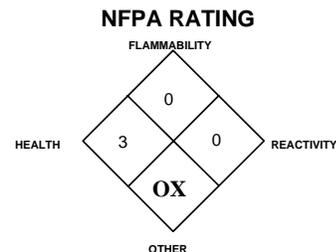




MATERIAL SAFETY DATA SHEET



Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:

NITRIC OXIDE - NO

PRODUCT USE:

Document Number: NOX

For general analytical/synthetic chemical uses.

SUPPLIER/MANUFACTURER'S NAME:

MESA Specialty Gases & Equipment

ADDRESS:

3619 Pendleton Avenue, Suite C
Santa Ana, CA 92704

BUSINESS PHONE:

1-714-434-7102

EMERGENCY PHONE:

INFOTRAC: 1-800-535-5053

DATE OF PREPARATION:

May 10, 1999

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		IDLH ppm	OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm		
Nitric Oxide	10102-43-9	> 99%	25	NE	25	NE	100	NIOSH REL: TWA = 25 ppm
Maximum Impurities		< 1%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established

C = Ceiling Limit

See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Nitric Oxide is a colorless, toxic, corrosive, oxidizing gas with an irritating odor. Nitric Oxide is extremely toxic by inhalation, and symptoms of overexposure may not become apparent for up to 72 hours. Exposure to the rapidly expanding gas can cause frostbite. Nitric Oxide is not flammable. The gas is an oxidizer and will support and enhance combustion. The gas can react with oxygen (in air) to generate nitrogen dioxide. Emergency Responders must protect themselves from inhalation.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for Nitric Oxide is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: Exposure to Nitric Oxide gas in low concentrations produces an irritating effect on the mucous membranes of the eyes, nose, throat, and lungs. Acute exposure through inhalation may result in dryness and irritation of the nose and throat, choking, coughing, and bronchospasm. Severe overexposure may cause death through systemic, delayed pulmonary edema. Typical symptoms of overexposure are as follows:

DURATION	SYMPTOMS of OVEREXPOSURE
25 ppm/ 8 hours:	Delayed (5 - 72 hours) pulmonary irritation.
100 - 150 ppm:	Delayed (5-48 hours) pulmonary edema after 30 - 60 minutes, as well as symptoms of pulmonary dysfunction.
200 - 700 ppm:	Severe pulmonary damage may result after a delay any exposure of 5-8 hours.

An overexposure incident generally follows this course: After inhalation of a few breaths of Nitric Oxide, there is no immediate reaction, or only a very slight respiratory discomfort, headache, dizziness, or lassitude. After 5-8 hours (frequently after the employee has left the workplace and returned home), it is noticed that the victim's lips and ears have a blue (cyanotic) color. There then follows rapidly increasing symptoms of breathing difficulty, irregular respiration, choking, dizziness, headache, increasing cyanosis, tightness in the chest, nausea, vomiting, lassitude, and palpitations. Left untreated, death frequently occurs. Physical examination immediately following overexposure reveals an accelerated respiratory rate, decreased vital capacity, generally suppressed breathing sounds, low blood pressure, and a platelet count elevated by 10-100%.

SKIN and EYE CONTACT: Prolonged exposure may cause potentially harmful amounts of Nitric Oxide to enter the body via absorption through the skin. The gas may be irritating to the skin, especially in a moist environment, for prolonged periods. Symptoms of skin overexposure may include scratchiness, pain, and redness. If Nitric Oxide contaminates the eyes, severe injury and swelling of the eye tissue may occur. Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

OTHER POTENTIAL HEALTH EFFECTS: While unlikely to occur during routine industrial operations, ingestion of Nitric Oxide can burn the tissues of the digestive system and can be fatal. Additionally, aspiration by inhalation is possible, causing pulmonary edema or death.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms.** Overexposure to Nitric Oxide may cause the following health effects:

ACUTE: This gas is toxic and damaging to the respiratory system, as well as contaminated skin and eyes. Overexposures can result in burns to any exposed tissue, delayed lung damage, and death. Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite.

