

## Storage

- Ammonia should be stored in a cool, dry, well ventilated area, out of direct sunlight, away from heat and ignition sources, away from flammable materials and process handling areas.
- It should not be stored near elevators, corridors or loading docks, below ground level or confined spaces.
- Keep quantities stored as small as possible. For large scale storage, consider the installation of a leak detection system with an alarm. Avoid storage more than six months and use the oldest first.
- Compressed gas cylinders should be stored separately. Store away from incompatible substances such as chlorine, copper etc.
- Always chain or securely restrain cylinders in an upright position to a wall, rock or other solid structure. Store empty cylinders separately from full ones and closed, properly labeled as 'Empty' or 'MT'.
- Walls, floors, shelving, fitting, lighting and ventilation systems in storage area should be made from carbon steel, stainless steel or aluminum which do not react with ammonia. Storage facility should be made of fire resistant materials.
- Outdoor cylinder storage should be weather proof and have proper drainage. Protect from temperature extremes, -29°C to 52°C. The storage area should have appropriate fire extinguishers and spill clean-up equipment.

## Transport

- The transportation of ammonia should be in accordance with the Motor Vehicle Rules, 1989 (Rules 129 to 138).
- The vehicle carrying ammonia should have Emergency Information Panel (EIP)\* on the side and back of the body of the vehicle.
- The driver of the vehicle must have TREMCARD (Transport Emergency Card) containing safety instructions and precautionary measures. The card should have minimum information about name and nature of chemicals, protection device, spilling/fire/first aid information. Any accident or untoward incident should be immediately notified to the police, fire brigade and ERC.

## During Spillage and Disposal

- Restrict access to area until completion of clean-up. Wear adequate personal protective equipment. Extinguish or remove all ignition sources. Ventilate area.
- Move cylinder to exhaust hood or safe outdoor area for venting. Use water spray/fog to reduce gas cloud from serious leak or spill.
- Do not direct water at source of leak or spill of liquid ammonia.
- Handle carefully as this is a corrosive material. It may be an explosion hazard, specially in confined spaces.
- Use corrosion resistant transfer equipment. Post "No Smoking" signs. Keep the storage area clear of materials which can burn, e.g. cardboard, sawdust etc.
- Never perform welding, cutting, soldering, drilling or other hot work in the area.



## Abbreviations used

ADR HIN	-	Agreement for International Carriage of Dangerous goods by Road Hazard Identification No.
CAS No.	-	Chemical Abstract Society Registration No.
CPR	-	Cardiopulmonary Resuscitation
HAZCHEM	-	Hazardous Chemical
HR	-	Hazard Rating
ICSC	-	International Chemical Safety Card
IDLH	-	Immediately Dangerous to Life and Health
OSHA	-	Occupational Safety and Health Association
PEL	-	Permissible Exposure Limit
RTECS	-	Registry of Toxic Effects of Chemical Substances
TWA	-	Time Weighted Average
UN No.	-	United Nation's No.

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# SAFETY GUIDELINES FOR AMMONIA

<b>AMMONIA</b>		
UN NO.	<b>1005</b>	
HAZCHEM	<b>2PE</b>	
IN EMERGENCY DIAL	SPECIALIST ADVICE : VAPOUR LIGHTER THAN AIR. STAY UPWIND. EVACUATE AREA. USE BREATHING APPARATUS. DILUTE SPILLAGE WITH PLENTY OF WATER AND FLUSH	

## EMERGENCY INFORMATION PANEL \*



## EMERGENCY RESPONSE CENTRE M.P. POLLUTION CONTROL BOARD

Paryawaran Parisar, E-5, Arera Colony,  
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## Identification Keys

- C.A.S.No. - 7664-41-7
- U.N.No. - 1005
- E.U.No. - 007-001-00-5
- ICSC No. - 0414
- RTECS No. - BO0875000
- ADR HI No. - 268
- HR - 3
- HAZCHEM Code - 2PE
- Also known as Anhydrous ammonia, ammonia, aqueous ammonia, molecular formula is  $\text{NH}_3$ .

## Exposure Limits

- OSHA PEL (TWA) - 50 ppm (35 mg/m<sup>3</sup>)
- NIOSH REL (TWA) - 25 ppm (18 mg/m<sup>3</sup>)
- NIOSH (IDLH) - 300 ppm
- ACGIH (STEL) - 35 ppm (24 mg/m<sup>3</sup>)

## Physical Data

Colourless gas with pungent, suffocating odor. Lighter than air, easily liquefied under pressure. Strong base and is corrosive in nature. Toxic to aquatic organisms. Dissolves in water evolving heat.

- Solubility - 54% at 20°C
- Melting point -78°C
- Boiling point -28°F (-33°C)
- Freezing Point -108°F
- Vapor pressure - 8.5 atm (1013 kPa at 26°C)
- Relative Density - 0.7 (water=1)
- Relative vapour density - 0.59 (air=1)
- Auto-ignition temperature - 615°C
- Explosive limits - 15-28% vol in air
- Flash Point - 11
- Specific gravity - 0.77

## Exposure Routes

Inhalation, ingestion (solution), skin and eye.

