MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: **Nitrogen, refrigerated liquid**
CHEMICAL NAME: Nitrogen **FORMULA:** N_2
SYNONYMS: Liquid Nitrogen, LIN, Cryogenic Liquid Nitrogen, Nitrogen

MANUFACTURER: **Air Products and Chemicals, Inc.**
7201 Hamilton Boulevard
Allentown, PA 18195-1501

PRODUCT INFORMATION: 1-800-752-1597
MSDS NUMBER: 1041 **REVISION:** 5
REVISION DATE: July 1995**

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Nitrogen is sold as pure product > 99%.
CAS NUMBER: 7727-37-9
EXPOSURE LIMITS:
OSHA: Not established **ACGIH:** Simple asphyxiant

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Liquid nitrogen is a colorless, odorless, extremely cold liquid and gas under pressure. It can cause rapid suffocation when concentrations are sufficient to reduce oxygen levels below 19.5%. Self Contained Breathing Apparatus (SCBA) may be required. Contact with liquid or cold vapors can cause severe frostbite. Cold vapors in the air will appear as a white fog due to condensation of moisture. While this may indicate the presence of the gas it should not be used to determine its concentration in the atmosphere. Oxygen concentrations must be monitored in the release area. All cryogenic liquids produce large volumes of gas when they vaporize. One volume of liquid nitrogen will expand to produce 696.5 equivalent volumes of gas.

EMERGENCY TELEPHONE NUMBERS
800-523-9374 Continental U.S., Canada and Puerto Rico
610-481-7711 other locations

POTENTIAL HEALTH EFFECTS INFORMATION:

INHALATION: Simple asphyxiant.

EYE CONTACT: Tissue freezing and severe cryogenic burns if contacted into eyes.

SKIN CONTACT: Tissue freezing and severe cryogenic burn of skin.

CHRONIC EFFECTS: None established.

EXPOSURE INFORMATION:

ROUTE OF ENTRY: Inhalation

TARGET ORGANS: None

EFFECT: Asphyxiation (suffocation)

SYMPTOMS: Exposure to an oxygen deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will quickly bring about unconsciousness without warning, leaving individuals unable to help or protect themselves. Lack of sufficient oxygen can cause serious injury or death.

Skin contact with liquid nitrogen can cause tissue freezing, resulting in severe burns. The burns are caused by the extremely low temperature of the cryogenic liquid and not the result of chemical action. Skin may appear red with the formation of blisters. In cases that involve prolonged or severe exposure, tissue may freeze and have a waxy or yellow appearance.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: None

CARCINOGENIC POTENTIAL: Nitrogen is not listed by NTP, OSHA or IARC as a carcinogen or suspected carcinogen.

SECTION 4. FIRST AID

INHALATION: Persons suffering from lack of oxygen should be moved to fresh air. If victim is not breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.

SKIN CONTACT: Remove any clothing that may restrict circulation to frozen area. Do not rub frozen parts as tissue damage may result. As soon as practical place the affected area in a warm water bath which has a temperature not to exceed 105°F (40°C). Never use dry heat. Call a physician as soon as possible.

Frozen tissue is painless and appears waxy with a possible yellow color. It will become swollen, painful, and prone to infection when thawed. If the frozen part of the body has been thawed, cover the area with dry sterile dressing with a large bulky protective covering, pending medical care. In case of massive exposure, remove clothing while showering with warm water. Call a physician.

EYE CONTACT: For exposure to liquid, immediately warm frostbite area with warm water (not to exceed 105°F).

SECTION 5. FIRE AND EXPLOSION

FLASH POINT:	**AUTOIGNITION:**	**FLAMMABLE LIMIT:**
Not Applicable	Nonflammable	Nonflammable

EXTINGUISHING MEDIA: Nitrogen is nonflammable and does not support combustion. Use extinguishing media appropriate for the surrounding fire.

HAZARDOUS COMBUSTION PRODUCTS: None

SPECIAL FIRE FIGHTING INSTRUCTIONS: Nitrogen is a simple asphyxiant. If possible, remove nitrogen containers from fire area or cool with water. Do not direct water spray at the container vent. Self contained breathing apparatus may be required for rescue workers. Evacuate the area.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Liquid nitrogen when spilled will vaporize rapidly forming an oxygen deficient vapor cloud. Evacuate this area. Pressure in a container can build up due to heat and it may rupture if pressure relief devices should fail to function. Contact with cold liquid or gaseous nitrogen may cause frostbite. Visibility may be obscured in its vapor cloud.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Evacuate all personnel from affected area. Increase ventilation to release area and monitor oxygen level. Use appropriate protective equipment (SCBA). To increase rate of vaporization spray large amounts of water on to the spill from an upwind position. If leak is from container or it's valve, call the Air Products emergency telephone number. Do NOT spray water directly at leak. If leak is in user's system close cylinder valve and vent pressure before attempting repairs.

SECTION 7. HANDLING AND STORAGE

STORAGE: Store and use with adequate ventilation. Do not store in a confined space. Cryogenic containers are equipped with pressure relief devices to control internal pressure. Under normal conditions these containers will periodically vent product. Do not plug, remove, or tamper with pressure relief device.

HANDLING: Never allow any unprotected part of the body to touch uninsulated pipes or vessels which contain cryogenic fluids. The extremely cold metal will cause the flesh to stick fast and tear when one attempts to withdraw from it.

Use a suitable hand truck for container movement. Containers shall be handled and stored in an upright position. Do not drop, tip, or roll containers on their sides. Do not remove or interchange connections. If user experiences any difficulty operating container valve or with container connections discontinue use and contact supplier. Use the proper connection. DO NOT USE ADAPTERS.

