If Required by Provincial Regulations, Two Self-Contained Breathing Apparatuses (SCBA).

Please note, that some jurisdictions require the presence of two Self-Contained Breathing Apparatuses (SCBA) on site. Consult your Provincial Regulations for further information.

For those locations that are required to have an SCBA, the SCBA must be kept in good operating condition.

B8.3 Two–One or Two-Piece Anhydrous Ammonia Resistant Suit

Two one or two-piece anhydrous ammonia resistant suits suitable for contact with environments containing high concentrations of anhydrous ammonia must be provided and maintained in good working order. These suits are intended for use in emergency situations only and must not be utilized for daily operational activities at the anhydrous ammonia operation. The anhydrous ammonia resistant suits must be protected from weather (e.g. kept in a weather tight box or office).

B8.4 First Aid Kit

A fully stocked and well-maintained first aid kit must be available to treat injuries at the anhydrous ammonia operation. The first aid kit must be kept in a weather tight box or be located inside a building at the operation. First aid kits are often equipped with latex gloves, which should be exchanged with nitrile gloves since latex reacts with anhydrous ammonia. The first aid kit must be sized according to the number of workers at the operation. Consult Federal or Provincial Occupational Health and Safety Regulations for specific size requirements.

B8.5 Fire Extinguisher

Anhydrous Ammonia is combustible in certain conditions. However, the chance of a fire from anhydrous ammonia is considered to be low. Fires can still happen at an anhydrous ammonia operation from the equipment used to transport anhydrous ammonia. Therefore it is a requirement to have, as a minimum, a 10 lb. charged ABC fire extinguisher or greater located in close proximity to all transfer points on the anhydrous ammonia storage vessel.

B8.6 Safety Shower or Emergency Water Troughs

The only effective method for treating skin exposure to anhydrous ammonia is continued irrigation of the affected area with water. In the case of a major release, significant areas of a worker's body may be exposed to high concentrations of anhydrous ammonia. The best practice for treating this is through the utilization of a potable water safety shower. Where this is not practical, an immersion tank can be used. The site will require two 200-gallon immersion tanks filled with clean water. The tanks must be shaped to allow easy access to an injured worker (round tanks are preferred). Each tank must be labelled with a red cross (minimum 8 inches in height and width) on the exposed side of the tank to designate the tank as emergency response water. The tanks must be located within 10 metres of the anhydrous ammonia storage vessel and/or point of transfer.

In an anhydrous ammonia release, the anhydrous ammonia vapour will follow the wind direction. This cloud may limit access to the immersion tank if they are located close together on the site. For this reason, it is imperative to position the immersion tanks opposite each other on the site in consideration of the prevailing wind direction. This will ensure access to at least one immersion tank.

Where there is the possibility of the water in the emergency water freezing, the immersion tanks should be equipped with heaters to prevent freezing. Heaters must be protected by ground fault interruption (GFI) devices.

The water in the tanks must be drained, the tanks cleaned and refilled with clean water before each season. If the tanks become contaminated during the season with dirt anhydrous ammonia absorption or other materials, they must be drained and cleaned to ensure a fresh supply of water. Best practice is to change the water in the tanks every two weeks during the ammonia season. Another best practice is to float a 1 inch or less Styrofoam insulation sheet on the water to prevent contamination and to aid in heating. In an emergency, the foam sheet can be easily broken to gain access to the water trough.

For safety showers, it is recommended following a CSA or ANSI standard for the safety shower. Typically, the flow is 20 gallons per minute for a minimum of 15 minutes.

B8.7 Emergency Eyewash Capability

One of greatest health and safety risks at an anhydrous ammonia operation is contact of anhydrous ammonia with a worker's eyes. For this reason, it is imperative that eye

wash capability is available at the anhydrous ammonia operation. An immersion tank is not appropriate as an eyewash. It is too difficult to irrigate the eyes properly. The eyewash must be in good operating condition at all times the ammonia business is operating. In colder spring and fall temperatures, the water in the eyewash station must be kept from freezing. At the same time, it must remain accessible. If there is no dedicated eyewash facility available, eyewash capability can be accomplished by simply placing a small (1 litre) eyewash bottle, complete with eyecup, filled with clean water in each of the heated water tanks where they can be accessed in the event of an emergency.

B8.8 Wind Indicators

A very important part of responding to an emergency at an anhydrous ammonia storage operation is knowing the wind direction. An anhydrous ammonia vapour cloud will follow the wind. Therefore, realizing the wind direction will ensure that employees know the proper direction to take in order to stay clear of the vapour cloud in the event of a release. The best approach for indicating the wind direction is with a flag or windsock. Since an anhydrous ammonia cloud may obscure one wind indicator, at least two flags and/or windsocks located in different areas of the operation ~~should~~ shall be provided. The locations of these wind indicators should be chosen considering the prevailing wind direction.

B9 ELECTRICAL CODE COMPLIANCE

The anhydrous ammonia storage and handling operation's electrical system complies with the requirements of applicable regulations.

B9.1 Grounding of Vessel Against Lightning

Since most anhydrous ammonia vessels are situated in isolated areas far from concentrations of other buildings or structures, they have a significant risk of contact from lightning. Contact with lightning carries significant risk to employees and potential damage to the vessel. Therefore, it is critical that the vessel be grounded to ensure any potential strike is adequately dissipated.

B9.2 Electric Motor Compliance

Anhydrous ammonia is highly corrosive to both copper and brass. Since these two products are used extensively in the construction of electric motors, it is critical to ensure there is no contact between electrical components and anhydrous ammonia. As a result, the best practice is that all electrical motors have a minimum rating of totally enclosed fan cooled (TEFC). Consult applicable regulations to determine specific requirements. Regulations may require that electric motors within a certain distance to ammonia equipment have the appropriate hazardous area classification.

B9.3 Weather Tight Enclosures

Since anhydrous ammonia is very corrosive to electrical system components, all switches, receptacles and controls must be contained in weather tight enclosures. This requirement also prevents possible contact between electrical components and moisture. Other copper wiring, etc., should be inspected regularly for anhydrous ammonia-induced corrosion (e.g. grounding connections).

Note that ammonia falls into Class 1 Division 2 Group D (Zone 2A) hazardous area classification. Electrical equipment within a certain distance from ammonia equipment must comply with electrical code hazardous area classification requirements.

B9.4 Ground Fault Interrupter Protection

Electrical equipment immersed in water that people might have contact with must have additional protection in the form of a Ground Fault Interrupter (GFI).

Note that the Canadian Electrical Code has certain requirements for GFI protection on outdoor receptacles. Check with your local electrical inspector if you are unsure of the requirements.

SECTION C–TRANSPORT AND APPLICATION EQUIPMENT

PART 1–TRANSPORT EQUIPMENT

Note that equipment out of service for inspection, maintenance, repair etc. at the time of an audit is exempt from the audit. Such equipment must be tagged out of service prior to the date of the audit according to a written tagout procedure. Equipment that is not being used during the off-season is still subject to audit.

All anhydrous ammonia transport vessels have been designed, constructed, operated and maintained in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

C1.1 Design and Construction Requirements

Most of the requirements for transportation vessels are the same as for fixed vessels. Refer to Implementation Guide Section B1. However, transportation vessels are subject to different hazards and regulations. As a result, transportation vessels are subject to Federal Transportation of Dangerous Goods Regulations as well as ASME Code requirements. The required design Code is CSA B51, which also references the ASME Boiler & Pressure Vessel Code. Transport vehicles including transport trucks and delivery trucks must also comply with CSA B622 and CSA B620.

If a vessel data plate is illegible or not visible, equivalent documentation is acceptable for the purposes of complying with this Code of practice.

C1.2 Canadian Registration Number (CRN)

All pressure vessels must have either a Canadian Registration Number (CRN#) or a Transport Canada Registration Number (TCRN#) indicated on an affixed nameplate. These registration numbers are issued by regulatory authorities based upon submitted construction drawings for the vessel. A pressure vessel cannot legally operate within Canada without these assigned numbers being permanently affixed to the vessel on a nameplate.

If data plate is illegible or not visible, equivalent documentation is acceptable for the purposes of complying with this Code of Practice.

C1.3 Maintenance

Transport vessels must be inspected and tested regularly ~~in accordance with~~as per regulatory requirements. These tests include:

- Pressure test
- Visual inspection
- Leakage test
- Non-destructive testing

Requirements vary by type of vessel. Refer to CSA B620, National Board of Boiler and Pressure Vessel Inspectors National Board Inspection Code and other applicable regulations for specific requirements.

All vessels must only be tested at Highway Tank and TC Portable Testing Registered Facilities. The registration status of a facility can be verified at http://wwwapps.tc.gc.ca/saf-sec-sur/3/fdr-rici/highway/tanks.aspx

From time-to-time, Fertilizer Canada may mandate other applicable testing requirements to address safety concerns related to tank integrity. Such requirements will be communicated in the form of a Code of Practice bulletin and will be verifiable and enforceable under the Code.

Stress corrosion cracking (SCC) is common for those vessels carrying anhydrous ammonia due to the nature of the product. It is recommended to perform ongoing non-destructive examination tests on all vessels, but especially those that have been identified by Fertilizer Canada as a tank of concern. The National Board of Boilers and Pressure Vessels Inspectors' National Board of Inspections Code provides clear guidance on the best approach for NDE and identifies repair procedures. All tanks must also meet the CSA B620 standard.

C2 TRANSPORT VESSEL VALVES, PIPING AND GAUGES

All valves, piping and gauges on the anhydrous ammonia transport vessels have been designed and constructed in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

Valves on Transport Vessel

C2.1 Emergency Shut-off Valve

All liquid and vapour lines must be equipped with an emergency shutoff value to stop the flow of product in an emergency.

~~One exception is allowed – inlet lines may have a double seat check value instead of an emergency shutoff value.~~ Remote control means that the valve can be actuated from a location on the truck other than right at the shutoff valve (e.g. cable operated systems, air-actuated system, wireless actuation system, etc.).

CSA B620 and B622 have requirements for emergency shutoff systems for transport vessels. Requirements may be different for transport trucks and metered delivery units, and can include requirements for off-truck emergency shutoff devices. Refer to those Codes for details.

Emergency shutdown actuation devices must be colour coded blue.

If it is not apparent from the markings on the vessel that these features are installed, documentation of compliance with CSA B620 and B622 will be required for audit.

C2.2 Excess Flow Valves

All anhydrous ammonia transport vessels must be equipped with excess flow valves on all outlet lines. Some recommendations for ensuring the proper selection and installation of excess flow valves are:

- Excess flow valves must be appropriately designed for the application in accordance with the manufacturer's recommendations.
- Excess flow valves must be matched to the designed flow rate. For example, . a 3-inch flow valve will not operate correctly when connected to a 1-¼ inch hose. If the flow rating of the system is reduced below the excess flow valve rating (e.g. by installation of a smaller diameter hose or piping, an additional excess flow valve must be installed with the correct rating.

Note that excess flow valves are not 100% reliable. For this reason, and for compliance with this Code of Practice, a mechanically activated shut-off device as defined in C2.1 is mandatory.

CSA B620 and B622 both contain requirements for excess flow valves.

C2.3 Anhydrous Ammonia Valves

Some materials are not suitable for anhydrous ammonia service such as brass, copper, zinc, cast iron and non-anodized aluminium. Forged carbon steel, ductile iron, and stainless steel are suitable materials. The pressure rating of the valve must be suitable for the service.

C2.4 Hose-End Valves

Some of the most serious injuries to workers have occurred due to accidental opening of hose-end valves while handling. Therefore, it is critical that all hose-end valves be equipped with a device that prevents accidental operation of the valve while handling the hose. Several approaches are available to prevent accidental opening. This can include devices that lock the hand wheel on the valve, ~~or~~ hand wheel guards to prevent inadvertent contact with the hand wheel, or the use of snap valves.

C2.5 Safety Relief Valves

All anhydrous ammonia vessels must be equipped with pressure relief valves to prevent over pressurization of the storage vessel. The safety relief valves are mounted on the top of the vessel. Relief valves shall be installed directly on the vessel. Ensure the safety relief valves are rated for anhydrous ammonia service and sized in accordance with the design of the vessel (e.g. 250 or 265 psi). Pressure relief valves will also be equipped with raincaps to prevent accumulation of water, debris, etc., against the relief valve.

C2.6 Hydrostatic Relief Valves

Hydrostatic relief valves are designed to prevent localized pressure build-up in lines where liquid may be present. Hydrostatic relief valves must be designed and installed in accordance with the following requirements:

- Hydrostatic relief valves must be selected and installed in accordance with manufacturer's requirements and specifications.
- Hydrostatic relief valve outlets shall be pointed down or away from people.

Most hydrostatic valves are marked with a five-year expiry date or date of manufacture, and must be replaced before expiry. Some hydrostatic relief valves are designed to re-

seat once they have operated. Others are not designed to re-seat, and the manufacturer recommends they be replaced if they have operated or ‘popped.’ The reason is that the spring may have been weakened and the relief valve may not operate at the correct pressure. Therefore valves must be replaced before their expiry date, and should be replaced if they are leaking or not operating correctly. Valves that have operated may be detected by a visual inspection of the outlet with a mirror. If they have released, corrosion is usually visible on the disk. Do not look directly into the outlet.

The following industry best practices are recommended for the installation of hydrostatic relief valves:

- Standardize on 350 psi rating for hydrostatic relief valves to ensure that the hydrostatic relief valve releases prior to damaging piping or hoses.
- Best practice is for hydrostatic relief valves to have their outlets tubed away to a safe location. Brass/copper in vehicle components can be damaged by anhydrous ammonia vapour.

C2.7 Securing Discharge Valves

Transport vessels must have some method of securing the valves when the truck is left where non-authorized personnel may have access to it. This could be a lock box, locks on valves, or valves chained shut. Valve locks are commercially available. Lock boxes should be constructed from expanded metal, to prevent splashback in the event of an accidental valve opening, and to vent any seepage.

Piping on Transport Vessel

C2.8 Piping Material

Schedule 40 or 80 piping is acceptable for anhydrous ammonia vessel piping systems. However, all connections on Schedule 40 piping must be welded and cannot be threaded. All welding operations on pressure vessels must be done by pressure certified welders. Threads on Schedule 40 piping results in reduced wall thickness and increased risk of cracking. Piping materials shall be suitable for anhydrous ammonia service.

It is a recommended best practice to standardize on minimum Schedule 80 piping for all anhydrous ammonia pressure piping, whether welded or threaded. This will reduce risks to the operation due to incorrect connections if Schedule 40 piping is used.