## Incompatibility & Reactivity

Stable, Hygroscopic, flammable. Incompatible with acids, strong oxidizing agents. May react violently with acids, aldehydes, alkylene oxides, amides, boron, boron halides, calcium, chlorine azide, chloric acid, chlorine monoxide, chlorites, halogens, heavy metals etc.

## Symptoms on Exposure

Irritation to eyes, nose, throat. Dyspnea (breathing problem), chest pain, bronchospasm; pulmonary edema, skin burn, vesiculation. It is extremely corrosive to skin, eyes and mucous membrane and may cause frostbite. Inhalation may cause irritation and burns of respiratory tract. Exposure to high concentration may cause pink

frothy sputum, convulsions and coma. Nausea and vomiting may result on ingestion. Loss of vision is possible. Dermal exposure may result in burns and pain.

## Target Organs

Eyes, Skin, Respiratory system.

## Emergency Life Support System

Compressed oxygen, forced oxygen mask, soap, water, milk, normal saline, DSW, Ringer's lactate.

## Hazard and Prevention

- High airborne concentration can be ignited and pose a significant fire and explosion hazard, specially in a confined space. The flammable and explosion range is in between 16-25% but it is broadened to 15 to 79% by mixing with combustible or flammable gas like hydrogen. Presence of oil also increases the fire hazard and presence of iron lowers the ignition temperature from 850°C to 650°C. Toxic and irritating nitrogen dioxide can form during burning. Cylinders may rupture violently due to over pressurization if exposed to fire or heat for sufficient time.
- Use dry chemical powder or carbon dioxide for small fires and water spray, fog or foam for larger fires.
- Evacuate area and fight fire from safe distance in upwind direction to avoid hazardous gases and toxic decomposition products. Try first to stop the flow of gas before applying extinguishing media. Extinguishing the fire with continued gas flow is extremely hazardous because ammonia is highly corrosive gas.
- If it is not possible to stop the flow of gas, it is preferable to allow continued burning while protecting surrounding and exposed material by water spray and fog.
- Water reacts with ammonia to form corrosive ammonium hydroxide.
- Do not apply water directly to a liquid spill as it may greatly increase evaporation. Don't direct water directly on the leak as this may cause leak to increase and reverse flow into cylinder may also cause rupture.
- No part of the cylinder should be subject to temperature higher than 52°C. If this is not possible, evacuate the area immediately.
- For a massive fire in a large area, use unmanned hose holder on monitor nozzles. If this is not possible, withdraw from the fire area and allow fire to burn. Stay away from ends of tanks but be aware that flying

material from ruptured tanks may travel in any direction.

## Protective Clothing & Equipment

- Butyl Rubber, Teflon (TM), Viton (TM), Responder (TM), Trelchem HPS (TM), Tychem 10000 (TM) (Resistance to breakthrough longer than 8 hours)
- Nitrile rubber (Resistance to breakthrough longer than 4 hours)
- Neoprene (For short period only, i.e. 1 to 4 hours)
- It is not recommended to use Polyethylene, Polyvinylalcohol, Polyvinyl chloride, Saranex (TM), Natural rubber, Barricade, CPF3 (TM)
- It is not recommended to use very thin natural rubber, Neoprene, Nitrile and PVC gloves of 0.3 mm or less.
- Recommendations are valid for rates reaching 1 mg/m<sup>2</sup>/min and over.
- Use chemical cartridge respirator with cartridges or SAR upto 250 ppm.
- Upto 300 ppm, use SAR operated in a continuous flow mode or full face piece chemical cartridge respirator with cartridge or gas mask with canister or full face piece SCBA or full-face piece SAR.

## First Aid

- In case of inhalation move the victim to fresh air. Oxygen is beneficial if victim is finding breathing difficulty. The victim should not be allowed to move about unnecessarily. Take the victim to emergency care facility.
- Evaluate vital signs including pulse. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. Give the victims water or milk (Children up to 1 year, 125 ml, 1 to 12 year 200 ml, adults 250 ml.) This should be given only if the victim is conscious and alert.
- In case of skin contact quickly remove the victim from source of contamination and briefly flush with Lukewarm water until the chemical is removed. Don't rub exposed area or apply dry heat. Remove clothing or jewelry gently which may restrict circulation. Carefully cut around clothing that sticks to the skin. Cover the affected area with sterile dressing. In case of frostbite, do not remove clothes, wash exposed skin area thoroughly with soap and water. Quickly take the victim to the emergency unit.
- In case of eye contact, remove the victim from the site and flush with Lukewarm water for at least 15 minutes. Cover both eyes with sterile dressing. Do not allow victim to take alcohol or smoke.