CHRONIC: Prolonged or repeated overexposures may cause respiratory problems, bronchitis, hacking cough, nasal irritation and discharge, increased fatigue, alteration in the senses of taste and smell. Repeated over exposures to Nitric Oxide can also result in dental erosion and gum disorders. Nitric oxide has been shown to cause genetic damage and fetal toxicity in animal or bacterial studies. See Section 11 (Toxicology Information) for additional data.

TARGET ORGANS: Respiratory system, skin, eyes.

HAZARDOUS MATERIAL INFORMATION SYSTEM			
HEALTH		(BLUE)	3
FLAMMABILITY		(RED)	0
REACTIVITY		(YELLOW)	0
PROTECTIVE EQUIPMENT			X
EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8
For routine industrial applications			

See Section 16 for Definition of Ratings

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO NITRIC OXIDE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Personal Protective Equipment should be worn

Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

SKIN EXPOSURE: If Nitric Oxide contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

Note: if frostbite has occurred after exposure to rapidly expanding gases, treatment for frostbite should be initiated after the contaminated areas has been flushed (per the instructions in the previous paragraph). In case of frostbite, place the frostbitten part in warm water. **DO NOT USE HOT WATER.** If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

EYE EXPOSURE: If irritation of the eye develops after exposure to Nitric Oxide, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes.

NOTICE! Delayed onset of life-threatening symptoms is very likely to occur.
Victim(s) must be taken for medical attention.

Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s). Medical care providers should refer to Section 11 (Toxicology Information) of this MSDS for additional information.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

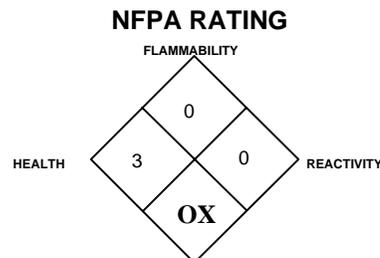
Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Use extinguishing media appropriate for the surrounding fire.

Water Spray: YES Carbon Dioxide: YES Foam: YES

Dry Chemical: YES Halon: YES Other: Any "ABC" Class.



See Section 16 for Definition of Ratings

UNUSUAL FIRE AND EXPLOSION HAZARDS: Nitric Oxide is a toxic and corrosive gas which poses a severe health hazard to firefighters. Nitric Oxide can slowly react with water to form a corrosive solution of nitrogen dioxide. Nitrogen dioxide is corrosive to skin and metal. Corrosive and toxic gases, vapors, and mists may spread from the point of release. Nitric Oxide is an oxidizer and can support or enhance combustion.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Fight fires in a protected location. Approach fire from an upwind direction, to prevent overexposure to Nitric Oxide. If this product is involved in a fire, fire run-off water should be contained to prevent possible environmental damage. If cylinders are exposed to heat, the cylinder may rupture or burst and release the contents. It may be prudent to remove potentially heat-exposed cylinders from the area surrounding a fire, if it is safe for fire-fighters to do so. In the event of fire, cool containers of Nitric Oxide with water to prevent failure. Use a water spray or fog to reduce or direct vapors. Do not direct a water spray at the source of a release. Water spray should be used with care.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. Due to the oxidizing power of this gas, adequate fire protection must be provided. Call CHEMTREC (1-800-424-9300) for emergency assistance.

Minimum Personal Protective Equipment should be **Level B: triple-gloves (Neoprene rubber gloves and nitrile gloves, over latex or N-Dex™ gloves), chemically resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus.** Monitor the surrounding area for oxygen and Nitric Oxide. A colorimetric tube is available for Nitric Oxide. The level of Nitric Oxide must be below the limits described in Section 2 (Composition and Information on Ingredients) and the atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. While starch-iodide paper will respond to the presence of nitric oxide, the limit of detection is too high to be of appreciable value, and its use is not recommended. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

THIS IS AN EXTREMELY TOXIC GAS. Protection of all personnel and the area must be maintained.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Nitric Oxide ON YOU or IN YOU. Wash hands after handling chemicals. Do not eat or drink while handling chemicals. All work practices should minimize the release of Nitric Oxide. Be observant for signs and symptoms of overexposure (see Section 3, Hazard Information).