C2.9 Pipe Fittings

Incorrect selection and installation of pipe fittings creates the risk of a major failure in the piping system. Anhydrous ammonia, by its nature, is corrosive to materials such as brass, copper, galvanized metals, and zinc. Therefore, it is critical that the piping system utilize forged steel, stainless steel, or malleable iron fittings.

Best practice is to standardize to one type of approved fittings to eliminate the possibility of installing inadequate components in the pressure piping system.

C2.10 Pipe Colour-Coding

Standardized colour coding enables operators and emergency responders to quickly identify lines and valves. Yellow for vapour lines and orange for liquid lines have been the standard for many years. Spray fill lines are used for liquid but end in vapour space. Best practice is to label them as spray fill to eliminate confusion, regardless of their colour.

Emergency shut-offs (cable operated) for all transport vessels must be colour-coded blue to allow easy identification by emergency responders.

Approved colours are safety blue, safety yellow and safety orange. Consult your local paint supplier for “safety colours.”

The entire line must be painted since it may need to be traced. Safety is paramount and the lines on a pumping station, and to the vessel, need to reflect whether they are liquid or vapour lines so they can be identified and traced easily by an employee or emergency responder.

C2.11 Hose Flex Connectors for Differential Movement

Flex connectors are sometimes required to absorb differential movement. All rubber hose used for flex connections must be inspected annually. Rubber hose flex connectors less than 1.5m long must be pressure tested at the same intervals as the tank. Rubber hose flex connectors longer than 1.5m must be pressure tested annually, in the same way that all other anhydrous ammonia hoses must be tested. Braided stainless steel flex connectors must be pressure tested at the same intervals as the tank.

C2.12 Gauges

Blank

C2.13 Level Gauges

Level gauges are required to ensure that tanks are not over-filled. Level gauges are not sufficiently accurate to use for trade. Note that some jurisdictions require more than one level device to be installed. A variety of level gauges are available including:

- Magnetic float type. Advantage: Relatively accurate, no leakage of product. May be damaged by vigorous filling when tank is empty. *Recommended best practice is to use this type.*
- Fixed liquid level gauge. Disadvantage: Only indicates 85% level. Releases product.

C2.14 Pressure Gauges

Blank.

C3 TRANSPORT VESSEL HOSES

All hoses on the transport vessel have been installed and tested in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

C3.1 Approval for Service

All hoses used for handling anhydrous ammonia must be marked as suitable for anhydrous ammonia service by the manufacturer. Hoses are constructed with both nylon and stainless steel reinforcement. Both are acceptable, however, many prefer stainless steel reinforced hoses due to longer service life.

C3.2 Maximum Allowable Working Pressure (MAWP)

All hoses must be clearly marked with maximum allowable working pressure (MAWP) or they must be removed from service. Hoses must be rated for a minimum MAWP of 350 psi (2410 kPa).

C3.3 Remove from Service Date

All hoses must be marked with a clearly visible “remove from service” date by the manufacturer. If the date cannot be read the hoses must be removed from service. All hoses that have exceeded the “remove from service” date must be discarded.

C3.4 Hose Couplings

All couplings must be suitable for anhydrous ammonia service as determined by the manufacturer. Couplings can be either the crimped or bolted type. However, the recommended best practice for anhydrous ammonia hose couplings is the bolted type since industry experience has shown the crimped connections to be less reliable, and they cannot be re-used if the hose has to be shortened and the coupling re-attached.

C3.5 Inspection and Hydrostatic Testing of Hoses

All hoses must be hydrostatically tested annually to identify any potential problems. In addition, hoses must be inspected annually for erosion, kinks, cracking, blistering and soft spots. Damaged or suspect hoses, altered hoses or hoses where fittings have been replaced must be hydrostatically tested before being returned to service. Hose testing requirements are listed in CSA B620 (Section 7), including documentation requirements.

Once a hose has successfully passed the annual visual inspection and hydrostatic test, the test date and tester initials shall be marked on the hose. It is a recommended best practice to use a metal or plastic tag attached to the hose rather than painting or other less durable methods of marking.

Recommended test pressure is 120% of MAWP. Note that industry experience is that a test pressure of 150% of MAWP may damage hose and fittings.

C4 TRANSPORT VESSEL TRANSFER PUMPS OR COMPRESSORS

The transfer pump or compressor on the anhydrous ammonia transport vessel has been designed and approved for use with anhydrous ammonia.

C4.1 Approval for Service

Pumps and compressors used in anhydrous ammonia service must be designed and approved by the manufacturer for anhydrous ammonia service. Relief valves shall be equipped with piping to direct releases away from personnel.

C4.2 Guarding of Transfer Pumps or Compressors

All transfer pumps and compressors have been equipped with guards to prevent contact with moving parts. Guards shall be constructed of non-combustible material or materials that will not react when contacted by anhydrous ammonia. In addition, the guards must be constructed to withstand the rigors of the anhydrous ammonia operation.

C4.3 Mounting of Transfer Pumps and Compressors

All transfer pumps and compressors must be secured to their respective mounts to prevent detachment during operation.

C5 VESSEL LABELS AND MARKINGS

The anhydrous ammonia transport vessel has the required labels and markings.

Signage on an anhydrous ammonia transport vessel is critical to ensure that the danger of the product contained within the vessel is communicated to personnel and emergency responders.

C5.1 Historically both TDG and Provincial Boiler and Pressure Vessel Regulations have specified different warnings applied to anhydrous ammonia transport tanks including either “Danger” or “Caution” or “Anhydrous Ammonia.” There may be requirements in both Federal and Provincial Regulations and requirements may vary from province to province.

C5.2 The primary risk with anhydrous ammonia is the inhalation hazard. Therefore, it is a requirement to mark all anhydrous ammonia transport vessels with “inhalation hazard” on the basis that this best describes the hazard presented by anhydrous ammonia. This labeling, and other labeling may also be required by TDG Regulations.

C5.3 In order to provide an effective and universal communication tool for emergency responders, the correct TDG placards must be visible from all four sides of the vessel.

C5.4 Blank.

C5.5 and C5.6 In order to reinforce safe handling and first aid procedures, these written procedures must be mounted on the transport vessel. For twin tank units, the notice need only be posted on the side where loading/unloading takes place.

C5.7 Emergency contact numbers must also be provided on the two long sides of the transport vessel. These numbers should be consistent with numbers and processes outlined in the sites emergency response plan.

Other Information

The standard colour for anhydrous ammonia storage tanks is white on the basis that solar heat input is minimized. ANSI K61.1 recommends white as the primary colour for anhydrous ammonia tanks. There are no restrictions listed in regulations for decals or trim colours. Heat transfer calculations indicate that such minor additions on the exterior of the vessel have no significant effect on the interior temperature and pressure of the vessel.

C6 TRANSPORT EMERGENCY AND PERSONAL PROTECTIVE EQUIPMENT

The anhydrous ammonia transport vessel is equipped with the required emergency and personal protective equipment.

Emergency Equipment

Note: For facilities being inspected in the off-season, this equipment must be available for inspection by the auditor. It does not have to be installed in transport vehicles & equipment if they are inactive, however it must be available for inspection.

C6.1 First Aid Kit

A first aid kit sized in accordance with regulatory requirements is to be carried in the transport unit. (Nitrile gloves are required versus latex gloves, as latex gloves will break down when exposed to anhydrous ammonia).

C6.2 ABC Fire Extinguisher

The transport unit must be equipped with at minimum a ~~10 ABC~~3A 10BC (5lb) Fire Extinguisher or greater is required by regulations.

C6.3 Emergency Water

An emergency water supply of clean, fresh water of 20 litres (5 gallons) is to be provided on every unit. The best practice is 40 litres (10 gallons) of water and available on both sides. Emergency water may also have to be protected from freezing in the spring and fall seasons.

C6.4 Roadside Emergency Kit

Every highway vehicle that transports anhydrous ammonia must be equipped with a roadside emergency kit. The roadside emergency kit comes in an orange plastic box and contains 3 triangular reflectors. These reflectors are for use in case of a release of product or if there is a problem with the vehicle.

C6.5 Communication Device

It is critical that ammonia transport operators be equipped with a communication device that allows them to remain in contact. This device can be either a two-way radio or a cell phone.

Personal Protective Equipment

Generally, Occupational Health and Safety Regulations require that all reasonable precautions be taken to protect the health and safety of workers. The following are the minimum standards for worker personal protection equipment when handling anhydrous ammonia.

C6.6 Full Face Respirator Complete with Cartridges

Anhydrous ammonia presents a significant contact risk for eyes and an inhalation risk for the respiratory system. Therefore, wearing a full-face cartridge style respirator complete with extra cartridges is mandatory for all personnel working at the anhydrous ammonia operation. The full-face respirator also allows personnel to escape concentrations of anhydrous ammonia that may be accidentally released. The respirators must be inspected and cleaned regularly to ensure proper operation. Cartridges must be changed in accordance with manufacturer's specifications.

C6.7 One- or Two-Piece Anhydrous Ammonia Resistant Suit

Direct contact with anhydrous ammonia on the skin will lead to severe burns. Therefore, a one or two-piece anhydrous ammonia resistant suit that covers the neck to ankle area is the minimum requirement to prevent accidental contact with skin. This excludes slickers, wraps, smocks and aprons. The anhydrous ammonia resistant suits also allow personnel to escape concentrations of anhydrous ammonia that may be accidentally released. The anhydrous ammonia resistant suits must be inspected and cleaned regularly to ensure proper functioning.

It is a best practice to use one piece suits which provide the best protection when used in accordance with manufacturer's operating instructions

C6.8 Gauntlet Style Anhydrous Ammonia Resistant Gloves

To prevent additional risk of skin contact with anhydrous ammonia, all personnel working at the anhydrous ammonia operation must be equipped with minimum 14-inch gauntlet style anhydrous ammonia resistant gloves. The cuffs of the gloves must be rolled outward to prevent anhydrous ammonia from running down the gloves and onto the skin of a worker's forearm. Note that some people have experienced cracking of PVC and/or 'green' gloves. Neoprene is a recommended material although some people have had success with other grades of PVC.

C6.9 Safety Boots

All personnel working at the anhydrous ammonia operation must be equipped with CSA approved safety boots. The boots must be equipped with a minimum 6 inch upper to prevent contact with anhydrous ammonia and a worker's ankle area. Leather is a satisfactory material for boots. Rubber is also resistant to anhydrous ammonia, however some other materials are not. The pant legs of the anhydrous ammonia resistant suit must not be tucked inside the footwear to ensure spilled anhydrous ammonia does not run inside the safety footwear.

C6.10 Individual Emergency Water Bottle

Contact between anhydrous ammonia and a worker's eyes can lead to significant irreparable damage to the eyes. Therefore, it is imperative that all workers at the anhydrous ammonia operation carry an individual water bottle of clean, fresh water that can be used to immediately flush eyes with water should they come in contact with anhydrous ammonia. The water in the individual water bottle must be changed regularly to ensure it is fresh.

C7 TRANSPORT VEHICLE CERTIFICATION

Vehicles transporting anhydrous ammonia must pass a safety inspection annually.

In order to ensure the proper maintenance of the anhydrous ammonia transport vessel, it is a requirement that licenced transport vehicles (including trailers) over a certain GVWR transporting anhydrous ammonia receive a current safety inspection as defined by the Commercial Vehicle Safety Alliance (CVSA). Inspection periods vary province to province so consult your local authorities.

This inspection is very comprehensive and reviews all critical operating systems in the vehicle to ensure they are working properly. The inspection is conducted by licenced mechanics that have been certified to conduct the inspection.

Vehicles used to transport ammonia tanks that are not required to have the CVSA inspection must have an annual safety inspection. This is best performed by a qualified mechanic. Maintenance records are required to satisfy the audit.

C8 SECURITY FOR ANHYDROUS AMMONIA TRANSPORT VESSELS

With the increase in the illegal misuse of anhydrous ammonia in the illegal drug trade, it is critical that security risks be addressed for transport vehicles. Experience has shown that thefts of anhydrous ammonia can happen anywhere and at anytime. Interference with transport vessels can also lead to significant releases of product.

C8.1 Securing While in Transport

Precautions must be taken to prevent interference with transport vessels during transportation, including rest stops. It is a requirement that the main access valves on the vessel be secured if the driver is out of visual contact with the vessel for more than 30 minutes.

C8.2 Parking Near Evacuation Sensitive Occupancies

Experience has shown that anhydrous ammonia releases can occur due to equipment failure. These failures can occur when vehicles are parked, even for short periods. While a well-planned and executed maintenance program will minimize this risk, it can never be prevented 100% of the time. For these reasons, it is a requirement that anhydrous ammonia transport vessels not be parked within 500 metres of high occupancy facilities such as hospitals, schools, shopping malls, daycare centers and senior care homes unless the vessel has been emptied and de-pressured.

C8.3 Off-Site Storage of Transport Vessels

The risks identified in C8.2 also require that transport vessels cannot be stored within city or town limits unless the vessels have been emptied and de-pressured. The only exception is for maintenance periods not exceeding 72 hours for emergency repairs, or if the units are kept at a compliant site. Please note that this emergency maintenance exemption is superseded by the requirement that anhydrous ammonia transport vessels not be parked within 500 metres of high occupancy facilities such as hospitals, schools, shopping malls, daycare centres and senior care homes unless the vessel has been emptied and de-pressured.

City or town limits is intended to mean the municipal boundaries of a cities, towns, villages or hamlets. Where such a boundary is not defined, judgment will have to be exercised to determine an equivalent boundary.

C8.4 Mobile Storage Vessels Main Access Valves Securement

Mobile storage vessels must have all liquid valves secured while they are in storage unless they are stored inside a locked, fenced compound that complies with the fencing

requirements in the Site Security section or they have been emptied and de-pressured. Examples of securement include valve locks or lock boxes. In load lines with check values do not require additional locking mechanisms.

SECTION C–TRANSPORT AND APPLICATION EQUIPMENT

PART 2–APPLICATION EQUIPMENT

Note that equipment out of service for inspection, maintenance, repair etc. at the time of an audit is exempt from the audit. Such equipment must be tagged out of service prior to the date of the audit according to a written tagout procedure. Equipment that is not being used during the off-season is still subject to audit.

C9 NURSE AND APPLICATOR TANK DESIGN AND CONSTRUCTION

All anhydrous ammonia nurse tanks and applicator tanks have been designed, constructed, operated and maintained in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

C9.1 Design and Construction

Transport Canada has the responsibility for nurse and applicator tanks. Their Transportation of Dangerous Goods Regulations reference the CSA B620 and B622 Standards for tank design and selection. These Standards reference the ASME Code. There are some tanks in anhydrous ammonia service which have been imported into Canada which were not manufactured to the ASME Code or to the CSA B620 and B622 Standards. These tanks must not be used for anhydrous ammonia service.

C9.2 Canadian Registration Number (CRN)

All pressure vessels must have either a Canadian Registration Number (CRN#) or a Transport Canada Registration Number (TCRN#) indicated on an affixed nameplate. These registration numbers are issued by regulatory authorities based upon submitted construction drawings for the vessel. A pressure vessel cannot legally operate within Canada without these assigned numbers being permanently affixed to the vessel on a nameplate. Documentation must be available for all nurse tanks vessels showing that they have a CRN or TCRN.

C9.3 Maintenance

Vessels must be tested regularly in accordance with regulatory requirements. These tests include pressure tests & visual inspections.

Requirements vary by type of vessel. Consult CSA B620, National Board of Boiler and Pressure Vessel Inspectors' National Board Inspection Code and other applicable regulations for specific requirements.

All vessels must only be tested at Highway Tank and TC Portable Testing Registered Facilities. The registration status of facility can be verified at: http://wwwapps.tc.gc.ca/saf-sec-sur/3/fdr-rici/highway/tanks.aspx

From time-to-time, Fertilizer Canada may mandate other applicable testing requirements to address safety concerns relating to tank integrity. Such requirements will be communicated in the form of a Code of Practice bulletin and will be verifiable and enforceable under the Code.

Stress corrosion cracking (SCC) is common for those vessels carrying anhydrous ammonia due to the nature of the product. It is recommended to perform ongoing non-destructive examination test on any vessel especially those that have been identified by Fertilizer Canada as a tank of concern. The National Board of Boilers and Pressure Vessels Inspectors' National Board of Inspections Code provides clear guidance on the best approach for NDE and identifies repair procedures. All tanks must also meet the CSA B620 standard.

C10 NURSE AND APPLICATOR TANKS VALES, PIPING AND GAUGES

All valves, piping and gauges on the anhydrous ammonia nurse and applicator tanks have been designed and constructed in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

Valves on Nurse and Applicator Tanks

C10.1 Excess Flow Valves

All anhydrous ammonia nurse and applicator tanks must be equipped with fill or withdrawal valves that incorporate excess flow valves. Some recommendations for ensuring the proper selection and installation of excess valves are:

- Excess flow valves must be appropriately designed for the application in accordance with the manufacturer's recommendations.
- Excess flow valves must be matched to the designed flow rate. For example, a 3-inch flow valve will not operate correctly when connected to a 1¼-inch hose. If the flow rating of the system is reduced below the excess flow valve rating (e.g. by installation of a smaller diameter hose or piping, an additional excess flow valve must be installed with the correct rating.
- Note that excess flow valves are not 100% reliable.
- There are Code requirements for double seat check valves on inlets, excess flow valves on outlets, and manual shutoff valves on filling and discharge lines. Refer CSA B620 for specific requirements.

A best practice is to have all nurse and applicator tanks, or combination of tanks equipped with an emergency shut-off valve to stop the flow of product from the vessel(s) in an emergency.

C10.2 Anhydrous Ammonia Valves

Some materials are not suitable for anhydrous ammonia service such as brass, copper, zinc, cast iron, and non-anodized aluminum. Forged carbon steel, ductile iron, and stainless steel are suitable materials. The pressure rating of the valve must be suitable for the service.

C10.3 Safety Relief Valves

All anhydrous ammonia vessels must be equipped with pressure relief valves to prevent over pressurization of the storage vessel. The safety relief valves are mounted on the top of the vessel. Relief valves shall be installed directly on the vessel. Ensure the safety relief valves are rated for anhydrous ammonia service and sized in accordance

with the design of the vessel (example 250 or 265 psi). Relief valves must be replaced by their expiry date, or tested and re-installed by an authorized agency. Pressure relief valves will also be equipped with raincaps to prevent accumulation of water, debris, etc., against the relief valve. They shall also be equipped with roll-over protection to prevent destruction of the valve during a roll-over accident.

C10.4 Hydrostatic Relief Valves

Hydrostatic relief valves are designed to prevent localized pressure build-up in lines where liquid may be present. Hydrostatic relief valves must be designed and installed in accordance with manufacturer's requirements and specifications.

- Hydrostatic relief valve outlets should be pointed down or away from people.

Most hydrostatic valves are marked with a five-year expiry date or date of manufacture, and must be replaced before expiry. Some hydrostatic relief valves are designed to re-seat once they have operated. Others are not designed to re-seat, and the manufacturer recommends they be replaced if they have operated or 'popped.' The reason is that the spring may have been weakened and the relief valve may not operate at the correct pressure. Therefore valves must be replaced before their expiry date, and should be replaced if they are leaking or not operating correctly. Valves that have operated may be detected by a visual inspection of the outlet with a mirror. If they have released, corrosion is usually visible on the disk. Do not look directly into the outlet.

The following industry best practices are recommended for the installation of hydrostatic relief valves:

- Standardize on 350 psi rating for hydrostatic relief valves to ensure that the hydrostatic relief valve releases prior to damaging piping or hoses.

Best practice is for hydrostatic relief valves to have their outlets tubed away to a safe location.

C10.5 Remote Emergency Shutoff System

In order to manage the risk of releases during transport or field operation, remotely operated or automatic emergency shutoff valves must be installed and functional on all new nurse tanks. Existing nurse tanks should be equipped with remotely operated or automatic emergency shutoff valves.

The system is designed to either close by activating a switch located in the tractor cab, when a breaking point in an electronic wire or air-line is separated or when the cab operator is at a physical distance from the cab/tank assembly. This system allows for prompt stoppage of flow from the nurse tanks in the event of an intended release. This reduces the risk for human and environmental exposure.

Recommendations:

- Pneumatic automatic passive emergency shutdown
- ESV activated via remote radio device
    - Loss of signal activation (running from the tanks)

Physical cable-pull activated shutdown valves is not considered best practice and must not be used as they have a history of malfunctioning.

Piping on Nurse and Applicator Tanks

C10.65 Piping Material

Schedule 40 or 80 piping is acceptable for anhydrous ammonia vessel piping systems. However, all connections on Schedule 40 piping must be welded and cannot be threaded. All welding operations on pressure vessels must be done by pressure certified welders. Threads on Schedule 40 piping results in reduced wall thickness and increased risk of cracking.

It is a recommended best practice to standardize on minimum Schedule 80 piping for all anhydrous ammonia pressure piping, whether welded or threaded. This will reduce risks to the operation due to incorrect connections if Schedule 40 piping is used.

C10.6 7 Pipe Fittings

Incorrect selection and installation of pipe fittings can provide significant risks of a major failure in the piping system. Anhydrous ammonia, by its nature, is corrosive to materials such as brass, copper, galvanized metals, and zinc. Therefore, it is critical that the piping system utilizes forged steel, stainless steel, or malleable iron fittings.

Best practice is to standardize to one type of approved fitting to eliminate the possibility of installing inadequate components in the pressure piping system.

C10.7 8 Pipe Colour-Coding

Standardized colour coding enables operators and emergency responders to quickly identify lines and valves. Yellow for vapor lines and orange for liquid lines have been the standard for many years.

Approved colours are safety blue, safety red and safety orange. Consult your local paint supplier for “safety colours.” Spray fill lines are used for liquid but end in vapor space. Best practice is to label them as spray fill to eliminate confusion.

Emergency shut-offs (cable operated) for all nurse or applicator tanks must be colour-coded blue to allow easy identification by emergency responders. (Appendix C10.8)

The entire line must be painted since it may need to be traced. Safety is paramount and the lines on a pumping station, and to the vessel, need to reflect whether they are liquid or vapour lines so they can be identified and traced easily by an employee or emergency responder

C10.~~8~~ 9 Hose as Part of the Piping System

Hose is sometimes required to absorb differential movement as part of the piping system. All rubber hose used for flex connections must be inspected annually. Rubber hose flex connectors less than 1.5 metres long must be pressure tested at the same interval as the tank. Rubber flex connectors more than 1.5 metres must be tested and marked annually, in the same way that all other anhydrous ammonia hoses must be tested. Stainless steel flex connectors must be pressure tested at the same intervals as the tank. Rubber hose must be marked as suitable for ammonia service, and the ‘remove from service’ date must not be exceeded.

Gauges on Nurse and Applicator Tanks

C10.~~9~~ 10 Gauges

All gauges shall be designed for ammonia service. No brass, zinc, copper, galvanized materials shall be used in contact with ammonia.

C10.1~~0~~ Level Gauges

Level gauges are required to ensure that tanks are not over-filled. Level gauges are sufficiently accurate to use for inventory measurement, but are not legal for trade. Note that some jurisdictions require more than one level device to be installed. A variety of level gauges are available including (Appendix C10.10):

- Magnetic float type. Advantage: Relatively accurate, no leakage of product. May be damaged by vigorous filling when tank is empty.
- *Recommended best practice is to use this type.*
- Fixed liquid level gauge. Disadvantage: Only indicates 85% level. Releases product.

C10.~~11~~ 12 Pressure Gauge

Blank.

C11 NURSE AND APPLICATOR TANK HOSES

All hoses on the anhydrous ammonia nurse and applicator tanks have been installed and tested in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

C11.1 Approval for Service

All hoses used for handling anhydrous ammonia must be marked as suitable for anhydrous ammonia service by the manufacturer. Hoses are constructed with nylon or stainless steel reinforcement. Both are acceptable, however, many prefer stainless steel reinforced hoses due to longer service life.

C11.2 Maximum Allowable Working Pressure (MAWP)

All hoses must be clearly marked with their maximum allowable working pressure (MAWP) or they must be removed from service. Hoses must be rated for a minimum MAWP of 350 psi (2410 kPa).

C11.3 Remove from Service Date

All hoses must be marked with a clearly visible “remove from service” date by the manufacturer. If the date cannot be read the hoses must be removed from service. All hoses that have exceeded the “remove from service” date must be discarded.

C11.4 Hose End Valves

Some of the most serious injuries to workers have occurred due to accidental opening of hose-end valves while handling. Therefore, it is critical that all hose-end valves be equipped with a device that prevents accidental operation of the valve while handling the hose. Several approaches are available to prevent accidental opening. This can include devices that lock the hand wheel on the valve or hand wheel guards to prevent inadvertent contact with the hand wheel.

C11.5 Hose Couplings

All couplings must be suitable for anhydrous ammonia service as determined by the manufacturer. Couplings can be either the crimped or bolted type. However, the recommended best practice for anhydrous ammonia hose couplings is the bolted type

since industry experience has shown the crimped connections to be less reliable, and they cannot be re-used if the hose has to be shortened and the coupling re-attached.

C11.6 Inspection and Hydrostatic Testing of Hoses

All hoses must be hydrostatically tested annually to identify any potential problems. In addition, hoses must be inspected annually for erosion, kinks, cracking, blistering and soft spots. Damaged or suspect hoses, altered hoses or hoses where fittings have been replaced must be hydrostatically tested before being returned to service. Hose testing requirements are listed in CSA B620 (Section 7), including documentation requirements.

Once a hose has successfully passed the annual visual inspection and hydrostatic test, the test date and tester initials shall be marked on the hose. It is a recommended best practice is to use a metal or plastic tag attached to the hose rather than painting or other less durable methods of marking.

Recommended test pressure is 120% of MAWP. Note that industry experience is that test pressure of 150% of MAWP may damage hose and fittings.

C11.7 Breakaway Couplers

All anhydrous ammonia applicators designed for towing nurse tanks must be equipped with a breakaway coupler in the event of a disengagement of the nurse tank from the applicator. These couplers must be replaced when out-dated or at the first sign of wear or corrosion. If in doubt refer to the manufacturer or dealer.

C12 VESSEL LABELS AND MARKINGS

The anhydrous ammonia nurse and applicator tanks have the required labels and markings as designated by regulatory requirements.

Signage on anhydrous ammonia nurse and applicators tanks is critical to ensure that the danger of the product contained within the vessel is communicated to personnel and emergency responders.

C12.1 Historically both TDG and Provincial Boiler and Pressure Vessel Regulations have specified different warnings applied to anhydrous ammonia nurse and applicator tanks including either “Danger” or “Caution” and “Anhydrous Ammonia.” There may be requirements in both federal and provincial regulations and requirements may vary from province to province.

C12.2 The primary risk with anhydrous ammonia is an inhalation hazard. Therefore, it is a requirement to mark all anhydrous ammonia vessels with “inhalation hazard” on the basis that this best describes the hazard presented by anhydrous ammonia. This labeling, and other labeling may also be a requirement of the TDG Regulations.

C12.3 In order to provide an effective and universal communication tool for emergency responders, vessels must be placarded in accordance with Transport Canada Regulations. The requirement in the Regulations is for placards on all four sides of the tank* ., ~~however two placards may be permissible under a special permit.~~

Please review Part 4 of the *Transportation of Dangerous Goods Regulations* for additional details on placarding requirements

*Note - two placards may be permissible under Fertilizer Canada’s Equivalency Certificate however the Certificate expires May 31, 2017

C12.4 Marking requirements for testing & inspection are listed in CSA B620 Section 7.4.

C12.5 In order to reinforce safe handling and first aid procedures, it is a recommended best practice to post transfer procedures and first aid procedures on the pressure vessel.

C12.6 Slow moving vehicle signs only apply to nurse wagons and field equipment. The slow moving vehicle sign has to be visible from the back of the vessel or wagon. If the

unit is equipped with a slow moving vehicle sign this means you cannot exceed 40 kilometres/hour. Note that some tires are rated for lower and higher speeds.

C12.7 Emergency contact numbers should appear on both sides of a tank. Where tanks are twinned, markings are necessary on both sides of the assembly. Markings are not required on the sides of the tanks that face each other, where they cannot be seen.

C13 NURSE AND APPLICATOR TANK PERSONAL PROTECTIVE EQUIPMENT

Anhydrous ammonia nurse and applicator tanks are equipped with the required personal protective equipment.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

The nurse and applicator tank safety kit must be equipped with the following:
Note that where this PPE is issued to customers rather than accompanying nurse and applicator tanks, the audit requires that documentation of issue to customers be provided instead of inspection of the equipment on the tanks.

C13.1 Indirect or Non-Vented Goggles

The safety kit must be equipped with indirect or non-vented goggles. Direct-vented goggles are not permitted due to the potential contact of anhydrous ammonia with the eyes.

C13.2 Gauntlet Style Anhydrous Ammonia Resistant Gloves

To prevent additional risk of skin contact with anhydrous ammonia, the safety kit must be equipped with minimum 14-inch gauntlet style anhydrous ammonia resistant gloves. The cuffs of the gloves must be rolled outward to prevent anhydrous ammonia from running down the gloves and onto the skin of a person's forearm. Note that some people have experienced cracking of PVC and/or 'green' gloves. Neoprene is a recommended material although some people have had success with other grades of PVC.

C13.3 Individual Water Bottle

Contact between anhydrous ammonia and the eyes can lead to significant irreparable damage to the eyes. Therefore, it is imperative that all safety kits be equipped with an individual water bottle of clean, fresh water that can be used to immediately flush eyes with water should they come in contact with anhydrous ammonia. The water in the individual water bottle must be changed regularly to ensure it is fresh.

C13.4 Emergency Water

An emergency water supply of clean, fresh water of a minimum of 20 litres (5 gallons) must be provided on each nurse tank. Twin nurse tank units must have as a minimum, two 20litre water tanks, one on each side of the unit.

While gloves and goggles are provided on nurse wagons the best practice for personnel working with anhydrous ammonia is

1. Full-face cartridge style respirator complete with spare cartridge.
2. One or two-piece anhydrous ammonia resistant suit.
3. Gauntlet Style anhydrous ammonia resistant gloves.
4. CSA Safety boot with a minimum six inch upper.
5. Individual water bottle with clean, fresh water.

Retailers are asked to encourage farmer/producers to employ this standard for personal protective equipment when working with anhydrous ammonia.

C14 TOW VEHICLE MINIMUM SIZE REQUIREMENTS

All vehicles used for towing anhydrous ammonia nurse wagons to and from the point of application of the product must meet minimum capacity requirements in accordance with the size of nurse tank they are towing.

Regulatory requirements vary and must be consulted in order to determine minimum tow vehicle sizes. However, the following guidelines are provided:

1. The tow vehicle must have a curb weight of at least 3000 kilograms, and the manufacturer's towing capacity must exceed the maximum gross trailer weight.
2. Manufacturers of nurse wagons specify maximum safe speed. Most have implement tires and therefore should be restricted to 40 kilometres/hour.
3. Note that tow vehicle towing capacity limits and gross combined vehicle limits are normally applicable, however these limits are dependent on the trailer being towed having brakes. Refer to local regulations for requirements.
4. Note that a study in Manitoba found that the minimum requirement for a 1,000 gallon nurse wagon was a 4wheel drive 1 ton with dual wheels, in order to meet the minimum braking distance limit requirement in that province.
5. Below is an example of a guideline from one province for nurse wagons without brakes.

NURSE TANK SIZE (US GALLONS)	TOW VEHICLE SIZE	ADDITIONAL TOW VEHICLE LOAD (KGS)
1,000	1/2 TON 2 WD	400
1,200	HD ½ TON 2 WD	900
1,450	HD ¾ TON 2 WD	1,200
1,750	HD ¾ TON 4 WD	1,600
2,000	1 TON WITH DUALS	2,000

Note: Additional tow vehicle load is the minimum requirement for load in the tow vehicle to ensure stability.

Recommended best practice is to tow with at least a three-ton truck or fill the nurse tanks in the field.

C15 LIGHTING REQUIREMENTS FOR TOWING

All nurse tanks or applicators being towed by licensed vehicles on roads must be equipped with lighting in accordance with the applicable Highway Traffic Act or Transport Regulations.

The size and configuration of nurse and applicators tanks often results in the signal lights of the towing vehicle being obscured by the equipment being towed. Therefore, it is imperative that the nurse or applicator tank being towed be equipped with signal lights in order to convey their intentions to following drivers. These signals can either be temporarily or permanently mounted. The signals must be sized and positioned in accordance with the requirements of the Highway Traffic Act. Signals must be visible from behind the nurse or applicator tanks being towed. Therefore, the use of hand signals is not considered adequate.

Note that anhydrous ammonia corrodes copper electrical connections therefore frequent inspection and maintenance of electrical equipment is required to ensure continued operation.

When transporting nurse or applicator tanks with a farm tractor, best practice is to enhance the visibility of the nurse or applicator tank through the use of reflective devices.

Reflective tape conspicuously affixed to the rear and sides of the nurse or applicator tank can provide an indication to the following drivers of the presence of application equipment behind the tractor. Placing reflectors or reflective tape on the outside wings of an applicator can also inform drivers of the width of the equipment being towed.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

C16 SECURITY FOR ANHYDROUS AMMONIA NURSE AND APPLICATOR TANKS

The anhydrous ammonia transport vessel is secured in accordance with the security protocol.

Nurse and Applicator Tank Security Protocol

With the increase in the illegal misuse of anhydrous ammonia in the illegal drug trade, it is critical that security risks be addressed for transport vehicles. Experience has shown that thefts of anhydrous ammonia can happen anywhere and at any time. Interference with nurse and applicator tanks can also lead to significant releases of product.

C16.1 Securing While in Transport

Precautions must be taken to prevent interference with nurse and applicator tanks during transportation, including rest stops. It is a requirement that the main access valves on the vessels be secured if the driver is out of visual contact with the vessel for more than 30 minutes.

C16.2 Parking Near Evacuation Sensitive Occupancies

Experience has shown that anhydrous ammonia releases can occur due to equipment failure. These failures can occur when vessels are parked, even for short periods. While a well-planned and executed maintenance program will minimize this risk, it can never be prevented 100% of the time. For these reasons, it is a requirement that anhydrous ammonia nurse and applicator tanks not be parked within 500 metres of high occupancy facilities such as hospitals, schools, shopping malls, daycare centers and senior care homes, unless the vessels have been emptied and de-pressured.

C16.3 Storage of Nurse and Applicator Tanks

The risks identified in C16.2 also require that nurse and applicator tanks cannot be stored within city or town limits unless the vessels have been emptied and de-pressured. The only exception is for maintenance periods not exceeding 72 hours for emergency repairs, or if the tanks are stored at a code compliant site. Please note that this emergency maintenance exemption is superseded by the requirement that anhydrous ammonia nurse and applicator tanks not be parked within 500 metres of high occupancy facilities such as hospitals, schools, shopping malls, daycare centres and senior care homes unless the vessels have been emptied and de-pressured.

City or town limits is intended to mean the municipal boundaries of a cities, towns, villages or hamlets. Where such a boundary is not defined, judgment will have to be exercised to determine an equivalent boundary.

C16.4 Nurse and Applicator Tank Value Securement

Nurse and applicator tanks must be secured against unauthorized access unless they have been emptied and de-pressured. Refer section A4.1 for acceptable methods.

C16.5 Securing of Nurse and Applicator Tanks at Farm Locations

Theft and tampering incidents have been reported when nurse and applicator tanks are being used in the field. Farmers must be instructed on the proper measures to take to secure nurse and applicator tanks at farm locations. These instructions must include:

C16.5(a)

Nurse or applicator tanks must have the main access valves secured while they are being stored overnight at a farm location or in the field. Storing the vessels inside a locked building is prohibited unless the vessels have been emptied and de-pressured.

C16.5(b)

Nurse or applicator tanks that remain in the field overnight should be positioned to discourage tampering. In some cases this may be in plain view, for example where there are people around that would likely see anyone tampering with the unit. In most cases however, this would be out of view, so that criminals are not aware of the presence of the equipment.

C17 NURSE AND APPLICATOR TANK INSPECTION AND MAINTENANCE

Failure of nurse and applicator tank running gear presents a serious risk of damage to the pressure vessel, and a potential release of ammonia. All nurse and applicator tanks shall be inspected and maintained with the goal of preventing running gear failures.

*-Seasonal is defined as any active period – typically twice a year (fall and spring)

Please refer to the appendices for inspection procedure guidance.

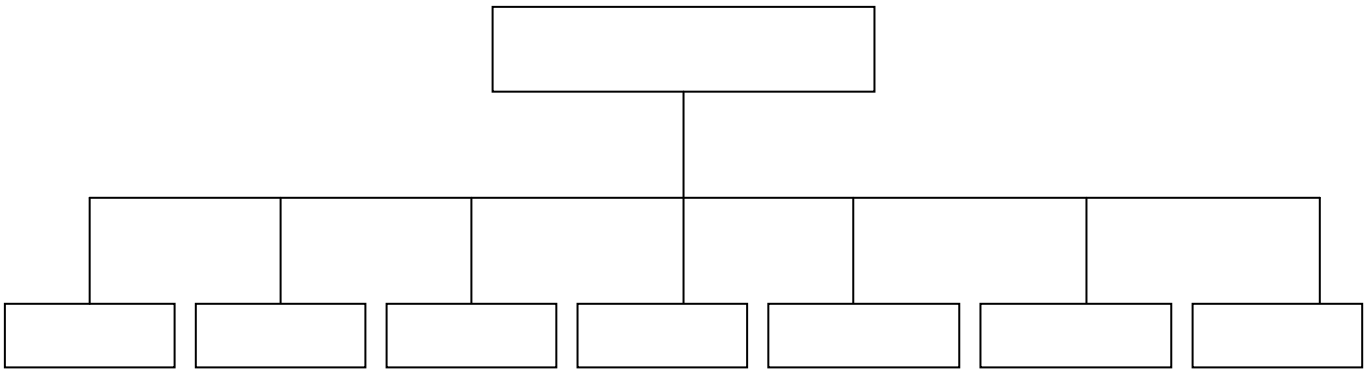
SECTION D–TRAINING

Those employees who are directly involved in the receiving and shipping of anhydrous ammonia including those who process shipping orders and transporting the product will all be involved in the training process. This will also include temporary or part time employees. Any employee, including the owner or manager who handles anhydrous ammonia will be included. This organizational chart is necessary during the audit so the auditor can track the training activities of all employees.

TRAINING FREQUENCY

D1	Rules	Upon sign up of new employee or when rules change
D2	Safe Operating Procedures	At the start of new duties
D3	TDG	Every three years
D4	Driver Certification / Abstract	Annually
D5	WHMIS/(M)SDS	Upon employment, when changes occur, and reviewed annually
D6	OHS	Upon employment and when changes occur
D7	First Aid	Valid certificate
D7	CPR	Valid certificate
D7	Fire Extinguisher	Once
D7	Respirator / Fit Test	Upon employment and at least annually
D8	Emergency Response	Annually
D9	Security Measures	Annually or when changes occur
D10	Contractor Training	Annually or when changes occur

SITE ORGANIZATIONAL CHART



TRAINING WORKSHEET

	Employee	D1 Rules		D2 Operating Procedures		D3 TDG	D4 Driver Certification & Abstract	D5 (M)SDS WHMIS 2015		D6 OH&S		D7 First Aid	D7 CPR	D7 Fire Extinguisher	D7 Respiratory Fit Test	D8 Emergency Response	D9 Security Measures	D10/11 Customer and Contractor Training
		S	P	S	T	C	T	T	S	T	S	C	C	T	T	T	SOP	SOP
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

C: certificate / P: posted / S: sign off / SOP: Safe Operating Procedures / T: training records

D1 FACILITY GENERAL SAFETY RULES

The management of the facility has developed, issued and reviewed the facility general safety rules with all employees of the facility.

In the Appendix is an example of some Facility General Safety Rules that should be documented and reviewed with the employees.

D2 SAFE OPERATING PROCEDURES TRAINING

Training has been provided to all employees on the operating procedures applicable to their job function.

Recommend best practice is to ensure all employees receive training prior to handling anhydrous ammonia. Training must consist of procedural and supervised “hands on” application of the procedures to verify comprehension.

It is a requirement of Federal and Provincial Occupational Health and Safety Regulations to train employees on the procedures for safely performing all critical tasks at an anhydrous ammonia operation. There is also good value in this for the operator since it substantially shortens the learning time for new employees as well as ensures a safe workplace for all employees.

Safe Operating Procedures Training

In order to comply with this requirement, the safe operating procedure training program provides the following content:

- The location and contents of the safe operating procedure manual.
- The rights and responsibilities of the employer and the employee.
- General characteristics and hazards of anhydrous ammonia.
- General workplace safety rules.
- Proper use (including a fit test for respirators) of personal protective equipment.
- Supervised hands-on training in all anhydrous ammonia transfer operations as required by the employee’s job description.

D3 TRANSPORTATION OF DANGEROUS GOODS TRAINING

All employees involved in the handling, offering for transport or transport of anhydrous ammonia have been training in the Transportation of Dangerous Goods Act and Regulations, specific to anhydrous ammonia, and have valid training certificates.

It is a regulatory requirement that all employees involved in the handling, offering for transport or transport of anhydrous ammonia are trained and certified in accordance with the Transportation of Dangerous Goods Act and Regulations (Part 6.2).

Transportation of Dangerous Goods Training

The required course curriculum for certification under the Transportation of Dangerous Goods Act and Regulations is

1. **Introduction**
    a. Intention of Regulations
    b. Training requirements including farmer training
    c. Non-compliance

2. **General Application**
    d. Product classification system
    e. Product segregation
    f. Handling procedures
        i. Loading/unloading guidelines
        ii. Loading and placarding procedures
        iii. Unloading and placarding procedures
    g. Use of vehicles (i.e. delivery units, etc.)

3. **Safety Marks**
    h. Requirements
    i. Responsibilities
    j. Removal of placards
    k. Placards
        i. Definition
        ii. Responsibilities
        iii. Exemptions
        iv. Location and display of placards including product identification number
        v. Durability/Reflectivity of placards
        vi. Removal of placards

4. Emergency Response Plans (see Section G of National Anhydrous Ammonia Code of Practice)

l. Definition
m. Immediate reporting
n. Thirty day reporting

5. Documentation

o. General
p. Shipping document
q. Location of documents (i.e. transport or storage)
r. Change to documents resulting From diversions
s. Delivery documents (i.e. multiple delivery sheets)
t. Retention of documents
u. Manual procedures

The scope of the Transportation of Dangerous Goods Regulations is very broad in application. Therefore, it is advisable to ensure a general knowledge of the Regulations while focusing in on specific requirements for anhydrous ammonia.

Employees must be re-certified every three years.

D4 DRIVER CERTIFICATION

Employees who operate transport units have received the required driver licence certification in accordance with Highway Traffic Act or Transport Regulation.

All anhydrous ammonia must be transported via road from a central storage vessel to the field. As a result, there is a significant risk of transport related incidents in the often-compressed application season. For this reason, it is critical that drivers of transport delivery vehicles for anhydrous ammonia be properly trained, licenced, and certified in accordance with the applicable Federal and/or Provincial Regulations.

The transport of anhydrous ammonia from the manufacturer/distributor to the retail storage facility is usually done utilizing large semi-trailer transport trucks. The operators of these vehicles must be properly licenced.

Delivery of anhydrous ammonia to point of application can occur in two ways. First, transport delivery trucks transport anhydrous ammonia from a central retail storage vessel to the field for application. Second, a full nurse tank is towed to the field where it is exchanged for an empty nurse wagon. The requirement for driver training in both of these circumstances is quite different. The driver of the transport delivery unit may require a different class of licence from their basic driver's licence dependent on the size of the vehicle and the equipment it has. The driver of the vehicle used for towing the nurse tanks back and forth to the field may only require a basic driver's licence of a class suitable for the vehicle. However, since requirements may vary by jurisdiction, it is important to verify the requirements for driver training, licencing and certification needed for anhydrous ammonia operations with the applicable regulatory authority.

It is highly recommended that drivers transporting anhydrous ammonia take additional training in operating large vehicles and defensive driving. Requiring that driver's abstracts be provided for all drivers towing ammonia (not just for vehicles required to comply with the National Safety Code) gives operators the opportunity to address the risks associated with drivers moving ammonia that have poor driving records.

Some additional points that must be covered in the training for all drivers of anhydrous ammonia delivery vehicles are

- Pre-travel inspection of all vehicles and equipment.
- Proper use, inspection and maintenance of delivery vehicle emergency equipment.
- Minimum tow vehicles sizes in accordance with size of tow load.
- Lighting requirements for towing in accordance with Provincial Regulations.

D5 WHMIS 2015 TRAINING

All employees at the anhydrous ammonia operation have been trained on the Workplace Hazardous Materials Information System 2015 version (WHMIS 2015).

It is a requirement that all employees involved in the storage of anhydrous ammonia be trained and certified in accordance with the requirements of the ~~Workplace Hazardous Materials Information System (~~WHMIS 2015. The required course curriculum for certification under the WHMIS Regulations is

1. **Introduction**
    a. WHMIS Act & Regulations
    b. Enforcement of legislation
2. **Responsibilities**
    a. Employer's responsibility
    b. Employee's responsibility
3. **Exemptions from WHMIS**
    c. Exemptions
4. **Labelling**
    a. The supplier label
    b. The workplace label
    c. Products which require labelling
5. **WHMIS 2015 Controlled Product Symbols**
    a. Product symbols
6. **(Material) Safety Data Sheets ((M)SDS)**
    a. (M)SDS sections
7. **Glossary of Terms**
    a. Glossary

The scope of the Workplace Hazardous Materials Information System is very broad in application. Therefore, it is advisable to ensure a general knowledge of the Regulations while focusing in on specific requirements for anhydrous ammonia in the following areas:

- Material Safety Data Sheets
- Supplier labels

D6 OCCUPATIONAL HEALTH AND SAFETY TRAINING PROGRAMS

General industry statistics indicate that some of the most severe workplace injuries occur when:

- Workers enter confined workspaces without proper training.
- Workers fail to follow proper lock-out and tag-out procedures when working with electrical systems.
- Workers fail to isolate energy sources or chemicals.
- Workers fall from heights due to improper fall restraint systems.
- Workers are working with spark producing and/or open flame equipment around flammable or combustible materials.

For these reasons, it is a regulatory requirement that the workplace has a safe work permit system and training program for all employees that are expected to conduct such hazardous activities.

Some anhydrous ammonia operations may choose to contract all such activities to external contractors. If this is the case, there must be clear evidence through posting of signage, documentation and in the training programs that all employees are not to conduct any of the following activities:

- Servicing of electrical equipment or systems
- Working on pressure equipment.
- Working at heights.
- Working with spark producing and/or open flame equipment
- Entering into a confined workspace

If employees are expected to conduct these activities, they must be properly instructed, trained and supervised.

D6.1 Safe Work Permit Training

Safe work permit training must include isolation and lock out of energy and chemical sources, hot work, confined space entry, and working at heights. All training must be developed based upon the requirements of the applicable Federal or Provincial Occupational Health and Safety Regulations and the specific conditions of the workplace.

D6.2

Blank

D6.3

Blank

D7 EMERGENCY TRAINING

There is the potential for emergency events to occur. This can include incidents such as:

- Minor to severe injuries to workers and/or customers
- Cardiac arrest of workers and/or customers
- Fires

While the chances of such incidents may seem remote, it is a regulatory requirement that training be provided to ensure quick and effective action is taken to address the incident.

D7.1/D7.2 First Aid/CPR Training

Federal or Provincial Occupational Health and Safety Regulations require that some workplaces have at least one person who has been trained and certified to render first aid and CPR as required to an injured person. Consult the applicable Federal or Provincial Occupational Health and Safety Regulation for further information on the number of required first responders for an individual workplace.

The training course should include elements explaining the proper emergency procedures for treating skin, eye or inhalation exposure to anhydrous ammonia.

Training courses are available through many external agencies.

D7.3 Fire Extinguisher Training

A fire extinguisher is a very effective tool for extinguishing minor fires. However, the person utilizing the fire extinguisher to fight a fire must be properly trained on how to use it in order to ensure the fire is suppressed. Improperly maintaining and/or utilizing the fire extinguisher may result in making the fire worse and/or endangering the user. Therefore, basic training for designated employees on the proper maintenance and use of a fire extinguisher is critical, in accordance with applicable Federal/Provincial Regulations. This training would include the following components:

- The types of fire extinguishers (A, B, C or combination) and the types of fires on which they can be used.
- Proper inspection and maintenance of a fire extinguisher.
- Proper use of a fire extinguisher in various fire situations.

Fire extinguisher training can be provided by a qualified staff member who is trained to deliver the training, or an external agency. Fire extinguisher training must include a hands-on component. It need not include live fires, but must include discharge of an extinguisher.

D7.4 Respiratory Protection, Training and Fit Check

All employees that may be required to wear a respirator either for day-to-day ammonia handling or in their role as a designated emergency responder must be trained in the use of the respirator. Compliance for this Code of Practice requires that training include how to do basic positive and negative pressure fit testing (seal intakes with the hands and evaluate integrity of seal by inhaling, check exhaust valve function by exhaling). Note that Provincial Occupational Health & Safety Regulations typically include requirements for training, use and documentation around respirator use. Respirator training must be refreshed annually.

D8 EMERGENCY RESPONSE TRAINING

D8.1 The training required for employees in emergency response is based on the emergency response philosophy of the anhydrous ammonia operation. If workers at the operation are expected to actively participate in the response to an emergency situation, they must receive in-depth training on proper emergency response techniques as well as proper use of emergency response equipment. If an emergency response situation is to be addressed by local first responders (e.g. local fire department) or contracted third party, and the workers are expected to immediately evacuate the site, significantly less training is required for the workers.

D8.2 If workers are expected to actively participate in a response, they will require the following training:

- Proper inspection, maintenance and use of a Self-Contained Breathing Apparatus.
- Proper inspection, maintenance and use of all other emergency response equipment.
- Potential emergency response incidents at an anhydrous ammonia operation and the proper emergency response techniques including responding to an employee/carrier transportation or farmer related incidents.
- Decontamination procedures.
- Annual practice drills of staged emergency response incidents.

D8.3 Transportation by Rail and Road

- A route risk assessment has been conducted for all major routes typically utilized for the delivery of anhydrous ammonia. The intent of the risk assessment is to minimize the frequency of travel in high occupancy areas. Consult Federal, Provincial and/or Municipal regulations for further instructions regarding prescribed Dangerous Goods Routes.
- Employees transporting ammonia have been advised to avoid parking anhydrous ammonia transport units in areas of concentrated population for extended periods of time. Consult Federal, Provincial and/or Municipal regulations for further restrictions on the parking of containers of dangerous goods.
- Employees transporting ammonia have been advised as to the measures to be taken in case of an emergency. This includes:
    * Ensure safety of those involved in the incident.
    * Assess and take action in order to protect life, property and environment.
    * Conduct notifications to activate the emergency response plan.

    * Mitigate the emergency to the extent that it is safe to do so (i.e., closing of emergency shut-offs).
- Employees transporting ammonia have been instructed on the proper methods for minimizing the risk of working alone. This would include the use of planned check-in times or other suitable measures.

D9 SECURITY

All employees at the anhydrous ammonia operation have received training on security measures to prevent unauthorized access to anhydrous ammonia.

Security of anhydrous ammonia operations has become an increasingly important issue due to the criminal misuse of anhydrous ammonia in the illegal drug trade. Therefore, it is important to lessen the risk through a well-developed security plan. For this plan to work effectively, all employees must be aware of the requirements of the plan and their role within it.

The following elements must be covered in the security training program:

- Process for identifying and validating a customer
- On site security measures:
    * After hours facility lock-up
    * Key control plan
    * Appropriate response to a security incident
    * Reporting requirements for suspicious activity
    * For securing anhydrous ammonia equipment
    * Daily inspection requirements for anhydrous ammonia vessels
- Securing anhydrous ammonia in transport delivery units.
- Precautions for storage of anhydrous ammonia in the field after hours.
- Record keeping for tracing sales of anhydrous ammonia.

D10 CONTRACTOR SAFETY

All contractors providing services on or in close proximity to anhydrous ammonia equipment shall be made aware of the hazards associated with ammonia.

The use of contractors at anhydrous ammonia operations is a common occurrence for many inspection and maintenance activities. It is critical that these individuals be knowledgeable about the hazards of anhydrous ammonia and the proper procedures for working safely around it, or are directly supervised by a competent person.

Contractors performing work independently on anhydrous ammonia equipment or at the site must be provided the following training:

- Awareness of anhydrous ammonia characteristics and hazards, including operation orientation.
- Awareness of specific on-site safety hazards and correct procedures to follow.
- Personal protective equipment requirements.
- Proper procedures to follow in the event of an emergency.
- Awareness of the requirements of the safe work permit systems at the operation.
- Knowledge of the general safety rules at the operation.
- Knowledge of the requirements of the security plan for the operation.

Contractors performing off-site work such as in repair shops must receive the following training:

- Awareness of anhydrous ammonia characteristics and hazards.
- Awareness of specific safety hazards for equipment.
- Proper procedures to follow in the event of an emergency

D11 CUSTOMER EDUCATION

Customers transporting and using anhydrous ammonia have been instructed on the proper safety and emergency response procedures.

This requirement imposes an obligation on the seller of ammonia to inform the customer of the appropriate safety and emergency response procedures for transporting and handling ammonia. Components that should be covered include:

- Customers have been instructed on the proper procedures for activating the emergency response plan.
- Customers have been instructed on the proper emergency response procedures for exiting an area contaminated by a release of anhydrous ammonia.
- Customers have been instructed on the proper procedures for using the personal protective equipment provided with the nurse wagon. Customers have also been instructed that the recommended best practice is to wear a full-face respirator, one or two-piece anhydrous ammonia resistant suits, gloves, and boots.
- Customers have been instructed on the proper procedures for conducting a daily walk-around inspection of a nurse tank to ensure all critical components are in good working condition.
- Customers have been advised NOT to reconnect a disconnected quick-coupler unless properly trained or with the assistance of the anhydrous ammonia retailer.
- Customers have been asked to report all incidents involving ammonia equipment to the person they purchased the ammonia from.

SECTION E–DOCUMENTATION

E1 EMPLOYEE TRAINING RECORDS

The anhydrous ammonia operation has training records for all employees.

E1.1 The anhydrous ammonia operation has training records for all employees. Training records can be stored at an administrative office but must to available for review by the auditor. The records must include the following information:

- Name of person being trained.
- Training course name.
- Training method (i.e. classroom, hand on application, computer based training, etc.)
- Date training course was taken.
- Trainer's name
- Manager signature verifying training was taken.

E2 CRITICAL SAFE OPERATING PROCEDURES

The anhydrous ammonia operation has written procedures for critical tasks at the operation.

Please refer to the Appendices for Safe Operating Procedures development guidance

E2.1 Safe Operating Procedures–Transfer Operations

The anhydrous ammonia operation has written safe operating procedures describing the correct process for safely and effectively performing all anhydrous ammonia transfer operations.

- Railcar to storage tank
- Transport vehicle to storage tank
- Storage tank to field delivery unit
- Storage tank to nurse wagon
- Field delivery unit to nurse wagon
- Nurse wagon to applicator
- Any other relevant ammonia transfer procedures

E2.2 Safe Operating Procedures–Hazardous Work

OH&S regulations generally require that employers have written safe operating procedures describing the correct process for safely and effectively performing all hazardous work including:

- Hot work
- Lock out tag out
- Confined space
- Elevated work

Where an operation contracts out such work, the contractor must have written procedures for the work. It is strongly recommended that even if such work is contracted out, the operation have its own written procedures. For example, the operation's procedure could require that the contractor provide his or her own written procedures for the work being conducted. If a different contractor is employed, their procedures should be provided. If employees of the ammonia operation perform any of this work, the operation must have its own procedures.

E2.3 Safe Operating Procedures–Maintenance

The anhydrous ammonia operation has written procedures for the proper use and maintenance of personal protective equipment.

- Full face respirator

- Care and maintenance of all personal protective equipment

E3 MAINTENANCE RECORDS

The anhydrous ammonia operation has maintenance records indicating the completion of appropriate scheduled inspection and maintenance plans on anhydrous ammonia related equipment.

Maintenance of anhydrous ammonia equipment is a critical risk management program to prevent accidental release of product, injury and loss of productivity of equipment. Therefore it is critical that the following inspections be undertaken and documented:

E3.1 Annual safety inspection of all vehicles as applicable.

E3.2 Annual hydrostatic test on all hoses.

E3.3 ~~Annual~~ Seasonal* visual inspection and 5-year physical inspection of all running gear on nurse wagons.

*-Seasonal is defined as any active period – typically twice a year (fall and spring)

E3.4 All pressure vessels are tested and certified in accordance with regulatory requirements.

E4 SHIPMENT OF PRODUCT TO COMPLIANT SITES

All locations receiving shipments of ammonia must be compliant with the Ammonia Code of Practice. It is the responsibility of the shipper to obtain and verify the code certification number from the consignee.

Each certified storage facility will have a unique seven digit number issued by the Ammonia Code of Practice administrator. When shipping anhydrous ammonia to another storage location, shipping documentation must include the certification number of the receiving site.

SECTION F–EMPLOYEE KNOWLEDGE

F1 CRITICAL SAFE OPERATING PROCEDURES

The employees at the anhydrous ammonia operation are knowledgeable of the procedures for conducting critical tasks safely.

It is critical for employees at the anhydrous ammonia operation to have a working knowledge of the procedures for conducting their required duties safely. In order to verify that employees have the required knowledge, the following questions shall be asked of employees involved in the transfer of anhydrous ammonia.

F1.1 The employees at the anhydrous ammonia operation can explain the hazards associated with anhydrous ammonia.

Correct answer:

- Anhydrous ammonia has a high affinity for water. As such, it poses a serious risk to contact with the eyes and skin.
- It presents a serious inhalation risk.
- Contact with high concentrations of anhydrous ammonia can cause serious bodily injury, including death.

