



AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

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

1. PRODUCT AND COMPANY INFORMATION

CHEMICAL NAME; CLASS: LIQUID OXYGEN

SYNONYMS: Oxygen USP; LOX, Cryogenic Liquid Oxygen; Aviator's Breathing Oxygen (ABO)

CHEMICAL FAMILY NAME: Oxidizing Gas

FORMULA: O₂

PRODUCT USE:

Document Number: 10075

For medical, welding and general
and synthetic chemical uses.

MANUFACTURED/SUPPLIED FOR:

ADDRESS:

EMERGENCY PHONE:

BUSINESS PHONE:



AIR LIQUIDE

2700 Post Oak Drive

Houston, TX 77056-8229

CHEMTREC: 1-800-424-9300

General MSDS Information 1-713/896-2896

Fax on Demand: 1-800/231-1366

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Liquid Oxygen is a colorless, odorless, cryogenic liquid. The main health hazard from contact with this gas is the extreme cold. The liquefied gas can cause freezing of tissue, or cryogenic burns, similar to frostbite to eyes or skin upon contact. The main hazard associated with releases of this gas is its powerful oxidizing power. In high oxygen content atmospheres, common combustible materials can become highly flammable. The cryogenic liquid will rapidly boil to the gas at standard temperatures and pressures. Emergency responders must practice extreme caution when approaching oxygen releases because of the extreme fire potential.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of over-exposure for this gas are by inhalation, and contact with the cryogenic liquid.

INHALATION: Inhalation of the extremely cold vapors of this product will cause cryogenic burns to the respiratory system.

CONTACT WITH SKIN or EYES: Contact of the liquid with the skin can lead to severe cryogenic burns or dermatitis (red, cracked, irritated skin), depending upon concentration and duration of exposure. Contact of the liquid with the eyes can cause pain, redness, severe cryogenic burns, and prolonged exposure could cause blindness. Contact with the undiluted liquid will cause frostbite, ulceration of the skin (which may be delayed in appearance for several hours), blistering, and pain. Contact with rapidly expanding gas poses a frostbite hazard.

OTHER POTENTIAL HEALTH EFFECTS: Contact of the skin or eyes with cryogenic liquid or rapidly 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 contact with liquid can quickly subside. Ingestion and absorption through the skin are not considered significant routes of entry of Liquid Oxygen into the body.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to Liquid Oxygen may cause the following health effects:

ACUTE: The most significant hazard associated with this gas is related to the extreme cold of the product. Contact with cryogenic liquid or 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 contact with liquid can quickly subside. Low oxygen environments cannot be caused by this product. Upon evaporation of the liquid to gas, an oxygen-rich atmosphere may exist. In an oxygen rich atmosphere (80% or greater Oxygen concentration), individuals breathing such an atmosphere for durations of 17-14 hours may experience symptoms which include nasal stuffiness, nausea, dizziness, bronchial irritation (cough), sore throat, hypothermia, increased depth of respiration, bradycardia, pulmonary discomfort (including chest pain), peripheral vasoconstriction, amblyopia (loss of vision), or seizures.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this gas.

TARGET ORGANS: ACUTE: Respiratory system. CHRONIC: None known.

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TTWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	ppm
Oxygen	7782-44-7	99.5%	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5% and below 23.5%					
Maximum Impurities		< 0.5%	None of the trace impurities in this product 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 equivalents standards.					

This material is classified as hazardous under OSHA regulations in the United States and the WHMIS in Canada.

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, adequate Personal Protective equipment (and fire retardant clothing, if appropriate) should be worn to protect against high oxygen content, and cryogenic vapors.

Remove victim(s) to fresh air, as quickly as possible. Physician should be advised of victim's exposure to a high oxygen concentration. Only trained personnel should administer cardio-pulmonary resuscitation, if necessary. Supplemental oxygen is not normally appropriate. Victims tend to recover rapidly, when removed from the hypoxic exposure.

