

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Ammonia	Trade Name: Ammonia
Product Use: Not available.	
Chemical Name: Ammonia	Synonym: Ammonia Gas, Spirit of Hartshorn.
Chemical Formula: NH ₃	Chemical Family: Amine
Telephone: Emergencies: * 1-800-363-0042	Supplier /Manufacture: Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2
	Phone: 905-803-1600
	Fax: 905-803-1682

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Hazards Identification

Emergency Overview

DANGER! Corrosive liquid and gas under pressure. Harmful if inhaled. Can cause eye, skin, and respiratory tract burns. May cause kidney and respiratory system damage. Can catch fire. Self-contained breathing apparatus and protective clothing must be worn by rescue workers. Under ambient conditions, this is a colourless gas with a pungent, irritating odour.

ROUTES OF EXPOSURE: Inhalation, skin contact, skin absorption, eye contact, and swallowing..

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE

- INHALATION:** Overexposure to concentrations moderately above the threshold limit value (TLV) of 25 ppm may cause irritation of the eyes, nose, and throat. Higher concentrations may cause breathing difficulty, chest pain, bronchospasm, pink frothy sputum, and pulmonary edema. Overexposure may predispose to the development of acute bronchitis and pneumonia. STEL = 35 ppm (ACGIH).
- SKIN CONTACT:** Prolonged or widespread skin contact may result in the absorption of potentially harmful amounts of material.
- SKIN ABSORPTION:** Prolonged or widespread skin contact with the liquid may result in the absorption of harmful amounts of material.
- SWALLOWING:** An unlikely route of exposure. This product is a gas at normal temperature and pressure, but may cause chemical burns of the mouth, throat, esophagus, and stomach.

EYE CONTACT: Liquid may cause pain, severe redness and swelling of the conjunctiva, damage to the iris, corneal opacification, glaucoma, and cataract. Exposure to the gas may cause pain and excessive tearing, with acute corneal injury at high concentrations.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

Chronic exposure may cause chemical pneumonitis and kidney damage.

OTHER EFFECTS OF OVEREXPOSURE:

None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. Because of its irritating properties, this material may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

None currently known.

CARCINOGENICITY:

Not listed as carcinogen by OSHA, NTP or IARC.

3. Composition and Information on Ingredients

COMPONENTS	CAS NUMBER	CONCENTRATION % by Mole
Ammonia	7664-41-7	100

4. First Aid Measures

INHALATION:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SKIN CONTACT:

Immediately flush affected areas with water for at least 15 minutes while removing contaminated clothing and shoes. Discard clothing and shoes. Call a physician.

SWALLOWING:

This product is a gas at normal temperature and pressure. Rinse mouth with water. If patient is fully conscious, give two glasses of water or milk. Do not induce vomiting. Call a physician.

EYE CONTACT:

Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN:

Victims of overexposure should be observed for at least 72 hours for delayed onset of pulmonary edema. The hazards of this material are mainly due to its severe irritant and corrosive properties on the skin and mucosal surfaces. There is no specific antidote. Treatment of over-exposure should be directed at the control of symptoms and the clinical condition.

5. Fire Fighting Measures

FLAMMABLE : Yes. **IF YES, UNDER WHAT CONDITIONS?** Slightly flammable.

EXTINGUISHING MEDIA:

In case of fire, use water spray (fog), foam, dry chemical, or CO2.

PRODUCTS OF COMBUSTION:

These products are nitrogen oxides (NO, NO2...).

PROTECTION OF FIREFIGHTERS:

DANGER! Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool containers with water spray from maximum distance, taking care not to extinguish the flames. Reduce corrosive vapours with water spray or fog. Stop flow of gas if without risk while continuing cooling water spray. Remove all containers from area of fire if without risk. Allow fire to burn out.

SPECIFIC PHYSICAL AND CHEMICAL HAZARDS:

Forms explosive mixtures with air and oxidizing agents. Heat of fire can build pressure in cylinder and cause it to rupture. No part of a cylinder should be subjected to a temperature higher than 52 C. Cylinders are equipped with a pressure-relief device. (Exceptions may exist where authorized by TDG Regulations.) If venting or leaking gas catches fire, do not extinguish flames. Flammable gas may spread from leak, creating an explosive re-ignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

SENSITIVITY TO IMPACT:

Avoid impact against container.

