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## MATERIAL SAFETY DATA SHEET

### SECTION 1. PRODUCT IDENTIFICATION

**PRODUCT NAME:** Ammonia  
**CHEMICAL NAME:** Ammonia **FORMULA:** NH<sub>3</sub>  
**SYNONYMS:** Ammonia, Anhydrous  
**MANUFACTURER:** Air Products and Chemicals, Inc.  
7201 Hamilton Boulevard  
Allentown, PA 18195-1501  
**PRODUCT INFORMATION:** (800) 752-1597  
**MSDS NUMBER:** 1003 **REVISION:** 7  
**REVIEW DATE:** December 1999 **REVISION DATE:** December 1999

### SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Ammonia is sold as pure product (>99%).

**CAS NUMBER:** 7664-41-7

**EXPOSURE LIMITS:**

**OSHA:** PEL = 50 ppm

**ACGIH:** TLV/TWA = 25 ppm  
TLV-STEL = 35 ppm

**NIOSH:** IDLH = 300 ppm

### SECTION 3. HAZARD IDENTIFICATION

#### EMERGENCY OVERVIEW

Anhydrous Ammonia is an irritating, flammable, and colorless liquefied compressed gas packaged in cylinders under its own vapor pressure of 114 psig at 70 °F. Ammonia can cause severe eye, skin and respiratory tract burns. It poses an immediate fire and explosion hazard when concentrations exceed 15%; therefore, area must be ventilated before entering. Wear self-contained breathing apparatus (SCBA) when entering release area if concentrations exceed allowable exposure limits. Fully protective suits are required in large releases. Always be aware of fire and explosion potential in the case of large releases.

#### EMERGENCY TELEPHONE NUMBERS

(800) 523-9374 Continental U.S., Canada, and Puerto Rico  
(610) 481-7711 other locations

#### ACUTE POTENTIAL HEALTH EFFECTS:

##### ROUTES OF EXPOSURE:

**EYE CONTACT:** Exposure to Ammonia can cause moderate to severe eye irritation.

**INGESTION:** Ingestion is not a likely route of exposure for Ammonia.

**INHALATION:** Ammonia is severely irritating to nose, throat, and lungs. Symptoms may include burning sensations, coughing, wheezing, shortness of breath, headache and nausea. Overexposure may also cause central nervous system effects including unconsciousness and convulsions. Upper airway damage is more likely and can result in bronchospasm (closing of the airway). Vocal chords are particularly vulnerable to corrosive effects of high concentrations. Lower airway damage may result in fluid build up and hemorrhage. Death has occurred following a 5 minute exposure to 5000 ppm.

**SKIN CONTACT:** Vapor contact may cause irritation and burns. Contact with liquid may cause freezing of the tissue accompanied by corrosive caustic action and dehydration.

**POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:**

**ROUTE OF ENTRY:** Inhalation, eye or skin contact

**SYMPTOMS:** Repeated or prolonged skin exposure may cause dermatitis.

**TARGET ORGANS:** Eyes, skin, central nervous and respiratory systems.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** Conditions generally aggravated by exposure include asthma, chronic respiratory disease (e.g., emphysema), dermatitis and eye disease.

**CARCINOGENICITY:** Ammonia is not listed as a carcinogen or potential carcinogen by NTP, IARC, or OSHA.

**SECTION 4. FIRST AID MEASURES**

**EYE CONTACT:** Flush eyes with large quantities of water. Seek medical attention immediately.

**INGESTION:** Ingestion is not a likely route of exposure for Ammonia.

**INHALATION:** Remove person to fresh air. If not breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.

**SKIN CONTACT:** Flush affected area with large quantities of water. Remove contaminated clothing immediately. If liquid comes in contact with skin, remove contaminated clothing and flush with plenty of lukewarm water for several minutes. Seek medical attention immediately.

**NOTE TO PHYSICIAN:** Bronchospasm may be treated with the use of a bronchodilator such as albuterol and an anticholinergic inhalant such as Atrovent.

**SECTION 5. FIRE FIGHTING MEASURES**

**FLASH POINT:**

Not applicable

**AUTOIGNITION:**

1204 °F (651 °C)

**FLAMMABLE RANGE:**

16% - 25%

**EXTINGUISHING MEDIA:** Dry chemical, carbon dioxide or water.

**SPECIAL FIRE FIGHTING INSTRUCTIONS:** Evacuate all personnel from area. If possible without risk, stop the flow of Ammonia, then fight fire according to types of materials that are burning. Extinguish fire only if gas flow can be stopped. This will avoid possible accumulation and re-ignition of a flammable gas mixture. If possible, move adjacent cylinders away from fire area. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out. Self-contained breathing apparatus (SCBA) may be required.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Most cylinders are designed to vent contents when exposed to elevated temperatures. Pressure in a cylinder can build up due to heat and it may rupture if pressure relief devices should fail to function. Runoff from firefighting may be contaminated; check pH. Ammonia can form explosive compounds when combined with mercury.

