Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Ammonia, anhydrous (MSDS No. P-4562-F)

Trade Name: Ammonia

Chemical Name: Ammonia

Synonyms: Ammonia gas, spirit of hartshorn

Formula: NH_3

Chemical Family: Amine

Telephone:
Emergencies: 1-800-645-4633*
CHEMTREC: 1-800-424-9300*
Routine: 1-800-PRAXAIR

Company Name: Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113

** Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).*

2. Composition/Information on Ingredients

For custom mixtures of this product, request an MSDS for each component. See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCEN-TRATION	OSHA PEL	ACGIH TLV-TWA (1999)
Ammonia	7664-41-7	>99%*	50 ppm	25 ppm (35 ppm, 15 min, TLV STEL)

** The symbol > means "greater than"; the symbol <, "less than."*

3. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Corrosive liquid and gas under pressure.
Harmful if inhaled.
Causes 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.
Odor: Pungent, irritating

THRESHOLD LIMIT VALUE: TLV-TWA, 25 ppm; 35 ppm, 15 min STEL (ACGIH, 1999). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

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Revised

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION–Exposure to concentrations moderately above the TLV may irritate the eyes, nose, and throat. Higher concentrations may cause breathing difficulty; chest pain; bronchospasm; pink, frothy sputum; and pulmonary edema (fluid on the lungs).

SKIN CONTACT–Liquid may cause moderate-to-severe redness, swelling, and ulceration of the skin, depending on the degree and duration of contact. At high concentrations, gas may cause chemical burns. Prolonged or widespread skin contact may result in the absorption of potentially harmful amounts of material.

SWALLOWING–An unlikely route of exposure; this product is a gas at normal temperature and pressure. But exposure, should it occur, 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 cataracts. 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: Asphyxiant. Lack of oxygen can kill. Contact with the liquid may cause frostbite.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. Skin irritation may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None known.

CARCINOGENICITY: Ammonia is not listed by NTP, OSHA, or IARC.

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. **WARNING: Rescuer may receive chemical burns from giving mouth-to-mouth resuscitation.** If breathing is difficult, qualified personnel may give oxygen. Keep victim warm. Call a physician.

SKIN CONTACT: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Discard clothing and shoes. Call a physician.

SWALLOWING: An unlikely route of exposure; this product is a gas at normal temperature and pressure. Give at least two glasses of water or milk at once. Do not induce vomiting. Call a physician.

EYE CONTACT: Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: *Victims of overexposure should be observed for at least 72 hours for delayed 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 overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLASH POINT (test method):	Flammable gas	
AUTOIGNITION TEMPERATURE:	1202°F (650°C)	
FLAMMABLE LIMITS IN AIR, % by volume:	**LOWER:** 16%	**UPPER:** 25%

EXTINGUISHING MEDIA: CO_2, dry chemical, water spray, or fog.

SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Corrosive liquid and gas under pressure. Can catch fire. Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately spray cylinders with water from maximum distance until cool, taking care not to extinguish flames. Remove sources of ignition if without risk. Remove all cylinders from fire area if without risk; continue cooling water spray while moving cylinders. Stop flow of gas if without risk, or allow flames to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION 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 125°F (52°C). Cylinders are equipped with a pressure-relief device. (Exceptions may exist where authorized by DOT, in this case where cylinders contain less than 165 pounds of product.) If leaking or spilled product catches fire, do not extinguish flames. Flammable and toxic vapors may spread from leak and could explode if reignited. 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. Reverse flow into cylinder may cause rupture. To protect persons from cylinder fragments and toxic fumes should a rupture occur, totally evacuate the area if the fire cannot be brought under immediate control.

HAZARDOUS COMBUSTION PRODUCTS: Carbon monoxide, carbon dioxide

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Corrosive liquid and gas under pressure. Can catch fire. Forms explosive mixtures with air and oxidizing agents. (See section 5.) Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Reverse flow into cylinder may cause rupture. (See section 16.) Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Flammable vapors may spread from leak. Before entering area, especially confined areas, check atmosphere with an appropriate device.

WASTE DISPOSAL METHOD: 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, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

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 in using ammonia, see section 16.

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.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST–Use a local exhaust system, if necessary, to prevent oxygen deficiency and to keep hazardous fumes and gases below applicable TLVs in the worker's breathing zone.

MECHANICAL (general)–Not recommended as a primary ventilation system to control worker's exposure.

SPECIAL–Use only in a closed system. An explosion-proof, corrosion-resistant, forced-draft fume hood is preferred.

OTHER –None

RESPIRATORY PROTECTION: Use air-supplied respirators for concentrations up to 10 times the applicable permissible exposure limit. For higher concentrations, a full-face, self-contained breathing apparatus operated in the pressure-demand mode is required. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

SKIN PROTECTION: Wear work gloves for cylinder handling; neoprene during cylinder changeout or wherever contact with product is possible.

EYE PROTECTION: Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or wherever contact with product is possible. Select eye protection in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Select equipment in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT:	17.031
SPECIFIC GRAVITY (Air = 1) at 32°F (0°C) and 1 atm**:**	0.5970
GAS DENSITY at 32°F (0°C) and 1 atm**:**	0.0481 lb/ft^3 (0.771 kg/m^3)
VAPOR PRESSURE at 70°F (21.1°C)**:**	128.8 psia (888 kPa abs)
SOLUBILITY IN WATER, vol (liq.)/vol (liq.) at 68°F (20°C) and 1 atm**:**	0.848
PERCENT VOLATILES BY VOLUME:	100
EVAPORATION RATE (Butyl Acetate = 1)**:**	High
BOILING POINT at 1 atm**:**	-28.12°F (-33.40°C)
FREEZING POINT at 1 atm**:**	-107.9°F (-77.72°C)

APPEARANCE, ODOR, AND STATE: Colorless gas at normal temperature and pressure; pungent, irritating odor.

10. Stability and Reactivity

STABILITY: ☐ **Unstable** ☒ **Stable**

INCOMPATIBILITY (materials to avoid): Gold, silver, mercury, oxidizing agents, halogens, halogenated compounds, acids, copper, copper-zinc alloys (brass), chlorates, zinc

HAZARDOUS DECOMPOSITION PRODUCTS: The normal products of combustion are nitrogen and water. Hydrogen may be formed at temperatures above 1,544°F (840°C).

HAZARDOUS POLYMERIZATION: ☐ **May Occur** ☒ **Will Not Occur**

CONDITIONS TO AVOID: None known.

11. Toxicological Information

LC_{50} = 7338 ppm, 1 hr, rat.

12. Ecological Information

No adverse ecological effects expected. Ammonia does not contain any Class I or Class II ozone-depleting chemicals. Ammonia is not listed as a marine pollutant by DOT.

13. Disposal Considerations

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

14. Transport Information

DOT/IMO SHIPPING NAME: Ammonia, anhydrous

HAZARD CLASS:	**IDENTIFICATION NUMBER:**	**PRODUCT RQ:**
2.2 (domestic shipment) 2.3 (international shipment)	UN 1005	100 lb (45.4 kg)

SHIPPING LABEL(s):	NONFLAMMABLE GAS (domestic shipment) POISON GAS, CORROSIVE (international shipment)*
PLACARD (when required):	NONFLAMMABLE GAS (domestic shipment) POISON GAS, CORROSIVE (international shipment)*

**The words in the POISON GAS diamond are INHALATION HAZARD.*

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Additional Marking: INHALATION HAZARD (domestic and international)

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

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, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): 100 lb (45.4 kg)

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):

Threshold Planning Quantity (TPQ): 500 lb (226.8 kg)
Extremely Hazardous Substances (40 CFR 355): 100 lb (45.4 kg)

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes
DELAYED: Yes
PRESSURE: Yes
REACTIVITY: Yes
FIRE: Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Ammonia requires reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Ammonia, anhydrous is listed as a regulated substance in quantities of 10,000 lb (4536 kg) or greater.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Ammonia is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION**:**

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Ammonia, anhydrous is listed in Appendix A as a highly hazardous chemical in quantities of 10,000 lb (4536 kg) or greater.

STATE REGULATIONS:

CALIFORNIA: This product is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: This product is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: ***Corrosive liquid and gas under pressure.*** Harmful if inhaled. Do not breathe gas. Do not get liquid or vapor in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. Use piping and equipment adequately designed to withstand pressures to be encountered. Store and use with adequate ventilation at all times. Use only with compatible materials and equipment. Use only in a closed system. ***May form explosive mixtures with air.*** Keep away from heat, sparks, and open flame. Use only spark-proof tools and explosion-proof equipment. Ground all equipment. Store and use with adequate ventilation at all times. Keep away from oxidizing agents and other flammables. ***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. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state, and local laws; then repair the leak***. When returning 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.***

NOTE: *Prior to using any plastics, confirm their compatibility with ammonia.*

MIXTURES: When you mix two or more gases or liquefied gases, you can 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 evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:		**HMIS RATINGS:**	
HEALTH	= 2 (gas), 3 (liq.)	HEALTH	= 3
FLAMMABILITY	= 1 (gas), 1 (liq.)	FLAMMABILITY	= 1
REACTIVITY	= 0 (gas), 0 (liq.)	REACTIVITY	= 0
SPECIAL	= None		

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

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

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlet V-1 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), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

AV-1	*Safe Handling and Storage of Compressed Gases*
P-1	*Safe Handling of Compressed Gases in Containers*
V-1	*Compressed Gas Cylinder Valve Inlet and Outlet Connections*
—	*Handbook of Compressed Gases, Third 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.

The opinions expressed herein are those of qualified experts within Praxair, 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, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14150-7891).

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