SKIN EXPOSURE: Remove any clothing that may restrict circulation to any frozen area. Do not rub frozen parts as tissue damage may occur. As soon as practicable, place any affected area in warm water bath which has a temperature that does not exceed 105°F (40°C). NEVER USE HOT WATER. NEVER USE DRY HEAT. If area of frostbite is extensive, and if possible, remove clothing while showering with warm 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 of the body in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention. Frozen tissue is painless and appears waxy, with a possible yellow color. Frozen tissue will become swollen, painful and prone to infection when thawed. If the frozen part of the body has been thawed by the time medical attention has been obtained, cover the area with a dry sterile dressing and a large bulky protective covering.

EYE EXPOSURE: If liquid is splashed into eyes, or if irritation of the eye develops after exposure to liquid or gas, 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. Seek medical assistance immediately, preferably an ophthalmologist.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by over-exposure to this product. Persons with chronic obstructive pulmonary disease can retain carbon dioxide abnormally. If oxygen is administered to such persons, raising the oxygen concentration in the blood depresses the breathing rate and raises the retained carbon dioxide levels in the blood to a dangerous level in these persons.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure. Symptoms of over-exposure usually are relieved quickly. Immediate sedation and anticonvulsive therapy should be provided, as needed.

ADDITIONAL NOTES TO PHYSICIANS: Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increase the susceptibility to toxicity from Oxygen at high pressures. Animal studies also indicate that vitamin "E" deficiency may increase susceptibility to toxicity to Oxygen toxicity. Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the Oxygen. Similarly, occlusion of the Eustachian tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce "vacuum-type" headache.

All individuals exposed for long periods to Oxygen at high pressure and who exhibit overt Oxygen toxicity should have ophthalmologic examinations.

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: Non-flammable gas. Use extinguishing media appropriate for surrounding fire.

RESPONSE TO FIRE INVOLVING CRYOGEN: Cryogenic liquids can be particularly dangerous during fires because of their potential to rapidly freeze water. Careless use of water may cause heavy icing. Furthermore, the relatively warm water greatly increases the evaporation rate of Oxygen. If large concentrations of Oxygen gas are present, the water vapor in the surrounding air will condense, creating a dense fog that may make it difficult to find fire exits or equipment. Liquid Oxygen, when exposed to the atmosphere, will produce a cloud of ice/fog in the air upon its release.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Liquid Oxygen does not burn; however, cryogenic containers, when involved in fire, may rupture or burst in the heat of the fire. Liquid Oxygen will support and accelerate combustion. Common combustible materials will burn more readily in elevated oxygen environments, and some materials which are non-combustible in air will burn in an oxygen-enriched atmosphere. Liquid Oxygen, when released, will vaporize rapidly, forming an oxygen-rich vapor cloud. Evacuate this vapor cloud area. Visibility may be obscured by this cloud. Direct water onto vessels to keep the vessels cool. Shut-off the flow of Liquid Oxygen or move vessels from fire area if it can be done safely. Rescue personnel should be aware of the extreme fire hazards associated with oxygen-enriched atmospheres.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, remove Oxygen cryogenic containers from fire area or cool with water. Do not direct water spray at the container vent. Evacuate area. Other information for pre-planning can be found in the North American Emergency Response Guidebook, and the DOT Emergency Response Guidebook.

6. ACCIDENTAL RELEASE MEASURES

RESPONSE TO CRYOGENIC RELEASE: Clear the affected area and allow the liquid to evaporate and the gas to dissipate. After the gas is formed, follow the instructions provided below. Alternatively, to increase the rate of vaporization, spray large amounts of water on to the leak from an upwind position. If the area must be entered by emergency personnel, leather or thermally protective gloves, and appropriate foot and leg protection must be worn. Minimum Personal Protective Equipment should be **Level B: fire protective clothing, leather or thermally insulated, fire protective gloves**. In general, **DO NOT ENTER AN AREA IF THE OXYGEN CONTENT EXCEEDS 23.5%. USE VENTILATION TO REDUCE THE OXYGEN LEVELS.**

RESPONSE TO CRYOGENIC RELEASE (continued): 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. Protect personnel attempting the shut-off with water-spray. Remove sources of heat, ignition, and, if possible, separate combustibles from the leak. Monitor the surrounding area for oxygen levels. If possible, prevent liquid oxygen from contacting grease, oil, asphalt and other combustibles. Avoid all contact with liquid oxygen or cold gas.

If leaking incidentally from the container or valve, contact your supplier.