**HAZARDOUS COMBUSTION PRODUCTS:** Oxides of nitrogen

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:** Evacuate immediate area. Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. Shut off source of leak if possible. Isolate any leaking cylinder. If leak is from container, pressure relief device or its valve, contact your supplier. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs. Ammonia vapors can be controlled with water spray, however; runoff may be contaminated. Releases that exceed 100 lbs (45.4 kgs) during a 24-hour period must be reported. (See Section 15).

All responders must be adequately protected from exposure. Levels of Ammonia should be below levels listed in Section 2 (Composition / Information on Ingredients) and the atmosphere must have at least 19.5% oxygen before personnel can be allowed in the area without self-contained breathing apparatus (SCBA).

## SECTION 7. HANDLING AND STORAGE

**STORAGE:** Store cylinders in a well-ventilated, secure area, protected from the weather. Cylinders should be stored upright with valve outlet seals and valve protection caps in place. There should be no sources of ignition. All electrical equipment should be explosion-proof in the storage areas. Storage areas must meet National Electrical Codes for class 1 hazardous areas. Flammable storage areas should be separated from oxygen and other oxidizers by a minimum distance of 20 ft. or by a barrier of non-combustible material at least 5 ft. high having a fire resistance rating of at least ½ hour. Ammonia cylinders should not be stored near acids or acid-forming gases. Post "No Smoking or Open Flames" signs in the storage or use areas. Do not allow storage temperature to exceed 125 °F (52 °C). Storage should be away from heavily traveled areas and emergency exits. Full and empty cylinders should be segregated. Use a first-in first-out inventory system to prevent full containers from being stored for long periods of time.

Caution: Ammonia cylinders are subject to theft and misuse. Cylinders should be stored and used in controlled areas.

**HANDLING:** Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure reducing regulator or separate control valve to safely discharge gas from cylinder. Use a check valve to prevent reverse flow into cylinder. Never apply flame or localized heat directly to any part of the cylinder. Do not allow any part of the cylinder to exceed 125 °F (52 °C). Once cylinder has been connected to properly purged and inerted process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings. Doing so may damage valve causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps. All piped systems and associated equipment must be grounded. Electrical equipment should be non-sparking or explosion-proof.

Only a recommended CGA connection should be used. Adapters should not be used. Use piping and equipment adequately designed to withstand pressures to be encountered. If liquid product is being used, ensure steps have been taken to prevent entrapment of liquid in closed systems. The use of pressure relief devices may be necessary. Dedicated inert gas cylinders with in line back-flow protection should be used for purging.

**SPECIAL REQUIREMENTS:** Always store and handle compressed gases in accordance with Compressed Gas Association, Inc. (ph.703-979-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage or use.

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### ENGINEERING CONTROLS:

**VENTILATION:** Provide adequate natural or mechanical ventilation to maintain Ammonia concentrations below exposure limits.

### RESPIRATORY PROTECTION:

**Emergency Use:** Self-contained breathing apparatus (SCBA) or positive pressure airline with full face mask with escape pack should be worn in areas of a large release or unknown concentration.

**EYE PROTECTION:** Safety glasses for handling cylinders. Chemical goggles with full faceshield for connecting, disconnecting or opening cylinders.

**SKIN PROTECTION:** Leather gloves for handling cylinders. Rubber or Neoprene gloves, and chemical resistant outergarment should be worn when connecting or disconnecting cylinders. Total encapsulating chemical suit may be necessary in large release area. Fire resistant suit and gloves in emergency situations.

**OTHER PROTECTIVE EQUIPMENT:** Safety shoes are recommended when handling cylinders. Safety shower and eyewash fountain should be readily available.

**CAUTION:** Contact with cold, evaporating liquid on gloves or clothing may cause cryogenic burns or frostbite. Cold temperatures may also cause embrittlement of PPE material resulting in breakage and exposure.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

**APPEARANCE, ODOR AND STATE:** Colorless gas with a sharp, strong odor similar to "smelling salts" which is readily detectable at 20 ppm

**MOLECULAR WEIGHT:** 17.0

**BOILING POINT (1 atm):** -28.1 °F (-33.4 °C)

**SPECIFIC GRAVITY (air=1):** 0.59

**FREEZING POINT / MELTING POINT:** -107.9 °F (-77.7 °C)

**VAPOR PRESSURE (At 70 °F (21.1 °C)):** 114.4 psig

**GAS DENSITY (At 70 °F (21.1 °C) and 1 atm):** 0.045 lb/ft<sup>3</sup>

**SOLUBILITY IN WATER (vol./vol. at 68 °F):** 0.848

## SECTION 10. STABILITY AND REACTIVITY

**CHEMICAL STABILITY:** Stable

**CONDITIONS TO AVOID:** High temperatures (greater than 800 °F (426 °C)). Cylinders should not be exposed to temperatures in excess of 125 °F (52 °C).

**INCOMPATIBILITY (Materials to Avoid):** Copper, silver, cadmium and zinc and their alloys; mercury, tin, acids, alcohols, aldehydes, halogens and oxidizers.