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing the gas or sprays or mists generated by Nitric Oxide. Store cylinders in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Use only compatible materials for cylinders, process lines, and other Nitric Oxide-handling equipment. Anhydrous Nitric Oxide is not corrosive to steel and other common structural materials. In the presence of air or moisture, however, corrosive conditions will develop. If piping and accessories cannot be maintained free of air or moisture, stainless steel is recommended. Lines should be purged with dry nitrogen both before and after maintenance activity. Keep cylinder tightly-closed when not in use. Keep cylinders away from incompatible material. Wash thoroughly after using this material. Workers must be thoroughly trained to handle Nitric Oxide without causing overexposure. Periodic inspections of process equipment by knowledgeable persons should be made to ensure that the equipment is used appropriately and the system is kept in suitable operating condition. Nitric Oxide emergency equipment should be available near the point of use.

- Wear protective clothing, as listed in Section 8 (Exposure Controls - Personal Protection).
- Instant-acting showers should be available in the event of an emergency.
- Special eye-wash fountains or similar equipment should be available for eye irrigation.
- Proper respiratory protection equipment must be provided and workers using such equipment must be carefully trained in its operation and limitations.
- Precautions must always be taken to prevent suck-back of foreign materials into the cylinder by using a check-valve, vacuum break, or trap, since suck-back may cause dangerous pressure changes within the cylinder.
- The cylinder valve should be closed after each use.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Use a check valve or trap in the discharge line to prevent hazardous backflow. Post "No Smoking or Open Flame" signs in storage and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices. The following rules are applicable to situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap in-place (where provided) until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap (where provided). Mark empty cylinders "EMPTY".

7. HANDLING and STORAGE (Continued)

NOTE: Use only DOT or ASME code containers. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 "Oxygen Deficient Atmospheres".

TANK CAR SHIPMENTS: (NOTE: BULK SHIPMENTS ARE PROHIBITED IN CANADA.) Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car owner's recommendations and all established on-site safety procedures. Appropriate personal protective equipment must be used during tank car operations (see Section 8, Exposure Controls and Personal Protection). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level and wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tank (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be clean and free of incompatible chemicals, prior to connection to the tank car or vessel. Valves and hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g., nitrogen) before attempting repairs.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to minimize exposure to Nitric Oxide. Local exhaust ventilation is preferred, because it prevents Nitric Oxide dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of Nitric Oxide. Eye wash stations/safety showers should be near areas where this product is used or stored. Employee exposure should be monitored and reduced to the lowest practical levels using ventilation or other, appropriate, engineering controls. If necessary, Nitric Oxide cylinders should be placed in a ventilated gas cabinet.

RESPIRATORY PROTECTION: Maintain Nitric Oxide below the exposure limits provided in Section 2 (Composition and Information on Ingredients) and oxygen above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of Nitric Oxide. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. The NIOSH respiratory protection recommendations for Nitric Oxide in air are as follows:

CONCENTRATION

Up to 100 ppm:

RESPIRATORY EQUIPMENT

SAR (Supplied-Air Respirator) operated in a continuous-flow mode; or full-facepiece chemical cartridge respirator with cartridge(s); or powered air-purified respirator with cartridge(s); or gas mask with canister; or SAR; or full-facepiece SCBA..

Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

ESCAPE:

Gas mask with canister to protect against nitric oxide; or escape- type SCBA.

NOTE:

The IDLH concentration for Nitric Oxide is 100 ppm.

EYE PROTECTION: Splash goggles or safety glasses, and face-shields should be used.

HAND PROTECTION: Wear mechanically-resistant gloves when handling cylinders of Nitric Oxide. Wear chemically-resistant gloves when using this gas. Neoprene gloves are recommended.

BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to the task.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 0.0777 lb/ft³ (1.245 kg/m³)

SPECIFIC GRAVITY (air = 1): 1.036

SOLUBILITY IN WATER (v/v): 7.4%

VAPOR PRESSURE (psia): Not applicable.

EXPANSION RATIO: Not available.

SPECIFIC VOLUME (ft³/lb): 13.0

EVAPORATION RATE (nBuAc = 1): Not applicable.

FREEZING POINT: -163.7 °C (-262.6°F)

BOILING POINT: -151.7°C (-241.2°F)

pH: Not applicable.

ODOR THRESHOLD: 0.36 mg/m³

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

APPEARANCE AND COLOR: Colorless gas with an irritating odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): Though the odor is irritating, it does not serve as a reliable warning property for Nitric Oxide. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation. Area monitoring should be performed using appropriate equipment.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Reacts with water or moist air to form nitrogen dioxide and other oxides of nitrogen.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Nitric Oxide is not compatible with the following materials: air, oxygen, flammable or combustible materials, charcoal, powdered aluminum, boron, chlorine monoxide, chromium, fluorine, nitrogen trichloride, ozone, phosphorous, oxidizing and reducing agents, halogens, a variety of halocarbons, powdered iron, sodium monoxide, magnesium, manganese, uranium, uranium dicarbide, and tungsten carbide.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with air, moisture and incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is for Nitric Oxide.

Mutation in Microorganisms-Salmonella typhimurium 30 ppm
Mutation in Mammalian Somatic Cells-Rat-Inhalation 27 ppm/3
hours
Mutation in Mammalian Somatic Cells-Hamster: lung 10 ppm/10
minutes, Continuous

Inhalation-Rat LC₅₀: 1068 mg/m³
Inhalation-Mouse LCLo: 320 ppm
Inhalation-Dog, adult LCLo: 5000 ppm/25 minutes
Inhalation-Rat TCLo: 50 mg/m³/6H/7 weeks, Intermittent

SUSPECTED CANCER AGENT: Nitric Oxide is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA; therefore it is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Nitric Oxide is severely irritating to the eyes, skin, and any other contaminated tissue.

SENSITIZATION TO THE PRODUCT: Nitric Oxide is not known to cause sensitization in humans. One study involving guinea pigs exposed to 4.3 ppm Nitric Oxide, 8 hours/day for 5 days enhanced an allergic reaction to ovalbumin (a known allergen).

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Nitric Oxide on the human reproductive system.

Mutagenicity: No mutagenicity effects on humans have been described for Nitric Oxide. Nitric Oxide has been shown to cause genetic damage in bacterial studies.

Embryotoxicity: Nitric Oxide is not expected to cause embryotoxic effects in humans.

Teratogenicity: No teratogenicity effects on humans have been described for Nitric Oxide.

Reproductive Toxicity: No reproductive toxicity effects on humans have been described for Nitric Oxide. Nitric Oxide has been shown to cause and fetal toxicity in animal studies.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions, skin conditions, or eye disorders may be aggravated by overexposure to Nitric Oxide.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen as soon as possible, following exposure. If possible, have victim breathe as deeply and rapidly as possible to help flush gas from the lungs. Enforce bed rest for 24 - 48 hours, whether or not symptoms have appeared. Start oxygen therapy at the first sign of symptoms. Provide medication to reduce anxiety and dyspnea, as needed. Keep respiratory tract clear of mucous and exudate. Atropine, epinephrine, expectorants, emetics, most sedatives and most cardiac glycosides are usually ineffective and possibly harmful. Surgical intervention to assist breathing may be necessary. Respiratory infection should be controlled as soon as it is detected. Prednisone has been reported to be effective during recovery, in amounts of 3-8 x 10⁻⁶ kg daily, in divided doses. If Nitric Oxide contaminates the eye, use an optic anesthetic. The victim should be examined by an ophthalmologist.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Nitric Oxide.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. Complex reactions of Nitric Oxide occur in the atmosphere which contribute to air pollution.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen deficient environments, respiratory system damage, and damage to the skin and eyes. Because of Nitric Oxide produces corrosive nitrogen dioxide upon contact with air or moisture, plants may be damaged or destroyed.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Nitric Oxide hydrolyzes to nitrogen dioxide when in contact with water. If a release of Nitric Oxide occurs near a other body of water, the release has the potential to kill fish and other aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Airgas Inc. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Nitric oxide, compressed

HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Poison Gas)

UN IDENTIFICATION NUMBER: UN 1660

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Poison gas; Oxidizer; Corrosive

SPECIAL PROVISION: Nitric Oxide is poisonous by inhalation. Shipments must be properly described as inhalation hazards. ZONE A.