SENSITIVITY TO STATIC DISCHARGE:

Possible.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS:

Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

FLAMMABLE LIMITS IN AIR, % by volume:

LOWER: 16

UPPER: 25

FLASH POINT:

Not applicable.

AUTOIGNITION TEMPERATURE: 650°C (1202°F)

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Personal Precautions:

DANGER! Immediately evacuate all personnel from danger area. **DANGER:** Corrosive, liquid & gas under pressure. Contact with flammable materials may cause fire or explosion (See Section V). Reduce vapours with fog or fine water spray. Do not spray water directly on leak as this may cause leak to increase. Reverse flow into cylinder may cause rupture. Shut off leak if without risk. Ventilate area of leak or move leaking container to well ventilated area. Prevent runoff from contaminating surrounding environment. Corrosive, vapours may spread from spill. Before entering area, especially confined areas, check atmosphere with appropriate device.

Environmental Precautions:

Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, provincial, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING:

Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions, see Section 16.

RECOMMENDED EQUIPMENT: In semiconductor process gas and other suitable applications, Praxair recommends the use of engineering controls such as gas cabinet enclosures, automatic gas panels (used to purge systems on cylinder changeout), excess-flow valves throughout the gas distribution system, double containment for the distribution system, continuous gas monitors, fire sprinkler, heat sensor for fire monitoring and Class 1, Division 2 hazard Class electrical inside the cabinet.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to Section 16 for the address and phone number along with a list of other available publications.

PRECAUTIONS TO BE TAKEN IN STORAGE:

Store and use with adequate ventilation. Separate flammable cylinders from oxygen, chlorine, and other oxidizers by at least 6 m or use a barricade of non-combustible material. This barricade should be at least 1.5 m high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 52 C. Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

Corrosive high-pressure gas. Harmful if inhaled. Do not breathe gas. Do not get vapour in eyes, on skin, or on clothing. Have safety showers and eyewash fountains immediately available. Use piping and equipment adequately designed to withstand pressures to be encountered. Use only in a closed system constructed of corrosion-resistant materials. Store and use with adequate ventilation at all times. **Prevent reverse flow.** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Vent the system down in a safe and environmentally sound manner in compliance with all federal, provincial, and local laws; then repair the leak. When returning the cylinder to supplier, be sure valve is closed, then install valve outlet plug tightly. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

RECOMMENDED PUBLICATIONS:

Additional information on storage, handling, and use of this product is provided in **NFPA 55: Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders**, published by the National Fire Protection Association.

See also Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

INGREDIENTS	CAS NUMBER	LD ₅₀ (Species & Routes)	LC ₅₀ (Rat, 4 hrs.)	Exposure Limits
Ammonia	7664-41-7	Not available.	Not available.	TWA: 25 ppm 8 hours. STEL: 35 ppm 15 minutes.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH):**VENTILATION/ENGINEERING CONTROLS:**

LOCAL EXHAUST: An explosion-proof, corrosion resistant exhaust system is acceptable. See SPECIAL.

MECHANICAL (General): Inadequate. See SPECIAL.

SPECIAL: Use only in a closed system. Explosion-proof, corrosion resistant, forced draft fume hood is preferred.

OTHER: See SPECIAL.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION: Select in accordance with provincial regulations, local bylaws or guidelines. Selection should also be based on the current CSA standard Z94.4, "Selection, Care and Use of Respirators". Respirators should also be approved by NIOSH and MSHA. For concentrations up to 10 times, the applicable exposure limit any NIOSH/MSHA approved supplied air respirator is recommended. Up to 50 times, a NIOSH/MSHA approved respirator with a full face piece or self-contained breathing apparatus is recommended. For higher concentrations, use only self-contained apparatus operated in the pressure-demand mode.

SKIN PROTECTION: Neoprene gloves.

EYE PROTECTION: Wear safety glasses when handling cylinders.

Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties

PHYSICAL STATE: Gas. (Compressed Gas.)	FREEZING POINT: -77.7°C (-107.9°F)	pH: Not applicable.
BOILING POINT: -33.4°C (-28.1°F)	VAPOUR PRESSURE: 786.3 kPa (@ 20°C)	MOLECULAR WEIGHT: 17.031 g/mole
SPECIFIC GRAVITY: 0.6819 (Water = 1) LIQUID (Water = 1)	SOLUBILITY IN WATER, TOTAL	
SPECIFIC GRAVITY: 0.588 @ 25 C VAPOUR (air = 1)	EVAPORATION RATE: > 1 compared to (Butyl Acetate=1)	COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable.
VAPOUR DENSITY: 0.000771 g/ml @ 25 C	% VOLATILES BY VOLUME: 100% (v/v).	ODOUR THRESHOLD: 5 ppm

APPEARANCE & ODOUR: Colourless.

Odour: Pungent. Irritant.

10. Stability and Reactivity

STABILITY:	The product is stable.
CONDITIONS OF CHEMICAL INSTABILITY:	Not applicable.
INCOMPATIBILITY (materials to avoid):	Gold, silver, mercury, oxidizing agents. Halogens, Halogenated compounds, Acids, Copper, Copper/Zinc alloys (brass), Chlorates.
HAZARDOUS DECOMPOSITION PRODUCTS:	Hydrogen may be formed at temperatures in excess of 840 C in the absence of air and oxygen.
HAZARDOUS POLYMERIZATION:	Hydrogen may be formed at temperatures in excess of 840 C in the absence of air and oxygen. The normal products of combustion are nitrogen and water.
CONDITIONS TO AVOID:	None known.
CONDITIONS OF REACTIVITY:	Contact with incompatible materials may result in explosive or violent reactions or form explosive mixtures with air.

11. Toxicological Information

ACUTE DOSE EFFECTS: LC50 = 7338 ppm, 1 hr, rat.

MUTAGENIC EFFECTS: In-vitro studies have shown toxic levels of ammonia to be mutagenic in e-coli bacteria. Mutagenic effects have also been reported in drosophila (fruit flies). There is no evidence that ammonia is mutagenic in mammals.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME: Ammonia, anhydrous

HAZARD CLASS: CLASS 2.3(8): Toxic and corrosive gas.	IDENTIFICATION #: UN1005	PRODUCT REPORTABLE RQ: Any accidental release in a quantity that could pose a danger to public safety or any sustained release of 10 minutes or more.
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SHIPPING LABEL(s): Toxic gas primary label, corrosive material subsidiary label

PLACARD (When Required): Toxic Gas placard or, as an option when transported in bulk, special Anhydrous Ammonia placard with the words "Anhydrous Ammonia, Inhalation Hazard" on a contrasting background on at least two sides of the vehicle.

SPECIAL SHIPPING INFORMATION:

Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, non-ventilated compartment of a vehicle can present serious safety hazards.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, provincial, and local regulations. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS (Canada): Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive gas.
This product is on the DSL list.

International Regulations:

EINECS: Not available.
DSCL (EEC): R20- Harmful by inhalation.

International Lists: No products were found.

16. Other Information

MIXTURES:

When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

HAZARD RATING SYSTEM:

HMIS RATINGS:

HEALTH 3
FLAMMABILITY 1
PHYSICAL HAZARD 2

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-705 standard, CGA-240 standard, CGA-660 limited
PIN-INDEXED YOKE: Not available.
ULTRA-HIGH-INTEGRITY CONNECTION: CGA-720

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, Fax (703) 961-1831, website: www.cganet.com.

- AV-1 Safe Handling and Storage of Compressed Gas
- G-2 Anhydrous Ammonia
- G-2.1 ANSI Safety Requirements for the Storage and Handling of Anhydrous Ammonia
- P-1 Safe Handling of Compressed Gases in Containers
- P-14 Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmosphere
- SB-2 Oxygen-Deficient Atmospheres
- V-1 Compressed Gas Cylinder Valve Inlet and Outlet Connections

V-7 Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures
--- Handbook of Compressed Gases, Fifth Edition

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

PREPARATION INFORMATION:

DATE: October 15, 2016
DEPARTMENT: Safety and Environmental Services
TELEPHONE: 905-803-1600

The opinions expressed herein are those of qualified experts within Praxair Canada Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair Canada Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

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