7. HANDLING AND STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue.

STORAGE AND HANDLING PRACTICES: Cryogenic containers should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Store containers away from heavily trafficked areas and emergency exits. Store away from process and production areas, away from elevators, building and room exits or main aisles leading to exits. Protect containers against physical damage.

7. HANDLING AND STORAGE (Continued)

Containers should be stored upright and be firmly secured to prevent falling or being knocked-over. Containers 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. Cryogenic containers are equipped with pressure relief devices to control internal pressure. Under normal conditions, these containers will periodically vent small amounts of product. Some metals such as carbon steel may become brittle at low temperatures and will easily fracture. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Use a check valve or other protective device in the discharge line to prevent hazardous backflow. Never tamper with pressure relief valves and containers.

Keep the smallest amount on-site as necessary. Full and empty containers should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. Liquid Oxygen containers should be separated from flammable materials 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. Isolate from other non compatible chemicals (refer to Section 10, Stability and Reactivity).

SPECIAL PRECAUTIONS FOR HANDLING CRYOGENIC CONTAINERS: Cryogenic liquids can present significant safety hazards. Never allow any unprotected part of the body to touch uninsulated pipes or vessels which contain cryogenic fluids. The extremely cold metal of the container will cause the flesh to stick fast and tear when one attempts to withdraw from it. The following rules are applicable to work situations in which cryogenic containers are being used.

Before Use: Move containers a suitable hand-truck. Do not drag, slide or roll containers. Do not drop containers or permit them to strike each other. Secure containers firmly.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat container by any means to increase the discharge rate of the product from the container. **Do not use oils or grease on valve fittings or equipment.** Leak-check system with leak detection solution. Immediately contact the supplier if there are any difficulties associated with operating container valve. Never strike an arc, on a cryogenic container of Oxygen or make a container part of an electric circuit. Use piping and equipment cleaned for oxygen service.

After Use: Close main container valve. Valves should be closed tightly. Mark empty container "EMPTY".

NOTE: Use only DOT or ASME code containers designed for gas storage. Close valve after each use and when empty.

For welding and brazing operations, refer to ANSI Z-49.1 "Safety in Welding and Cutting" and OSHA safety regulations for welding, cutting, and brazing (29 CFR 1910.252). In addition, see the National Fire Protection Association (NFPA) publication 51 *Oxygen Fuel Gas Welding and Cutting*. Refer to Section 16, Other Information, for additional available literature.

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA: Use the proper CGA connections, DO NOT USE ADAPTERS:

<u>THREADED:</u>	CGA 440
<u>PIN-INDEXED YOKE:</u>	Not applicable.
<u>ULTRA HIGH INTEGRITY:</u>	Not applicable.

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 (i.e. nitrogen) before attempting repairs. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents dispersion of this gas into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of oxygen.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% and below 23.5% in the workplace. **DO NOT ENTER AN AREA IF THE OXYGEN CONTENT EXCEEDS 23.5%.**

EYE PROTECTION: Full face shield and safety glasses are recommended. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear loose fitting, leather or thermally protective gloves when handling cryogenic containers of this product. . Otherwise, wear glove protection appropriate to the specific operation for which Liquid Oxygen is used. If necessary, refer to U.S. OSHA 29 CFR 1910.138 and appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate for task. Safety shoes are recommended when handling containers, as well as long sleeve shirts and trousers. Safety shoes are recommended when handling cylinders. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

GAS DENSITY @ 0°C (32°F) and 1 atm: 0.083 lb/cu ft (1.326 kg/m³)

BOILING POINT: -183.0°C (-297.4°F)

FREEZING/MELTING POINT @ 10 psig: -218.8°C (-361.8°F)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 1.105

SOLUBILITY IN WATER vol/vol at 0°C and 1 atm: 0.04.91

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable.

VAPOR PRESSURE @ 21.1°C (70°F) psig: Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

APPEARANCE, ODOR AND COLOR: This product is a pale, blue, odorless cryogenic liquid.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this product, except the extreme cold, which may form a vapor cloud. An oxygen monitor can be used to detect oxygen levels.

pH: Not applicable.

MOLECULAR WEIGHT: 32.00

EXPANSION RATIO: Not applicable.

VOLUME (ft³/lb): 12.1

10. STABILITY and REACTIVITY

STABILITY: Normally stable.

DECOMPOSITION PRODUCTS: None.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Liquid Oxygen is incompatible with combustible and flammable materials, chlorinated hydrocarbons, hydrazine, reduced boron compounds, ethers, phosphine, phosphorous tribromide, phosphorous trioxide, tetrafluoroethylene, and compounds which readily form peroxides. Oxygen may form explosive compounds when exposed to combustible material, or oil, grease, and other hydrocarbon materials. Refer to NFPA 491M Manual of Hazardous Chemical Reactions.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid contact with incompatible materials. Cryogenic containers exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Oxygen is the vital element in the atmosphere in which we live and breathe. The atmosphere contains approximately 21% oxygen. Breathing higher concentrations could lead to oxygen toxicity and pneumonia. Breathing lower oxygen concentrations could lead to hypoxia. The following toxicity data are for oxygen:

Human toxicological data and Teratogenic data are available for Oxygen; however, the effects have occurred after prolonged exposure to Oxygen (inhalation effects of TClO after 14 hours) and with exposure of very high concentration of Oxygen at greater than normal atmosphere.

Premature infants exposed to high oxygen concentrations may suffer delayed retinal damage which can progress to retinal detachment and blindness. Retinal damage may also occur in adults exposed to 100% oxygen for extended periods of time (24 to 48 hours).

At two or more atmospheres, central nervous system (CNS) toxicity occurs. Symptoms include nausea, vomiting, dizziness or vertigo, muscle twitching, vision changes, and loss of consciousness and generalized seizures. At three atmospheres, CNS toxicity occurs in less than two hours, and at six atmospheres in only a few minutes.

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

IRRITANCY OF PRODUCT: Contact with rapidly expanding gases or the refrigerated liquid can cause frostbite and damage to exposed skin and eyes.

SENSITIZATION OF PRODUCT: Liquid Oxygen is not a sensitizer.

11. TOXICOLOGICAL INFORMATION (Continued)

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

Mutagenicity: Mutation data have been reported for Oxygen; these data have been obtained in studies exposing specific animal tissues to relatively high concentrations (80%) of oxygen.

Embryotoxicity: Oxygen is not reported to cause embryotoxic effects in humans.

Teratogenicity: Human teratogenic effects have been reported after inhalation of 12 pph Oxygen for 10 minutes during 26-29 weeks of pregnancy; these effects include developmental abnormalities of the fetal cardiovascular system. Exposure of pregnant hamsters to 3-4 atmospheres of 100% Oxygen for periods of 2-3 hours produced teratogenic effects in a small, but significant number of fetuses. One quarter of the mother hamsters developed central nervous system symptoms.

Reproductive Toxicity: Oxygen is not reported to cause adverse reproductive effects in humans.

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.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) have not been determined for Oxygen.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Oxygen occurs naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No adverse effect is anticipated to occur to animal or plant-life, except for frost produced in the presence of rapidly expanding gases, or the cryogenic liquid.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

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

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors, away from all sources of ignition.

14. TRANSPORTATION INFORMATION

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

PROPER SHIPPING NAME: Oxygen, refrigerated liquid

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas), 5.1 (Oxidizer)

UN IDENTIFICATION NUMBER: UN 1073

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas), Class 5.1 (Oxidizer)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 122

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

SPECIAL SHIPPING INFORMATION: Cryogenic containers should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cryogenic containers in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.

NOTE: Shipment of compressed gas cryogenic containers which have not been filled with the owners consent is a violation of Federal law (49 CFR, Part 173.301 (b)).

14. TRANSPORTATION INFORMATION (Continued)

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

PROPER SHIPPING NAME: Oxygen, refrigerated liquid
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas). 5.1 (Oxidizer)
UN IDENTIFICATION NUMBER: UN 1073
PACKING GROUP: Not Applicable
HAZARD LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas), Class 5.1 (Oxidizer)
SPECIAL PROVISIONS: None
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 0.12
ERAP INDEX: 3000
PASSENGER CARRYING SHIP INDEX: 450
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: Forbidden
MARINE POLLUTANT: Oxygen is not a Marine Pollutant.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: Oxygen is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act. This product is subject to the reporting requirements of Sections 311 and 312 of Title III of the Superfund Amendments and Reauthorization Act (40 CFR 370.21).

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this gas. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

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

OTHER U.S. FEDERAL REGULATIONS:

- Oxygen USP is regulated by the FDA as a prescription drug.
- Depending on specific operations involving the use of this product, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Oxygen is not listed in Appendix A
- Oxygen does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Oxygen is not listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Releases.

U.S. STATE REGULATORY INFORMATION: Oxygen is covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: No.

California - Permissible Exposure Limits for Chemical Contaminants: No.

Florida - Substance List: Oxygen.

Illinois - Toxic Substance List: No.

Kansas - Section 302/313 List: No.

Massachusetts - Substance List: Oxygen.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: No.

Missouri - Employer Information/Toxic Substance List: No.

New Jersey - Right to Know Hazardous Substance List: Oxygen.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.

Pennsylvania - Hazardous Substance List: Oxygen.

Rhode Island - Hazardous Substance List: Oxygen.

Texas - Hazardous Substance List: No.

West Virginia - Hazardous Substance List: No.

Wisconsin - Toxic and Hazardous Substances: No.

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

ADDITIONAL CANADIAN REGULATIONS:

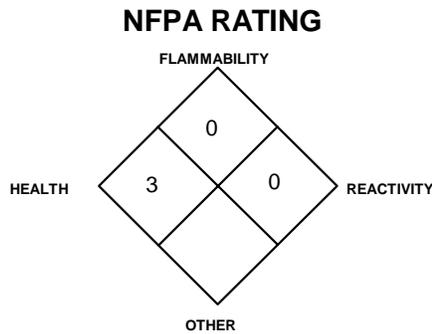
CANADIAN DSL/NDL INVENTORY STATUS: Liquid Oxygen is included in the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITY SUBSTANCES LISTS: Liquid Oxygen is not on the CEPA Priorities Substances Lists.

WHMIS CLASSIFICATION: Liquid Oxygen is categorized as a Controlled Product, Hazard Classes A, and C, as per the Controlled Product Regulations.

OTHER CANADIAN REGULATIONS: Not applicable.

16. OTHER INFORMATION



HAZARDOUS MATERIAL IDENTIFICATION SYSTEM		
HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0
PROTECTIVE EQUIPMENT		
EYES	RESPIRATORY	HANDS
BODY		
See Section 8		
For Routine Industrial Use and Handling Applications		

SPECIAL PRECAUTIONS: All gauges, valves, regulators, piping and equipment to be used in oxygen service must be cleaned for oxygen service in accordance with CGA pamphlet G-4.1. Use piping and equipment adequately designed to withstand pressures to be encountered. Oxygen is not to be used as a substitute for compressed air. Never use an oxygen jet for cleaning purposes of any sort, especially clothing, as it increases the likelihood of an engulfing fire. Use a check valve or other protective apparatus in any line or piping from the cylinder to prevent reverse flow.

Personnel who have been exposed to high concentrations of oxygen should stay in a well-ventilated or open area for 30 minutes before going into a confined space or near an ignition source.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to 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 make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about Oxygen can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 4221 Walney Road 5th floor, Chantilly, VA 20151-2923. Telephone: (703) 788-2700.

- G-4 "Oxygen"
- G-4.1 "Cleaning Equipment of Oxygen Service"
- G-4.3 "Commodity Specification for Oxygen"
- G-4.4 "Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems"
- G-4.6 "Oxygen Compressor Installation Guide"
- P-1 "Safe Handling of Compressed Gases in Containers"
- P-2.6 "Standard Density Data, Atmospheric Gases and Hydrogen"
- P-12 "Safe Handling of Cryogenic Liquids"
- P-14 "Accident Prevention in Oxygen-Rich and Oxygen Deficient Atmospheres"
- SB-8 "Use of Oxy-fuel Gas Welding and Cutting Apparatus"
- AV-1 "Safe Handling and Storage of Compressed Gases"
- AV-8 "Characteristics and Safe Handling of Cryogenic Liquid and Gaseous Oxygen"
- "Handbook of Compressed Gases"

16. OTHER INFORMATION (Continued)

PREPARED BY:

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PO Box 3519, La Mesa, CA 91944-3519
619/670-0609

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This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of Air Liquide's knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.