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 124

MARINE POLLUTANT: Nitric Oxide is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Nitric Oxide is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
NITRIC OXIDE	YES	YES	No

U.S. SARA THRESHOLD PLANNING QUANTITY: 100 lb.

U.S. CERCLA REPORTABLE QUANTITY (RQ): 10 lb.

CANADIAN DSL/NDL INVENTORY STATUS: Nitric Oxide is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Nitric Oxide is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Nitric Oxide (anhydrous) is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb. Compliance with the OSHA Process Safety Standard (29 CFR 1910.119) may be applicable to operations involving the use of Nitric Oxide. Nitric Oxide is listed in Appendix A of this regulation and has a Threshold Quantity of 250 lb.

STATE REGULATORY INFORMATION: Nitric Oxide is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Nitric Oxide.

California - Permissible Exposure Limits/ Chemical Contaminants: Nitric Oxide.

Florida - Substance List: Nitric Oxide.

Illinois - Toxic Substance List: Nitric Oxide.

Kansas - Section 302/313 List: Nitric Oxide.

Massachusetts - Substance List: Nitric Oxide.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: Nitric Oxide.

Missouri - Employer Information/Toxic Substance List: Nitric Oxide.

New Jersey - Right to Know Hazardous Substance List: Nitric Oxide.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Nitric Oxide.

Pennsylvania - Hazardous Substance List: Nitric Oxide.

Rhode Island - Hazardous Substance List: Nitric Oxide.

Texas - Hazardous Substance List: Nitric Oxide.

West Virginia - Hazardous Substance List: Nitric Oxide.

Wisconsin - Toxic and Hazardous Substances: Nitric Oxide.

15. REGULATORY INFORMATION (Continued)

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Nitric Oxide is not on the California Proposition 65 lists.

LABELING:

DANGER:

POISONOUS, OXIDIZING HIGH PRESSURE GAS.
MAY BE FATAL IF INHALED.
CAN CAUSE LUNG DAMAGE.
CAN CAUSE EYE AND SKIN BURNS.
SYMPTOMS MAY BE DELAYED.
VIGOROUSLY ACCELERATES COMBUSTION.
Do not breath gas.
Store and use with adequate ventilation, and use in closed systems.
Do not get in eyes, on skin or clothing.
Keep oil, grease, and combustibles away.
Use with equipment cleaned for nitric oxide service and rated for cylinder pressure.
Close valve after each use and when empty.
WHEN RETURNING CYLINDER, INSTALL VALVE OUTLET CAP OR PLUG, LEAK TIGHT
Use in accordance with the Material Safety Data Sheet.



POISON

CALL A PHYSICIAN



FIRST-AID:

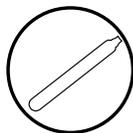
IF INHALED, remove to fresh air. If not breathing, give artificial respiration. (Rescuer may receive chemical burns as a result of giving mouth-to-mouth). If breathing, give oxygen. Call a physician, even if no symptoms are present. Keep under medical observation. Symptoms may be delayed.

IN CASE OF CONTACT, immediately flush eyes or skin with water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse.

DO NOT REMOVE THIS PRODUCT LABEL.

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gases
Class C: Oxidizing Materials
Class D1A: Toxic Material/Immediate and Serious Effects
Class E: Corrosive



16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. MESA Specialty Gas & Equipment assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, MESA Specialty Gas & Equipment assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (*Federal Register*: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued):

Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDSL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations.