

Anhydrous Ammonia

FACTBOOK

AWARENESS AND TRAINING FOR FIRST RESPONDERS



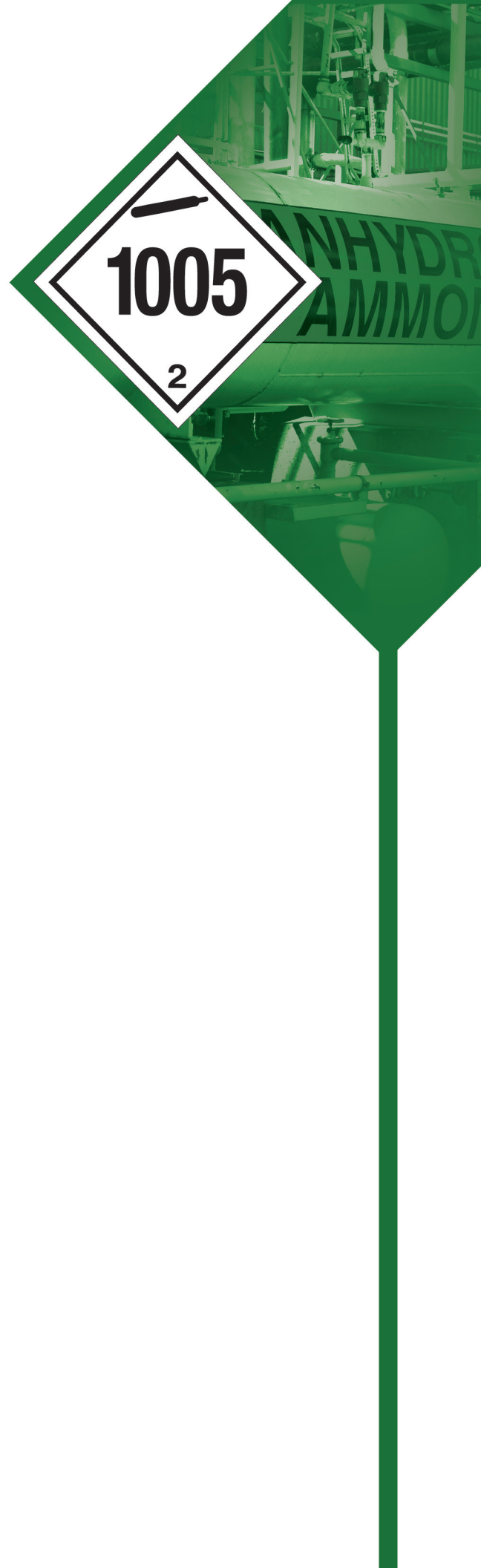
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Canada's first responders play a critical part in protecting the safety of the public, communities, and the environment every day. The Canadian fertilizer industry is committed to helping them fulfill their vital role. The industry has developed a course to provide emergency responders with the information and training they need to safely deal with anhydrous ammonia, which is classified as a toxic gas under the Canadian Transportation of Dangerous Goods Regulations. For first responders, a critical part of this classification is a unique placard, referred to as the "anhydrous ammonia placard" in the regulations.

Our goal is to help first responders learn about:

- ◆ anhydrous ammonia and its presence in our communities
- ◆ the hazards and safety requirements associated with the transportation, use and storage of this widely used fertilizer
- ◆ the new anhydrous ammonia placard.

We encourage first responders to read the enclosed information so they will become familiar with the placard and be best prepared to respond to incidents involving anhydrous ammonia.

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Anhydrous Ammonia in our communities

Ammonia is a naturally occurring substance essential to life and is a gas under normal conditions of temperature and pressure. Anhydrous ammonia is a concentrated form of ammonia used in a variety of agricultural and industrial applications. For these uses ammonia is often transported and used in its anhydrous form as a liquefied compressed gas. "Anhydrous" means "without water", so in this form ammonia is very corrosive and can cause serious injury or be fatal if inhaled, ingested, or absorbed by the skin. Under normal conditions of transportation and use it can be handled safely. The vast majority of shipments are completed without incident. Because of its corrosive properties anhydrous ammonia is classified as a dangerous good under the Transportation of Dangerous Goods Regulations (TDG). To protect first responders and the public safety these hazards need to be recognized and well understood.

Anhydrous Ammonia — In the city and on the farm

Anhydrous ammonia is widely used across Canada in a range of agricultural and industrial applications.

Anhydrous ammonia:

Helps grow food...

As a highly-effective nitrogen fertilizer used by farmers to grow food.

Keeps places cool...

As a refrigerant for ice rinks and in the food processing industry.

Is found in many products...

As a chemical building block for a range of products such as glues, dyes, smelling salts, pharmaceuticals, and household cleaners.

Protects the environment...

As a pollution control method to scrub gases from industrial stacks, purify water and treat wastes.

In rural areas, farmers use anhydrous ammonia as a plant nutrient which is applied in liquid form to the soil to grow crops. It may be found in pressure tanks located at agri-retailers, in rail cars, transport trucks and farm applicator units called nurse wagons.

It may also be found in large refrigerated tanks, gas cylinders, and piping systems where it is manufactured and distributed.

1005

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ANHYDROUS
AMMONIA

Properties of Anhydrous Ammonia (NH₃)

BOILING POINT	-33 degrees Celsius
FREEZING POINT	-78 degrees Celsius
VAPOUR PRESSURE (21°C)	888 kPa or 128 psi
FLAMMABLE RANGE	16-25%
AUTO IGNITION TEMPERATURE:	650 degrees Celsius
VAPOUR DENSITY	0.71 g/L
EXPANSION RATIO	800 to 1
ABSORPTION RATIO (volume of ammonia gas to volume of liquid water)	800 to 1
IMMEDIATELY DANGEROUS TO LIFE AND HEALTH	300 ppm

Transporting Anhydrous Ammonia

Anhydrous ammonia is transported through urban and rural communities across Canada and from Canada to the United States.

It is transported under pressure as a liquefied gas by:



Rail Cars



Transport Trucks



Nurse Wagons

During the fertilizer application season, typically between April and June, transportation of anhydrous ammonia fertilizer is at a peak.

In the agricultural industry, vessels transporting anhydrous ammonia will display:

- ◆ the black and white anhydrous ammonia placard;
- ◆ the product identification number UN1005; and
- ◆ the words "Anhydrous Ammonia, Inhalation Hazard."



NH₃

ANHYDROUS AMMONIA FACTS

“Anhydrous” means “without water” therefore, anhydrous ammonia is ammonia without water, usually over 99 per cent pure

Transporting ammonia in its concentrated form means lower volumes and fewer shipments

NH₃ is the chemical formula for ammonia.

NH₃ is made from two main ingredients – nitrogen from the air and hydrogen, usually extracted from natural gas.

Ammonia has a characteristic pungent smell similar to household cleaning products containing ammonia.

Every year about:

- 0.5 million tonnes of anhydrous ammonia are applied as fertilizer in Canada to grow food
- 2.5 million tonnes of anhydrous ammonia are used to make other fertilizers
- 1 million tonnes of anhydrous ammonia are exported to the United States
- 10 per cent of ammonia produced in Canada is used for industrial purposes.

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Understanding Reclassification

Anhydrous ammonia was reclassified as a dangerous good regulated under the Transportation of Dangerous Goods Regulations from a Class 2.2, Compressed Gas, with a subsidiary Class 8, Corrosive, to a Class 2.3, Toxic Gas, subsidiary Class 8, Corrosive. Under this classification all anhydrous ammonia tanks must display the proper TDG placard to immediately alert first responders to the presence of anhydrous ammonia.



Black and White
Anhydrous Ammonia Placard

NH₃ANHYDROUS AMMONIA
CLASSIFICATION

Class 2.3, Toxic Gas

Subsidiary Class 8, Corrosive

Product identification number
UN1005

**Get to know the Anhydrous
Ammonia Placard**

The black and white anhydrous ammonia placard identifies the product as anhydrous ammonia with the UN1005 product identification number, alerting first responders to the presence of a toxic gas with corrosive properties. This placard is unique to anhydrous ammonia. The words “Anhydrous Ammonia, Inhalation Hazard” must also be marked on transportation equipment.

Other Markings

There may be additional wording on a tank depending upon provincial rules, for example, “Caution Ammonia” or “Danger Ammonia.”



Protecting Yourself

The best way to protect yourself from the potentially harmful effects of anhydrous ammonia is to learn how to identify the substance and understand its basic properties. Protect yourself by knowing the facts.

Learn to identify Anhydrous Ammonia

- ◆ Look for the TDG placard.
- ◆ Look for the product number UN1005, which also identifies the contents as anhydrous ammonia
- ◆ Check for odours. Anhydrous ammonia has a pungent odour similar to ammonia-based household cleaners. An ammonia smell may signal the presence of a leak or spill.



Understand the hazards

Ammonia is essential to life and is naturally produced by all mammals. In very low concentrations ammonia is safe. However, exposure to anhydrous ammonia in either gaseous or liquid form in high concentrations can be deadly. The primary hazard is inhalation and in liquid form it can freeze and burn skin. Contact with anhydrous ammonia may cause one or more serious health effects. It can:

- ◆ seriously damage the respiratory system if inhaled
- ◆ cause chemical burns to the eyes, lungs and skin
- ◆ a vision, causing blindness in severe cases
- ◆ damage any moist areas such as the armpits and groin
- ◆ freeze clothing to skin in its liquid state
- ◆ cause death

Protect yourself

In a situation where anhydrous ammonia may be present, take the following steps to protect yourself:

1. **Identify** the placard.

2. **Stay** upwind of the incident away from the cloud of gaseous ammonia.
3. **Secure** the area so no one enters, including responders.
4. **Protect** yourself. Wear Personal Protective Equipment including bunker gear, and Self-Contained Breathing Apparatus to reduce the risk of inhalation and skin contact.



Person in level A suited gear

Be aware, however, that this structural fire-fighting equipment does not provide adequate protection in high concentrations, or if you are uncertain about the concentration. In these cases, fully-encapsulated suits with self-contained air are required for safety.

5. **Call** the Emergency Response Telephone Number on shipping papers or facility documentation or CANUTEC at (613) 996-6666 or *666 on a cellular phone. Only personnel trained to the NFPA Standard 472 Technician Level or equivalent and using appropriate Personal Protective Equipment (Level "A") should enter the area.¹

¹ Reference: National Fire Protection Association (NFPA) NFPA Standard 472 – Standard for Professional Competence of Responders to Hazardous Materials Incidents/Weapons of Mass Destruction Incidents



When injuries occur

Despite best efforts, injuries may occur from exposure to high concentrations of gas or liquid ammonia. First responders need to learn first aid measures to safely treat these injuries. Prior to administering any first aid, protect your hands using nitrile gloves (ammonia destroys latex) or if not available, wear two pairs of latex gloves.

Inhalation injuries

The greatest danger from anhydrous ammonia is through inhalation. An inhalation injury can damage the lungs and may be life-threatening.

In the event that inhalation or ingestion occurs:

1. **Move** the person to fresh air and begin decontamination with water as soon as possible.
2. **If conscious** and breathing, help the person drink as much water as possible to flush their system of ammonia.
3. **If oxygen** is required, get proper qualified help immediately to administer oxygen.
4. **Do not** induce vomiting. If a person is vomiting, keep the head lower than the waist to prevent further ammonia from getting into their lungs.
5. **Transport** the victim for more medical assistance once they are decontaminated.
6. **Tell** the medical facility in advance to prepare for the arrival of an ammonia injury victim.

Ammonia burns

Water is the only first aid treatment for an ammonia burn. Large amounts of water flushed onto the burn will draw out the ammonia, minimize the damage, and reduce pain. In the event that ammonia burns occur:

1. **Flush** eyes immediately with water.
2. **Flush** burn areas with water for a minimum of 15 minutes.



3. **Avoid** using pressure to prevent further damage to soft tissue. Reduce pressure from a water supply by covering the affected area with a towel or blanket before flushing.
4. **Do not** use creams or salves as they can trap ammonia and make the injury worse.
5. **Transport** the victim for more medical assistance once they are decontaminated.
6. **Tell** the medical facility in advance to prepare for the arrival of an ammonia injury victim.

FIRST AID FAST FACTS

1. **Move** the victim upwind to safety.
2. **Remove** anhydrous ammonia from the person by with water, remembering that ammonia may be frozen to the skin.
3. **Flush** any exposed tissue with water for a minimum of 15 minutes.
4. **Administer** oxygen if the person has breathing.
5. **Transport** the victim for medical assistance once they are decontaminated. **DO NOT** take their clothing or personal as they may still be contaminated with ammonia, and should be handled with caution and if possible, contained.



For more information on anhydrous ammonia and first aid, visit www.FSSC.ca



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Protecting Public Safety

While every effort is made to prevent accidents in the transportation and handling of anhydrous ammonia, incidents can occur. Protecting first responder and public safety is vital given the hazards of the product. Whatever the scenario, the priorities are the same — people first, then the environment and finally property.

Secure the Scene

In any incident involving anhydrous ammonia, make sure you are properly protected. Then secure the scene to reduce the potential of injury to others. Inhalation is the main hazard, so securing the scene means addressing the environment beyond the immediate incident area. Key points you need to know:



- ◆ **Check** the wind direction.
- ◆ **Secure** the incident site and downwind/downhill from a possible ammonia release, mindful that large spills of anhydrous ammonia can cause vapours to travel a long way downwind.
- ◆ **Establish** a perimeter even if no release exists until the integrity of the pressure vessel is known.
- ◆ **Do not** move or touch equipment containing ammonia until expert help arrives.
- ◆ **Evaluate** the need for evacuation and also consider shelter-in-place as a vital technique for people in buildings downwind

For safety recommendations and emergency response information to protect yourself and the public, see Guide 125 in the orange pages of the 2012 Emergency Response Guidebook, and also the Table of Initial Isolation and Protective Action Distances in the green pages.