**REACTIVITY:**

**A) HAZARDOUS DECOMPOSITION PRODUCTS:** Hydrogen at high temperatures.

**B) HAZARDOUS POLYMERIZATION:** Will not occur

## SECTION 11. TOXICOLOGICAL INFORMATION

**LC<sub>50</sub> (Inhalation):** 7338 - 11590 ppm (rat, 1 hour); 2000 ppm (rat, 4 hours)

**LD<sub>50</sub> (Oral):** Not applicable

**LD<sub>50</sub> (Dermal):** Not applicable

**SKIN CORROSIVITY:** Ammonia is corrosive to the skin.

**ADDITIONAL NOTES:** Rats exposed continuously to 180 ppm Ammonia for 90 days did not show any abnormalities of organs or tissues. Mild nasal irritation was observed in 12 out of 49 rats exposed to 380 ppm Ammonia. At 655 ppm Ammonia, 32 out of 51 rats died by day 25 of exposure and 50 out of 51 rats had died after 65 days of exposure.

## SECTION 12. ECOLOGICAL INFORMATION

**AQUATIC TOXICITY:** Currently, the following aquatic toxicity data are available for Ammonia:

Daphnia magna (48 hour) LC<sub>50</sub> = 189 mg/l

Rainbow trout (24 hour) LC<sub>50</sub> = 0.97 mg/l

Fathead minnow (96 hour) LC<sub>50</sub> = 8.2 mg/l

**MOBILITY:** Not available

**PERSISTENCE AND BIODEGRADABILITY:** Not available

**POTENTIAL TO BIOACCUMULATE:** Not available

**REMARKS:** Do not release large amounts of Ammonia to the atmosphere. It does not contain any Class I or Class II ozone depleting chemicals.

### SECTION 13. DISPOSAL CONSIDERATIONS

**UNUSED PRODUCT / EMPTY CYLINDER:** Return cylinder and unused product to supplier. Do not attempt to dispose of unused product.

**DISPOSAL:** Small amounts of Ammonia may be disposed of by discharge into water. A ratio of ten parts water to one part Ammonia should be sufficient for disposal. The subsequent solution of ammonium hydroxide can be neutralized and should be properly disposed of in accordance with regulations.

### SECTION 14. TRANSPORT INFORMATION

**DOT SHIPPING NAME:** Ammonia, Anhydrous

**HAZARD CLASS:** 2.2

**IDENTIFICATION NUMBER:** UN1005

**ADDITIONAL DESCRIPTION:** Inhalation Hazard

**SHIPPING LABEL(s):** Nonflammable gas

**PLACARD (When required):** Nonflammable gas

**ADDITIONAL MARKING:** Ammonia is also a hazardous substance regulated by the EPA. When shipping quantities of 100 lbs. or more in one cylinder, add the prefix "RQ" to the DOT shipping name on the documentation and clearly mark "RQ" on the cylinder near the label.

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure upright position in a well-ventilated truck. Never transport in passenger compartment of a vehicle. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

**CAUTION:** Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner's written consent is a violation of Federal law (49 CFR 173.301).

**NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (NAERG #):** 125

### SECTION 15. REGULATORY INFORMATION

#### 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 lbs (45.4 kgs)

**SARA TITLE III:** Superfund Amendment and Reauthorization Act

**SECTIONS 302/304:** Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Ammonia is listed.

Threshold Planning Quantity (TPQ): 500 lbs (227 kgs)

Reportable Quantity (RQ): 100 lbs (45.4 kgs)

**SECTIONS 311/312:** Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: Yes                      PRESSURE: Yes

DELAYED HEALTH: No                         REACTIVITY: No

FIRE: No

**SECTION 313:** Toxic Chemical Release Reporting (40 CFR Part 372)

Ammonia is on the list of chemicals which may require reporting under Section 313.

#### CLEAN AIR ACT:

**SECTION 112 (r):** Risk Management Programs for Chemical Accidental Release  
(40 CFR PART 68)

Ammonia is listed as a regulated substance.

Threshold Quantity (TQ): 10,000 lbs (4535 kgs)

**TSCA:** Toxic Substance Control Act  
Ammonia is listed on the TSCA inventory.

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

**29 CFR Part 1910.119:** Process Safety Management of Highly Hazardous Chemicals  
Ammonia is listed as a highly hazardous chemical.  
Threshold Quantity (TQ): 10,000 lbs (4535 kgs)

**STATE REGULATIONS:**

**CALIFORNIA:**

Accidental Release Prevention Program: Threshold Quantity (TQ): 100 lbs (45.4 kgs)  
Proposition 65: This product is not a listed substance which the State of California requires warning under this statute.

**NEW JERSEY:**

Toxic Catastrophe Prevention Act: Registration Quantity (RQ): 5200 lbs (2358 kgs)

<b>SECTION 16. OTHER INFORMATION</b>
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**NFPA RATINGS:**

HEALTH: = 3  
FLAMMABILITY: = 1\*  
REACTIVITY: = 0  
SPECIAL:

**HMIS RATINGS:**

HEALTH: = 3  
FLAMMABILITY: = 1  
REACTIVITY: = 0

\* NFPA rates this gas a 1 as opposed to a 4 because it is "difficult to burn".

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