F1.2 The employees at the anhydrous ammonia operation can explain the critical steps in completing anhydrous ammonia transfer operations.

Employees can demonstrate the proper steps for safely conducting transfer operations in accordance with the operation's written procedures. The following transfer operations will be tested (as applicable):

- Transfer to and from a transport unit or railcar
- Transfer to and from a storage facility
- Transfer and connection to applicators or other end-use equipment

F1.3 The employees at the anhydrous ammonia operation can demonstrate an understanding of the critical operating limits and emergency procedures for equipment.

Referring to written safe operating procedures, the employees can identify:

- The 85% limit requirement for filling anhydrous ammonia vessels and how to accurately assess it by either referring to the liquid level gauge or percentage gauge.
- Emergency shut-offs on anhydrous ammonia equipment and how to activate them.

F2 KNOWLEDGE OF TRANSPORTATION OF DANGEROUS GOODS ACT AND REGULATIONS

The employees at the anhydrous ammonia operation are knowledgeable of the Transportation of Dangerous Goods Act and Regulations.

The Transportation of Dangerous Goods Act and Regulations are one of the most significant sets of regulations affecting the handling and transportation of anhydrous ammonia. It is a regulatory requirement that employees handling, offering for transport and transporting anhydrous ammonia are trained and certified in accordance with the Transportation of Dangerous Goods Act and Regulations. Critical to this training is a focus on the core Transportation of Dangerous Goods requirements for anhydrous ammonia. If properly trained, an anhydrous ammonia worker will be able to provide the following answers to Transportation of Dangerous Goods related questions:

F2.1 Employees can explain the Transportation of Dangerous Goods placard classification system as it pertains to anhydrous ammonia.

Anhydrous ammonia workers can indicate that dangerous goods are classified into different categories in accordance with the TDG Classification system. They can also identify the classification of anhydrous ammonia in accordance with this system (Class 2.3 (Sub-class 8) and UN 1005). Knowledge should also include certification requirements (every 3 years), whether farmers need to be certified, placarding requirements, and how long TDG documentation must be kept (2 years).

F2.2 Employees can explain the hazards associated with anhydrous ammonia and how that relates to the information featured on a Transportation of Dangerous Goods placard.

Referring to an anhydrous ammonia placard, the workers can identify the classification of anhydrous ammonia from the placard (currently Class 2.3 (Sub-class 8)) and identify the hazards presented by anhydrous ammonia (compressed, corrosive gas with inhalation hazard).

F2.3 Employees can explain the documentation and safety marking requirements as defined by the Transportation of Dangerous Goods Act and Regulations.

If applicable, the anhydrous ammonia workers can produce a bill of lading for a sale of anhydrous ammonia (greater than 10,000 litres) and identify the wording and documentation requirements from the bill of lading (e.g. UN Number, Classification, Description, Emergency Response Activation Number). Note that shipments of anhydrous ammonia that are less than 10,000 litters in volume are exempt from Transportation of Dangerous Goods documentation requirements.

F3 KNOWLEDGE OF EMERGENCY RESPONSE PLAN

Employees at the anhydrous ammonia operation are aware of the contents of the emergency response plan for the operation and their role within it.

Employees at an anhydrous ammonia operation must have a thorough knowledge of the emergency response plan. Verification of this knowledge will consist of correct answers in the following areas:

F3.1 Employees can explain the emergencies addressed in the emergency response plan.

Workers at the anhydrous ammonia operation can explain the emergencies that are addressed in the emergency response plan. The correct answers would be

- An injury to a worker and/or customer.
- A minor or major accidental release of anhydrous ammonia.
- A fire.

F3.2 Employees can explain their specific duties in the event of various types of emergencies.

In the event of a release of anhydrous ammonia, injury and/or a fire, the worker can describe:

- The evacuation procedures for the anhydrous ammonia operation.
- Their specific responsibility in the emergency response plan (i.e. emergency control, communications, first aid, etc.).
- First aid personnel involved with anhydrous ammonia injuries need to wear anhydrous ammonia resistant gloves.
- The procedures they are to follow (refer to emergency response plan procedures) relative to their role in the plan.

F3.3 Employees can explain the proper procedures for activating the plan.

The workers at the anhydrous ammonia operation can describe the steps for activating the Emergency Response Plan. The correct answers would include:

- Identification of the location of the plan.
- Identification of the correct contact numbers for activating the plan.
- Workers need to be able to identify and explain their role in the activation of the plan.

F3.4 Employees at the anhydrous ammonia operation are knowledgeable of the correct procedures for treating skin or eye contact with anhydrous ammonia.

In the event of an anhydrous ammonia contact injury to a worker and/or customer, the worker can describe:

- How to locate the (M)SDS's and identify the section pertaining to skin or eye contact of anhydrous ammonia.

- ~~The proper procedure for responding to an exposure to anhydrous ammonia:~~
  - ~~Eye exposure = flush for 15 minutes with water, seek immediate medical attention.~~
  - ~~Skin exposure = immerse in water for at least 15 minutes, seek immediate medical attention.~~

F3.5 Employees at the anhydrous ammonia operation are knowledgeable of the procedures for treating inhalation of anhydrous ammonia.

In the event of an anhydrous ammonia inhalation injury to a worker and/or customer, the worker can describe:

- How to locate the (M)SDS's and identify the section pertaining to skin or eye contact of anhydrous ammonia.
- The proper procedure for responding to an inhalation exposure to anhydrous ammonia (as per the (M)SDS) i.e.:
  - ~~Minor Inhalation (conscious) = drink plenty of fluids. If necessary, seek medical attention.~~
  - ~~Major inhalation (conscious) = drink plenty of fluids and apply oxygen therapy (must be applied by a trained professional). Seek immediate medical attention.~~
  - ~~Inhalation (unconscious) = seek immediate medical attention.~~

F4 CARE OF EMERGENCY EQUIPMENT

The designated employees at the anhydrous ammonia operation are knowledgeable of the procedures for the proper care of emergency equipment.

The hazardous nature of anhydrous ammonia requires a high level of preparation to respond to emergencies. Critical to this requirement is ensuring that all emergency response equipment is properly maintained so it is ready when an emergency situation occurs.

Workers at the anhydrous ammonia operation must be able to explain and demonstrate the proper procedures for maintaining emergency equipment. The proper procedures for maintaining specific emergency equipment are:

(a) Full Face Respirator

(i) Clean respirator with a soap and water solution prior to application season.

(ii) Inspect respirator and straps for any cracks or tears prior to application season.

(iii) Inspect cartridges to ensure dates are not expired. Cartridges are only effective for one year after they have been unsealed or when the cartridge is saturated and the smell of anhydrous ammonia breaks through.

(b) Anhydrous Ammonia Resistant Suits/ Gloves and Boots

(i) Inspect suit for any cracks, tears or punctures at an appropriate interval.

(ii) Inspect gloves and boots for any cracks, tears or punctures at an appropriate interval.

(c) Fire Extinguishers

(i) Fire extinguishers must be “hefted” or shaken at least once per month to ensure ingredients do not pack down at the bottom of the container. Documentation must be provided indicating that this maintenance has been conducted.

(ii) The pressure gauge must be checked at the same time to ensure pressure is still in the usable range.

(iii) Fire extinguishers are to be protected from the elements.

(d) Self-Contained Breathing Apparatus (SCBA)

(i) Keep SCBA covered to prevent significant accumulations of dust and debris.

(ii) Clean face piece and breathing tube with an approved solution at the appropriate interval and after each use.

(iii) Inspect face piece and straps for any cracks or tears at the appropriate interval and after each use.

(iv) Ensure air cylinders are recharged prior to each application season to ensure proper oxygen content of air.

(v) Ensure entire SCBA assembly is inspected by a certified technician at least every two years in accordance with CSA standards.

(vi) Ensure SCBA is kept from freezing to prevent damage to critical components.

Note: Some Federal and Provincial Regulations require specific, documented inspections for respiratory protection equipment.

(e) Emergency Water Stations

(i) Emergency water tanks:

a. Water in tanks is changed and the tank cleaned at a minimum of every two weeks.

(ii) Emergency showers/eyewash stations:

a. Emergency showers/eyewash stations supplied with a potable water source must be cleaned, inspected and tested at least once per month. Tests must include a function check of the shower/eyewash station and temperature of water.

(iii) Portable showers and eyewash stations:

a. Portable showers and eyewash stations are checked for effective operation on appropriate intervals.

b. Water in portable showers and eyewash stations is changed and checked at appropriate intervals. Chemical additives are available to extend the frequency of water changes. Manufacturers' requirements should be checked regarding these additives prior to using them.

c. Portable showers and eyewash stations are checked monthly to ensure they are full.

d. Emergency water bottles are inspected for cracks at appropriate intervals.

e. Emergency water bottles are kept filled with clean water at all times.

f. Water in emergency water bottles is changed monthly.

F5 KNOWLEDGE OF WHMIS 2015

The employees at the anhydrous ammonia operation are knowledgeable of the Workplace Hazardous Materials Information System 2015 Version (WHMIS 2015)

The ~~Workplace Hazardous Materials Information System (~~WHMIS~~)~~ 2015 system provides several critical sources of information for identifying hazards in the handling of anhydrous ammonia. From various information sources contained in WHMIS, employees must be able to identify:

1. **Supplier Label**
   a. Utilizing the information on the supplier label, the worker can identify the hazards of the product by the symbols and the required safety precautions for working with the product.

2. ~~**Material**~~ **Safety Data Sheets (SDS)**
   b. Referring to the Material Safety Data Sheet for anhydrous ammonia, the worker can identify:
      i. The hazards of the product
      ii. The required personal protective equipment to be worn during handling.
      iii. The first aid procedures for treating exposure to anhydrous ammonia.

F6 CRITICAL SECURITY PROCEDURES

The employees at the anhydrous ammonia operation are knowledgeable of critical security procedures.

F6.1/F6.2 Security at an anhydrous ammonia operation has become an ever increasing concern due to the theft and criminal misuse of anhydrous ammonia in the illegal drug trade. Employees at the anhydrous ammonia site must be aware of the proper procedures to follow to ensure security of the anhydrous ammonia operation. Employees must be able to

1. Describe the proper procedures for locking-up the storage operation after hours. Appropriate answers would include an identification of
    i. The valves that must be locked.
    ii. The inspection of all vehicles for keys.
    iii. The locking of all vehicles after hours.
    iv. Which gates must be locked.
    v. The central location of locks and keys.

2. Describe the proper procedures for securing during transport. Appropriate answers would include:
    i. Identification of procedures for applying seals while transport unit is temporarily parked.
    ii. Minimum separation distance requirements for temporary parking of anhydrous ammonia transport vessels from public areas.
    iii. Identification of proper procedures for reporting tampering and/or suspicious activities.

3. Describe measures farmers can take to reduce the risk of tampering. Appropriate answers would include:
    i. Prompt pick-up and return of nurse wagons.
    ii. Parking of equipment in an area to reduce the risk of tampering (not near residence).

4. Describe the proper procedure for reporting suspicious incidents at the anhydrous ammonia operation. Appropriate answers would include:
    i. Identification of the contact number to be used for reporting suspicious activities.

F7 MAINTENANCE OF EQUIPMENT

The employees at the anhydrous ammonia operation are knowledgeable of the procedures for properly inspecting and maintaining anhydrous ammonia equipment specific to their job requirements.

The proper maintenance of the equipment is important to ensure safe, reliable operation of an anhydrous ammonia operation. Consistent inspection and repair of critical equipment components saves time and prevents serious injury. The following basic inspections categories serve as the foundation of a proper maintenance program. They are:

1. Start of Day Walk-Around Inspection

Employees involved in the handling and/or transport of anhydrous ammonia are knowledgeable of the pre-use inspections of equipment. Employees can describe the proper procedures for conducting these inspections. The inspections may include:

a. Inspections of equipment
b. Inspection for excessive wear or leakage
c. Signs of tampering or other hazardous conditions

Inspections could be daily, prior to use or as required.

2. Personal Protective Equipment (PPE)

Employees responsible for maintaining personal protective equipment (PPE) can describe the proper procedures for cleaning, inspecting and maintaining PPE. This could include:

Full Face Respirator

a. Clean respirator with a soap and water solution at least one per week during the season.
b. Inspect respirator and straps for any cracks or tears prior to use or at least once per week.
c. Inspect cartridges to ensure dates are not expired. Cartridges are only effective for one year after they have been unsealed or when the cartridge is saturated and the smell of anhydrous ammonia breaks through.

Anhydrous Ammonia Resistant Suits

a. Inspect suit for any cracks, tears or punctures before the start of the season, before each use or at a minimum of once per week during use.

Gloves and Boots

a. Inspect gloves and boots for any cracks, tears or punctures before the start of the season, before each use or at a minimum of once per week during use.

Note: Some Federal and Provincial regulations require specific, documented inspections for the above items.

3. Required Maintenance

Individuals who are responsible for maintenance inspection and repairs must have working knowledge of the applicable regulations and standards. This could include:

- Welding on pressure equipment or vessels must be completed by a certified welder.
- Knowledge of inspection frequencies and required documentation.

Other employees working with ammonia equipment must be aware that ammonia related equipment must be inspected and tested on a periodic basis, and be familiar with the markings that demonstrate compliance with these requirements; e.g. Hose “remove from service” and retest dates, pressure vessel markings etc.

SECTION G–EMERGENCY RESPONSE

G1 WRITTEN EMERGENCY RESPONSE PLAN

The anhydrous ammonia operation has a written emergency response plan.

Emergency response planning is a very critical risk management process at an anhydrous ammonia operation. A well-planned and executed emergency plan can result in significant mitigation of an emergency incident at an anhydrous ammonia operation.

Some basic guidelines for completing the plan:

- Involve workers and local emergency responders in the development of the emergency response plan.
- Utilize rural municipality maps to determine locations of surrounding residences for the surrounding area diagram.
- Utilize a checklist to ensure all elements of the plan have been completed.

Regulatory requirements for emergency plans are included in Transportation of Dangerous Goods Act and Regulations and Canadian Environmental Protection Act (CEPA) and the associated Environmental Emergency Regulations.

Additional templates are available at the websites for CEPA and TDG.

G2 COMMUNICATION OF EMERGENCY RESPONSE PLAN

The contents of the emergency response plan have been reviewed annually with emergency responders and any other person involved in or affected by execution of the plan.

For an emergency response plan to be effective, it must be properly communicated to all emergency responders involved in the plan. It must also be communicated to all potentially affected residents and businesses. A best practice is to re-communicate with stakeholders whenever there is a significant change to the plan.