Know who to contact

The inhalation hazard associated with anhydrous ammonia requires the help of trained experts. When an anhydrous ammonia incident threatens or impacts people and/or the environment, only responders who are properly trained and equipped should be involved in dealing with the emergency.

Your contacts should include:

- ◆ **Manufacturers or Distributors:** Manufacturers and distributors of anhydrous ammonia can provide information and emergency response capability. Look for the emergency contact information on site, or in the case of a transportation incident, check the shipping documentation for contact information. These documents will provide a 24-hour emergency telephone number to call for assistance.
- ◆ **CANUTEC:** For information and advice on anhydrous ammonia and for trained, properly equipped emergency response personnel with expertise in handling anhydrous ammonia emergencies, call (613) 996-6666 or *666 on a cellular phone to reach CANUTEC.
- ◆ **HAZMAT:** If your fire department has a HAZMAT team, contact it for information and assistance with anhydrous ammonia emergencies. If your department does not have a HAZMAT team, there may be mutual aid agreements with neighbouring departments or regional or provincial HAZMAT teams that can respond.



Be sure to review the additional information in our document “Responding to an Incident”



Understanding Incident Scenarios

Under normal conditions of transportation and use, anhydrous ammonia is handled safely in our communities every day. However, despite best efforts, incidents involving anhydrous ammonia may occur. First responders may encounter a range of possible incident scenarios, including:



Nurse Wagon Roll-Over



Potential Leak at an Agri-Retail Facility



Rail Car Derailment

REVIEW THE 2012 EMERGENCY RESPONSE GUIDEBOOK, GUIDE 125

Consult the 2012 Emergency Response Guidebook, Guide 125 (orange pages) outlining the technical response requirements for anhydrous ammonia, including:

- Potential hazards related to health, fire or explosion
- Public safety in the area, securing the scene, protective clothing and evacuation
- Emergency response for fire, spill or leak, and first aid

The 2012 Emergency Response Guidebook plays a critical role in helping you make initial decisions upon arriving at the scene.

To view the Emergency Response Guidebook click [here](#)



Be sure to review the additional information in our document "Responding to an Incident"



ANHYDROUS AMMONIA

Review

Anhydrous ammonia is safely handled, transported, and used in rural and urban communities across Canada every day. However, first responders need to be aware of its hazardous properties and its classification under the *Transportation of Dangerous Goods Regulations*.

Remember the Facts

Anhydrous ammonia is:

- ◆ Identified by this black and white anhydrous ammonia placard
- ◆ Classified as a Class 2.3, Toxic Gas, subsidiary Class 8, Corrosive
- ◆ Pungent, with a distinctive smell similar to ammonia based household cleaners and smelling salts
- ◆ Dangerous in high concentrations of liquid or gaseous form
- ◆ An inhalation hazard and a corrosive that may burn or freeze skin



Ammonia Code of Practice for Agri-Retailers

In 2008, an Ammonia Code of Practice was implemented to strengthen the safety and security measures for anhydrous ammonia. Developed by the Fertilizer Safety & Security Council (FSSC) in consultation with ammonia handlers and responders, the Code provides mandatory, uniform standards for the safe and secure handling and storage of anhydrous ammonia at agri-retail facilities in Canada. To learn more about the Ammonia Code of Practice, visit the FSSC web site at www.fssc.ca.

Telephone: (613) 230-2600

E-mail: info@fssc.ca

Be Prepared

If an incident involving anhydrous ammonia occurs:

- ◆ Identify the placard and product number UN1005
- ◆ Stay upwind
- ◆ Secure the scene
- ◆ Contact trained and properly equipped experts
- ◆ Wear protective clothing, including nitrile gloves when administering first aid
- ◆ Evaluate the effectiveness of evacuation or shelter-in-place protection
- ◆ Apply first aid and seek emergency medical help in the event of exposure



Partners

The Fertilizer Safety & Security Council extends thanks to the following partners who contributed to the development of this awareness and training initiative. We appreciate their expert advice and guidance in the development of this anhydrous ammonia responder program.

Special thanks to the following organizations:



Canadian Association
of Fire Chiefs



Transports
Canada

Transport
Canada

Resources

For more information about anhydrous ammonia, please consult the following:

Fertilizer Safety & Security Council
www.fssc.ca

Transport Canada — Transportation of Dangerous Goods
www.tc.gc.ca/tdg

CANUTEC
www.tc.gc.ca/canutec

Canadian Fertilizer Institute
www.cfi.ca

To download this Anhydrous Ammonia Factbook and related information please visit our web site at www.fssc.ca.

Contact Us

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