Use piping and equipment adequately designed to withstand pressures to be encountered. Use a check valve or other protective apparatus in any line or piping from the cylinder to prevent reverse flow. To prevent cryogenic liquids or cold gas from being trapped in piping between valves the piping shall be equipped with pressure relief devices. Only transfer lines designed for cryogenic liquids shall be used. Some metals such as carbon steel may become brittle at low temperatures, will easily fracture and should not be used with cryogenic liquids. It is recommended that all vents be piped to the exterior of the building.

SPECIAL PRECAUTIONS: Some metals, such as carbon steel, may become brittle and fracture at low temperatures.

For additional information concerning storage and handling refer to Compressed Gas Association pamphlet P-12 ***Safe Handling of Cryogenic Liquids*** available from the Compressed Gas Association, Inc., 1725 Jefferson Davis Highway, Arlington, VA 22202-4102 Telephone (703) 412-0900.

SECTION 8. PERSONAL PROTECTION / EXPOSURE CONTROL

ENGINEERING CONTROLS: Natural or mechanical ventilation to prevent oxygen deficient atmospheres under 19.5% oxygen.

RESPIRATORY PROTECTION:

- **General Use:** None required.
- **Emergency Use:** Self contained breathing apparatus (SCBA) or positive pressure airline with mask and escape pack are to be used in oxygen deficient atmosphere. Respirators will not function.

PROTECTIVE GLOVES: Loose fitting thermal insulated or leather gloves.

EYE PROTECTION: Full face shield and safety glasses are recommended.

OTHER PROTECTIVE EQUIPMENT: Safety shoes when handling containers. Long sleeve shirts and trousers without cuffs.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless, cryogenic liquid

ODOR: Odorless

MOLECULAR WEIGHT: 28.01

BOILING POINT (1 atm): -320.4 °F (-195.8 °C)

SPECIFIC GRAVITY (Air = 1): 0.967

FREEZING POINT/MELTING POINT: -345.8 °F (-209.9 °C)

VAPOR PRESSURE (AT 20 °C): Not applicable

GAS DENSITY (At 70 °F (21.1 °C) and 1 Atm): 0.072 lb/ft^3 (1.153 kg/m^3)

SOLUBILITY IN WATER (Vol/Vol at 32 °F (0 °C)): 0.023

EXPANSION RATIO: (For liquid to gas) at 70 °F (21.1 °C): 1 to 696.5

SECTION 10. REACTIVITY / STABILITY

CHEMICAL STABILITY: Stable
CONDITIONS TO AVOID: None
INCOMPATIBILITY: None
HAZARDOUS DECOMPOSITION PRODUCTS: None
HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

Nitrogen is a simple asphyxiant.

SECTION 12. ECOLOGICAL INFORMATION

The atmosphere contains approximately 78% nitrogen. No adverse ecological effects are expected. Nitrogen does not contain any Class I or Class II ozone depleting chemicals. Nitrogen is not listed as a marine pollutant by DOT 49 CFR.

SECTION 13. DISPOSAL

UNUSED PRODUCT/EMPTY CONTAINER: Return container and unused product to supplier. Do not attempt to dispose of unused product.

DISPOSAL: For emergency disposal, discharge slowly to the atmosphere in a well ventilated area or outdoors.

SECTION 14. TRANSPORTATION

DOT HAZARD CLASS: 2.2

DOT SHIPPING LABEL: Nonflammable Gas

DOT SHIPPING NAME: Nitrogen, Refrigerated Liquid

IDENTIFICATION NUMBER: UN1977

REPORTABLE QUANTITY (RQ): None

SPECIAL SHIPPING INFORMATION: Containers should be transported in a secure upright position in a well ventilated truck. Never transport in passenger compartment of a vehicle.

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 requires notification to the National Response Center of a release of quantities of hazardous substances equal to or greater than the reportable quantities (RQ) in 40 CFR 302.4.

CERCLA REPORTABLE QUANTITY: None

SARA TITLE III: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT OF 1986

SECTION 302: Requires emergency planning based on threshold planning quantities (TPQ) and release reporting based on reportable quantities (RQ) of EPA's extremely hazardous substances (40 CFR 355).

Nitrogen is not listed as an Extremely Hazardous Substance.

SECTIONS 311/312: Require submission of material safety data sheets (MSDSs) and chemical inventory reporting with identification of EPA defined hazard classes. The hazard classes for this product are:

IMMEDIATE HEALTH:	Yes	PRESSURE:	Yes
DELAYED HEALTH:	No	REACTIVITY:	No
		FIRE:	No

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372. This information should be included in all MSDSs that are copied and distributed for this material.

Nitrogen is not listed as a toxic chemical.

TOXIC SUBSTANCE CONTROL ACT (TSCA): Nitrogen is listed on the TSCA inventory.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

40 CFR PART 68: Risk Management for Chemical Accident Release Prevention.
Nitrogen is not listed as a regulated substance.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

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.
Nitrogen is not listed as a Highly Hazardous Chemical.

STATE REGULATIONS:

CALIFORNIA:

Proposition 65:This product does NOT contain any listed substances which the State of California requires warning under this statute.

SCAQMD Rule: VOC = Not applicable

SECTION 16. SUPPLEMENTAL INFORMATION

NFPA RATINGS:		**HMIS RATINGS:**	
HEALTH:	3	HEALTH:	3
FLAMMABILITY:	0	FLAMMABILITY:	0
REACTIVITY:	0	REACTIVITY:	0
SPECIAL:	SA*		

*Compressed Gas Association recommendation to designate simple asphyxiant.

** Documents with effective dates of July 1995 and July 1998 are identical in content and either may be used.