The specific requirements for this protocol are that the emergency plan be updated within the last twelve months (form the date of your audit) and reviewed with the emergency responders who may be involved in an emergency response incident (e.g. local fire services). The date of the plan review has been listed on the plan. Compliance is indicated by a dated letter from the current person responsible inviting the appropriate emergency response agencies to the review session. In the event that those agencies decline the invitation, the invitation will serve as compliance for this Code of Practice. It is recommended that an attendance list be kept for those that do attend, to document the review.

G3 RISK ASSESSMENT

Risk assessment is a formal process of identifying hazards and assessing the risks involved with those hazards. This assessment must be reviewed annually in case there are changes to the operation or its environment. The assessment can be a part of the emergency response plan. The risk assessment should include identification of hazards such as:

- Accidental release of ammonia
- Transportation incidents
- Fires
- Weather events (e.g. flood).
- Security incidents

The risk assessment should also take into consideration factors such as:

- Nature of the operation (e.g. storage & handling vs. parking lot for nurse wagons)
- Proximity of people to the potential hazard
- Availability of emergency response capability
- Proximity of environmentally sensitive areas

G4 COPIES OF EMERGENCY RESPONSE PLAN

Copies of the updated emergency response plan for the anhydrous ammonia operation are kept at secure on-site and off-site locations.

For most commercial operations there are two types of emergency response plans that may be required. A local emergency response plan is required at every operation and an emergency response assistance plan (ERAP) at operations that ship containers larger than 10,000 litres. The ERAP requirement is part of the Transportation of Dangerous Goods Act and Regulations.

Copies of the emergency response plans developed for the anhydrous ammonia operation must be readily accessible at two locations, one on-site and one off-site. The on-site copy must be kept in a blue weatherproof container at the entrance to the operation, either mounted to the fence or the emergency response sign. Blue is becoming the industry standard for ‘emergency.’ Note that it is best practice to have additional copies of the plan kept in site offices etc. in addition to the ‘blue’ copy at the gate, and the ‘off-site’ copy.

The other copy of the plan must be kept in a secure off-site location such as a head office, or facility manager or designated person’s home, etc. This is to ensure that a copy of the plan is available in case the copy or copies at the ammonia site are not.

Ensure that all copies of emergency response plans are replaced with new copies as the plans are updated.

G5 ANNUAL REVIEW AND UPDATE OF EMERGENCY RESPONSE PLAN

The emergency response plan for the anhydrous ammonia operation has been reviewed, contents verified and updated within the past 12 months.

The emergency response plan must be reviewed and updated annually in order to ensure proper execution of the plan during an emergency incident.

The requirements are:

Updating of the Plan

The emergency response plan must be reviewed and updated every year to take into account:

a. Changes in personnel.

b. Changes in on-site conditions (i.e. additional equipment).

c. Changes in contact numbers on plan.

Contact numbers should be verified at each annual review.

G6 EMERGENCY CONTACT LIST

A list of emergency contact numbers for local emergency responders, operation management and employees has been prepared and posted at the operation.

G6.1 One of the most critical elements of the emergency response plan is the emergency contact list. This list is core to ensuring accurate and timely communication should an incident occur. The names and phone numbers on the contact list must include:

- Management & employees involved in the execution of the Emergency Response Plan.
- Local emergency services (i.e. fire, ambulance and police).
- Product suppliers.
- Regulatory authorities (i.e. Environment & Occupational Health/Safety)

G6.2 The emergency contact list must be posted near all telephones at the operation as well as carried in each vehicle used for transporting anhydrous ammonia and/or related equipment. The telephone numbers must be verified and updated annually. A contact list within an electronic device is insufficient, a hardcopy must be available.

G6.3

Verify that contact numbers have been called to ensure numbers are still valid.

G7 EMERGENCY RESPONSE DRILL

The anhydrous ammonia operation has conducted at least one exercise of the emergency response plan annually.

It is important to conduct a drill of the emergency response plan with all individuals directly involved in the plan.

The requirements are:

Annual Emergency Response Drill

An emergency response drill must be conducted with all employees directly involved in the execution of the plan. Some examples of acceptable mock emergency response exercises are

- General discussion of the contents of the emergency response plan and a review of the implementation steps in a classroom setting.
- Walk through demonstration and explanation of the plan to the local emergency responders and staff reviewing where emergency equipment is stored, common meeting places, emergency shut-off valves, identification of the environmentally sensitive areas and the potential evacuation requirements.
- Perform a table top exercise involving a realistic potential accident that could occur simulated in a classroom setting.
- Mock activation of the emergency response plan where each of the local responders are notified, personnel listed in the plan assume their roles, and all phone numbers are tested. Personnel answering the calls are immediately notified they are answering a “test” call. All contacts need to be alerted previously that a test is taking place.

The following information must be verified as a result of the emergency drill:

- Identify the location of the emergency response plan to all participants.
- Verify all numbers on the emergency contact list.
- All steps taken to activate the emergency response plan have been reviewed.
- Identify a common meeting place for staff and emergency response personnel to assemble.
- Identify the emergency resources such as protective equipment including environmental considerations, wind socks, emergency controls, etc.
- Discuss the roles of the staff as they pertain to the emergency response plan.

- Discuss the role of the local responders including capabilities for responding to a situation involving anhydrous ammonia.
- Discuss the role of the police as it pertains to the emergency response plan.
- Discuss the role of ambulance personnel as it pertains to the emergency response plan.
- Identify the locations of the nearest neighbours, communities or environmentally sensitive areas, pastures, streams, lakes, etc.
- Have the facility manager/operator or designate review the communications process with the staff and the responders.
- All items listed in the emergency response plan were discussed or reviewed.
- Any changes and/or improvements required in the plan have been documented and assigned for correction.

G8 CONTAMINATED RUN-OFF WATER

The anhydrous ammonia operation has developed a plan for the containment of contaminated run-off water produced from emergency response activities.

As part of the emergency response plan, a plan has been developed for the containment of run-off water generated during emergency response activities. This will include:

G8.1 An analysis of the topography of the operation to identify run-off direction.

G8.2 Identification of potential at risk water sources within 1 kilometre of the operation. At risk water sources could include streams, wetlands and other environmentally sensitive as well as drinking water sources.

G8.3 and G8.4 Identification of measures to be taken in advance of an incident (i.e. construction of retention berm) or measures to be taken at the time of an incident (e.g. plugging of culverts with sand bags)

This analysis will be included and reviewed as part of the written emergency response plan.

G9 INCIDENT REPORTING

The anhydrous ammonia operation has an incident reporting system.

Incident reporting is a proven component of safety systems. Incident reporting and analysis enables both specific and systematic safety issues to be addressed, resulting in fewer losses and injuries.

An incident is defined as any event that results in loss or damage to property, equipment or environment, or injury to people. Incidents include:

- Loss of containment of a hazardous product (unintentional or accidental release of ammonia)
- Injury to a person
- Damage to property, equipment or environment
- Fires
- Vehicle accidents
- Security violations

A near miss is an event that could have but did not result in an incident.

There are also regulatory requirements to report releases of ammonia and other incidents involving a hazardous product. Refer Transportation of Dangerous Goods Regulations. Occupational Health & Safety Regulations also contain incident reporting requirements.

~~G9.1~~ **Minimum requirements for the incident reporting procedure**:

- Incidents involving release of ammonia must be reported
- Employees must be trained on the procedure
- Records of incidents must be kept for two years

Best practices for an incident reporting system:

- All incidents are reported
- Near misses are reported
- Incidents and near misses are analyzed and the results used to improve safety performance, including communication to employees
- Other stakeholders (e.g. end-users, transportation employees) are asked to participate in incident reporting
- Incidents are aggregated at industry level to monitor industry performance

SECTION H–RAILCARS AND EQUIPMENT

H1 RAILCAR DESIGN AND CONSTRUCTION

All anhydrous ammonia transport railcars are constructed, operated and maintained in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

H1 Design and Construction

Railcar pressure vessels are regulated under the Transportation of Dangerous Goods Act and Regulations. The design & construction code referenced is the Canadian General Standards Board 43.147.

H2 RAILCAR LOADING AND UNLOADING OPERATIONS

Railcar loading and unloading operations comply with applicable Federal/Provincial Regulations.

Note: Any equipment removed from service during the off season must be available for inspection during an audit.

H2.1 Emergency Shut-off Valve

Railcar loading and unloading must have emergency shut-off capability located at both the railcar end and the filling/unloading point. Emergency shut-off capability may be provided by excess flow valves, check valves, control valves or emergency shut-off valves. If a cable operated shut-off system is required for the emergency shut-off system, the activating lever must be colour-coded blue.

H2.2 Anhydrous Ammonia Valves

Some materials are not suitable for anhydrous ammonia service such as brass, copper, zinc, cast iron and non-anodized aluminium. Forged carbon steel, ductile iron, and stainless steel are suitable materials. The pressure rating of the valve must be suitable for the service.

H2.3 Hose-End Valves

Some of the most serious injuries to workers have occurred due to accidental opening of hose-end valves while handling. Therefore, it is critical that all hose-end valves be equipped with a device that prevents accidental operation of the valve while handling the hose. Several approaches are available to prevent accidental opening. This can include devices that lock the hand wheel on the valve or hand wheel guards to prevent inadvertent contact with the hand wheel.

H2.4 Fall Protection System

In order to perform routine connection and disconnections on a railcar for loading/unloading anhydrous ammonia, a worker will be working at a significant height above the ground. Occupational Health and Safety Regulations require that workers working at heights be equipped with a fall protection system to prevent serious injury. Fall protection systems may consist of harness and lanyard (fall arrest) or engineered fall prevention equipment such as platforms and handrails (fall prevention). Refer to applicable Federal/Provincial Occupational Health and Safety Regulations.

H3 RAILCAR VESSEL HOSES

All hoses used with railcars have been installed and tested in accordance with Federal and/or Provincial Boiler & Pressure Vessel Regulations.

Note: Any equipment removed from service during the off season must be available for inspection during an audit.

H3.1 Approval for Service

All hoses used for handling anhydrous ammonia must be marked as suitable for anhydrous ammonia service by the manufacturer. Hoses are constructed with both nylon and stainless steel reinforcement. Both are acceptable, however many prefer stainless steel reinforced hoses due to longer service life.

H3.2 Maximum Allowable Working Pressure (MAWP)

Hoses must be clearly marked with their maximum allowable working pressure (MAWP) or they must be removed from service. Hoses must be rated for a minimum MAWP of 350 psi (2410 kPa).

H3.3 Remove from Service Date

All hoses must be marked with a clearly visible “remove from service” date by the manufacturer. If the date cannot be read the hoses must be removed from service. All hoses that have exceeded this date must be discarded.

H3.4 Hose Couplings

All couplings must be suitable for anhydrous ammonia service as determined by the manufacturer. Couplings can be either the crimped or bolted type. However, the recommended best practice for anhydrous ammonia hose couplings is the bolted type since industry experience has shown the crimped connections to be less reliable, and they cannot be re-used if the hose has to be shortened and the coupling re-attached.

H3.5 Inspection and Hydrostatic Testing of Hoses

All hoses must be hydrostatically tested annually to identify any potential problems. In addition, hoses must be inspected annually for erosion, kinks, cracking, blistering and soft spots. Damaged/suspect hoses, altered hoses or hoses where fittings have been replaced must be hydrostatically tested before being returned to service. Hose testing requirements are listed in CSA B620 (Section 7), including documentation requirements.

Once a hose has successfully passed the annual visual inspection and hydrostatic test, the test date and tester initials shall be marked on the hose. It is a recommended best practice to use a metal or plastic tag attached to the hose rather than painting or other less durable methods of marking.

Recommended test pressure is 120% of MAWP. Note that industry experience is that a test pressure of 150% of MAWP may damage hose and fittings.

H4 TRANSFER PUMPS OR CONPRESSORS

The transfer pump or compressor used with the railcar has been designed and approved for use with anhydrous ammonia.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

H4.1 Approval for Service

Pumps and compressors used in anhydrous ammonia service must be designed and approved by the manufacturer for anhydrous ammonia service. Relief valves shall be equipped with piping to direct releases away from personnel.

H4.2 Guarding of Transfer Pumps or Compressors

All transfer pumps and compressors have been equipped with guards to prevent contact with moving parts. Guards shall be constructed of non-combustible material or materials that will not react when contacted by anhydrous ammonia. In addition, the guards must be constructed to withstand the rigors of the anhydrous ammonia operation.

H4.3 Mounting of Transfer Pumps and Compressors

All transfer pumps and compressors must be secured to their respective mounts to prevent detachment during operation. Some flat bed trucks have wooden decking on a metal structure. Pumps secured to the wooden deck are good provided bolts connect to some part of the metal structure.

H5 RAILCAR LABELS AND MARKINGS

Railcars have the required labels and markings as designated by regulatory requirements.

Signage on an anhydrous ammonia railcar is critical to ensure that the danger of the product contained within the vessel is communicated to personnel and emergency responders.

H5.1 Historically there have been several different warnings applied to anhydrous ammonia rail cars including “Anhydrous Ammonia” and “Inhalation Hazard.” Refer to Transport Canada Regulations to determine specific requirements.

H5.2 The primary risk with anhydrous ammonia is an inhalation hazard. Therefore, it is a requirement to mark all anhydrous ammonia transport vessels with “inhalation hazard” on the basis that this best describes the hazard presented by anhydrous ammonia. This may also be a regulatory requirement.

H5.3 In order to provide an effective and universal communication tool for emergency responders, Transportation of Dangerous Goods (TDG) placards must be visible from all four sides of the railcar.

H5.4 The date of the last pressure test for the vessel must also be marked on the exterior of the vessel.

H6 PERSONAL PROTECTIVE EQUIPMENT

The anhydrous ammonia railcar transfer operation is equipped with the required personal protective equipment.

Generally, Occupational Health and Safety Regulations require that all reasonable precautions be taken to protect the health and safety of workers. The following are the minimum standards for worker personal protection equipment when handling anhydrous ammonia.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

H6.1 Full Face Respirator Complete With Cartridges

Anhydrous ammonia presents a significant contact risk for eyes and an inhalation risk for the respiratory system. Therefore, wearing a full-face cartridge style respirator complete with extra cartridges is mandatory for all personnel working at the anhydrous ammonia railcar transfer operation. The full-face respirator also allows personnel to escape concentrations of anhydrous ammonia that may be accidentally released. The respirators must be inspected and cleaned regularly to ensure proper operation. Cartridges must be changed in accordance with manufacturer's specifications.

H6.2 One or Two-Piece Anhydrous Ammonia Resistant Suit

Direct contact with anhydrous ammonia and skin will lead to severe burns. Therefore, a one or two-piece anhydrous ammonia resistant suit that covers the neck to ankle area is the minimum requirement to prevent accidental contact with skin. This excludes slickers, wraps, smocks, and aprons. The anhydrous ammonia resistant suits also allow personnel to escape concentrations of anhydrous ammonia that may be accidentally released. The anhydrous ammonia resistant suits must be inspected and cleaned regularly to ensure proper functioning.

H6.3 Gauntlet Style Anhydrous Ammonia Resistant Gloves

To prevent additional risk of skin contact with anhydrous ammonia, all personnel working at the anhydrous ammonia railcar transfer operation must be equipped with minimum 14-inch gauntlet style anhydrous ammonia resistant gloves. The cuffs of the gloves must be rolled outward to prevent anhydrous ammonia from running down the gloves and onto the skin of a worker's forearm. Note that some people have experienced cracking of PVC and/or 'green' gloves. Neoprene is a recommended material although some people have had success with other grades of PVC.

H6.4 Safety Boots

All personnel working at the anhydrous ammonia railcar transfer operation must be equipped with CSA approved safety boots. The boots must be equipped with a minimum 6 inch upper to prevent contact with anhydrous ammonia and a worker's ankle area. Leather is a satisfactory material for boots. Rubber is also resistant to anhydrous ammonia, however some other materials are not. The pant legs of the anhydrous ammonia resistant suit must not be tucked inside the footwear to ensure spilled anhydrous ammonia does not run inside the safety footwear.

H6.5 Individual Water Bottle

Contact between anhydrous ammonia and a worker's eyes can lead to significant irreparable damage to the eyes. Therefore, it is imperative that all workers at an anhydrous ammonia railcar transfer operation carry an individual water bottle of clean, fresh water that can be used to immediately flush eyes with water should they come in contact with anhydrous ammonia. The water in the individual water bottle must be changed regularly to ensure it is fresh.

H7 EMERGENCY EQUIPMENT

In addition to personal protection equipment, the anhydrous ammonia railcar transfer operation must be equipped with the appropriate emergency equipment.

It is critical that all emergency response activities are conducted by individuals who are properly trained and equipped to respond to the emergency presented. This is especially true for individuals responding to unplanned releases of anhydrous ammonia. The equipment and training required to safely enter an area contaminated with high concentrations of anhydrous ammonia requires many hours of classroom and practical training. Therefore, it is highly recommended that the emergency response plan be focused on evacuation from the affected area, not responding to the source of the leak. Operations to address the source of the leakage must be left to individuals who have been properly equipped and trained to respond. This general philosophy will guide the type of emergency equipment required at the site.

Note: Any equipment removed from service during the off-season must be available for inspection during an audit.

H7.1 Respiratory Protection

As per the general emergency response philosophy, respiratory protection should be used for evacuation from the contaminated area only. This equipment must be designated as emergency response equipment only and must be stored in a readily accessible location. The required respiratory protection for this purpose is

- Two anhydrous ammonia full-face respirators complete with at least one extra cartridge/canister for each respirator.
- The expiry date on anhydrous ammonia cartridges and canisters must not have been exceeded. If cartridges/canisters are open to the atmosphere, they will last one year from the date they are opened. Otherwise, the cartridges and canisters have a limited shelf life.
- Full-face respirators and cartridges/canisters must be clean and in good working order with all straps and attachments intact.
- Full-face respirators and cartridges/canisters must be stored in order to prevent weathering and/or damage.

H7.2 If required by provincial Regulations, two Self-Contained Breathing Apparatuses (SCBA).

Please note, that some jurisdictions require the presence of a Self-Contained Breathing Apparatus (SCBA) on site. Consult Provincial Regulations for further information.

For those locations that are required to have an SCBA, the SCBA must be kept in good operating condition.

H7.3 Two One- or Two-Piece Anhydrous Ammonia Resistant Suits

Two one- or two-piece anhydrous ammonia resistant suits suitable for contact with environments containing high concentrations of anhydrous ammonia must be provided and maintained in good working order. These suits are intended for use in emergency situations only and must not be utilized for daily operational activities at the anhydrous ammonia railcar transfer operation. The anhydrous ammonia suit must be protected from weather.

H7.4 First Aid Kit

A fully stocked and well-maintained first aid kit must be available to treat injuries at the anhydrous ammonia railcar transfer operation. The first aid kit must be kept in a weather tight box or be located inside a building at the operation. First aid kits are often equipped with latex gloves, which should be exchanged with nitrile gloves since latex reacts with anhydrous ammonia. The first aid kit must be sized according to the number of workers at the operation. Consult Federal or Provincial Occupational Health and Safety Regulations for specific size requirements.

H7.5 Fire Extinguisher

Anhydrous ammonia is combustible in certain conditions. However, the chance of a fire from anhydrous ammonia is considered to be low. Fires can still happen at an anhydrous ammonia operation from the equipment used to transport anhydrous ammonia. Therefore it is a requirement to have, as a minimum, a 10 lb.ABC fire extinguisher located in close proximity to all transfer points on the anhydrous ammonia storage vessel.

H7.6 Emergency Water

The only effective method for treating skin exposure to anhydrous ammonia is continued irrigation of the affected area with water. In the case of a major release, significant areas of a workers body may be exposed to high concentrations of anhydrous ammonia. The best practice for treating this is through the utilization of a

potable water safety shower. Where this is not practical, an immersion tank can be used. The site will require two 200-gallon immersion tanks filled with clean water. The tanks must be shaped to allow easy access to an injured worker (round tanks are preferred). Each tank must be labelled with a red cross (minimum 8 inches in height and width) on the exposed side of the tank to designate the tank as emergency response water. The tanks must be located within 10 metres of the anhydrous ammonia transfer area.

In an anhydrous ammonia release, anhydrous ammonia vapour will follow the wind direction. This cloud may limit access to the immersion tanks if they are located close together at the operation. For this reason, it is imperative to position the immersion tanks opposite each other on the site in consideration of the prevailing wind direction. This will ensure access to at least one immersion tank.

Where there is the possibility of the water in the emergency water freezing, the immersion tanks must be equipped with heaters to prevent freezing. Heaters must be protected with ground fault interruption (GFI) devices.

The water in the tanks must be drained, the tanks cleaned and refilled with clean water before each season. If the tanks become contaminated during the season with dirt, anhydrous ammonia absorption or other materials, they must be drained and cleaned to ensure a fresh supply of water. Best practice is to change the water in the tanks every two weeks during the ammonia season. Another best practice is to float a 1inch or less styrofoam insulation sheet on the water to prevent contamination and to aid in heating. In an emergency the foam sheet can be easily broken to gain access to the water trough.

For safety showers, it is recommended following a CSA or ANSI standard. Typically the flow is 20 gallons per minute for a minimum of 15 minutes.

H7.7 Emergency Eyewash Capability

One of greatest health and safety risks at an anhydrous ammonia operation is contact of anhydrous ammonia with a worker's eyes. For this reason, it is imperative that eye wash capability is available at the anhydrous ammonia operation. An immersion tank is not appropriate as an eyewash. It is too difficult to irrigate the eyes properly. The eyewash must be in good operating condition at all times the ammonia business is operating. In colder spring and fall temperatures, the water in the eyewash station must be kept from freezing. At the same time, it must remain accessible. If there is no dedicated eyewash facility available, eyewash capability can be accomplished by simply placing a small (1 litre) eyewash bottle, complete with eyecup, filled with clean water in each of the heated water tanks where they can be accessed in the event of an emergency.

H7.8 Wind Indicators

A very important part of responding to an emergency at an anhydrous ammonia railcar transfer operation is knowing the wind direction. An anhydrous ammonia vapour cloud will follow the wind. Therefore, realizing the wind direction will ensure that workers know the proper direction to take in order to stay clear of the vapour cloud in the event of a release. The best approach for indicating the wind direction is with a flag or wind sock. Since an anhydrous ammonia cloud may obscure one wind indicator, at least two flags and/or wind socks located in different areas of the operation should be provided. The locations of these wind indicators should be chosen considering the prevailing wind direction.

H8 RAILCAR SECURITY

All anhydrous ammonia railcars must comply with the requirements of the anhydrous ammonia railcar security standard.

H8.1 Railcar Security While in Transit

Anhydrous ammonia railcars in transit may be exposed to tampering. As a result, it is a prudent security measure to seal the cars with a cable type seal to minimize the risk of the tampering and provide a direct indicator of tampering if the seal is broken upon inspection at the receiving location.

H8.2 Railcar Inspection

A pre-release inspection is required on all anhydrous ammonia railcars prior to shipping the vessel and once it has arrived at its destination. This inspection is to ensure that the car is adequately prepared for shipment, and will quickly determine if there have been any signs of tampering due to broken seals or if there has been any release of product due to equipment malfunction. Inspection check sheets or some other form of documentation must be available to comply with this requirement.

SECTION I–INSURANCE

I1 INSURANCE

This section contains the insurance requirements for an anhydrous ammonia handling operation.

The operation has insurance documentation that indicates current liability protection covering owned automobile (vehicle) liability, non-owned automobile (vehicle) liability, and comprehensive general liability, with each of these policies being written in a minimum limit of $5 million inclusive per occurrence.

The operation has insurance documents that indicate environmental impairment liability protection covering:

(a) Off premises liability for clean up, property damage and bodily injury in minimum limits of $1 million per occurrence, and $1 million in the policy aggregate of all occurrences; and

(b) On premises clean up expenses in minimum limits of $1 million per occurrence, and $1 million in the policy aggregate of all occurrences.

Note: (i) Any endorsement or other policy wording that directly or indirectly selects fertilizers as specifically excluded from coverage, or that selects fertilizers for diminished coverage, is NOT acceptable.

(ii) No deductibles more than $25,000 are permitted. For deductible limits more than $25,000, a reimbursable deductible acknowledgement must be completed. This can be found on the reverse side of the Confirmation of Coverage Form.

For operators with multiple locations, an annual policy aggregate limit of $1,000,000 for each location or $3,000,000 for all locations which ever shall be the lesser amount.

Acceptable Documentation

Compliance will be indicated through examination of the confirmation of coverage form. A confirmation of coverage form must be fully completed for each certified operation. No changes are permitted to the form. The form must be signed by either your insurance broker or insurer.

Self-~~-~~Insurance

Large organizations that choose to self-insure may be eligible for this option by providing the Ammonia Code of Practice ~~Administrator~~ Project Manager with either one of the following:

a. Arrange for a licenced insurer to issue the insurance to the required limits, subsequently executing a reimbursement agreement with that insurer in an amount which is equal to that limit. A copy of the reimbursement agreement can be found on side two of the Confirmation of Coverage Form, or

b. If a company's net worth is $3,000,~~-~~000 or greater in the most recent fiscal year as evidenced by audited financial statements, and a confirming letter is issued by a Director, CFO or CEO supporting coverage, the site may be eligible for self-insurance status.

The organization is permitted to make specific application to the Code ~~Administrator~~ Project Manager in order to provide other means of proof of coverage to the minimum limits.

The Ammonia Code Project Manager reserves the right to request additional documentation that provides evidence of liquidity of financial reserves

AMMONIA CODE OF PRACTICE

CONFIRMATION OF COVERAGE FORM–PROTOCOL I1

To be provided to Authorized Auditor as part of compliance documentation and a copy forwarded with the audit to the administrator's office.

1. Insurer A	Insurer B	Insurer C
Name of Insurer:	Name of Insurer:	Name of Insurer:
Address of Insurer:	Address of Insurer:	Address of Insurer:
Postal Code:	Postal Code:	Postal Code:
Tel:	Tel:	Tel:

2. Company			3. Agent/Broker
Name of Insured:			Name of Agent/Broker:
Address of Insured:		Postal Code:	Address of Agent/Broker:
Covered Location:			Postal Code:
Policy Number:	Certificate Number:	Policy Period:	Tel:
Ammonia Code Compliance #:			

Coverage type	Insurer	$ Coverage	$ Deductible	$ Policy Aggregate
Environmental Impairment Liability (on site)	(A, B or C)	Minimum $1,000,000	Max $25,000	Minimum $1,000,000/occurrence
Environmental Impairment Liability (off site)	(A, B or C)	Minimum $1,000,000	Max $25,000	Minimum $1,000,000/occurrence
Owned Automobile Liability	(A, B or C)	Minimum $5,000,000	Max $25,000	Minimum $5,000,000/ occurrence
Non-Owned Automobile Liability	(A, B or C)	Minimum $5,000,000	Max $25,000	Minimum $5,000,000/ occurrence
Comprehensive General Liability	(A, B or C)	Minimum $5,000,000	Max $25,000	Minimum $5,000,000/ occurrence

The undersigned warrants that he or she has reviewed the Anhydrous Ammonia Code of Practice insurance protocol; that the coverage represented above is in conformity with the required coverage limits and permitted deductibles.

It is further understood and agreed that the undersigned undertakes to give fifteen (15) days' notice to the Code Administrator if the policy should be cancelled or otherwise terminated prior to the specified policy expiration date; or if the policy should fail to be renewed on a basis that ensures continued compliance with the insurance protocol; or if any other circumstance should occur which prejudices or invalidates a representation of compliance previously given.

Name of Authorized Representative of Insurer:
Signature of Authorized Representative of Insurer: **Date:**

*NOTE: NO CHANGES ARE PERMITTED TO THIS FORM. IF LIMITS OR DEDUCTIBLE DO NOT MEET THIS CRITERIA PLEASE CONSULT INSTRUCTIONS ON REVERSE. 2/24/2011

AMMONIA CODE OF PRACTICE
CONFIRMATION OF COVERAGE FORM–PROTOCOL I1

The Standard Confirmation of Coverage Form is designed for use by facilities that have insurance meeting the required levels of coverage, limits and deductibles. Anhydrous ammonia facilities require insurance coverage as outlined protocol I1.

This form must be completed fully and signed by an authorized insurance representative. A separate form is required for each insured location.

Reimbursable Deductible Acknowledgement

For deductible limits in excess of $25,000, the deductibles must be of a reimbursable nature. With a reimbursable deductible, the insurer shall be responsible for paying all losses and loss expenses. The insured shall promptly reimburse the insurer for advancing any element of loss falling within the deductible.

For reimbursable deductibles:
(a) Insurance representative must complete the front side of this form, recording the deductible amounts (b) Insurance representative must complete the reimbursable deduction section below (c) Dealer must sign acknowledging reporting of all incidents.
The undersigned warrants that the deductibles recorded on page one of the Confirmation of Coverage Form are of a reimbursable nature (as described above).
Name of Authorized Representative of Insurer:
Signature of Authorized Representative of Insurer: Date:
The insured agrees to report all pollution losses promptly to the insurer(s) without regard for the size of the deductible.
Name of Authorized Representative of Insured premises:
Signature of Authorized Representative Insured premises: Date: