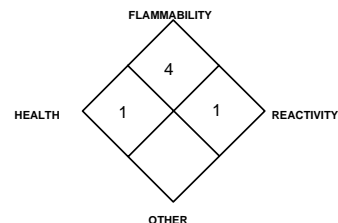


**NFPA RATING**

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:

DIMETHYL ETHER - (CH₃)₂O

Document Number: Dimethyl Ether

PRODUCT USE:

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		
Dimethyl Ether	115-10-6	> 99.0%	NE	NE	NE	NE	NE	DFG-MAK = 1000 ppm DuPont Acceptable Exposure Limit: 1000 ppm (8 hour and 12 hour TWA); American Industrial Hygiene Association: 1000 ppm, TWA
Maximum Impurities		<1.0%	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: Dimethyl Ether is a liquefied, flammable gas with an ethereal odor. High concentrations of Dimethyl Ether can lead to central nervous system depression which could be incapacitating. Overexposure to the gas could cause headache, nausea, dizziness, drowsiness, confusion, unconsciousness, and death. Dimethyl Ether is highly flammable and present dangerous fire and rupture hazards when exposed to heat, flames or oxidizers, or when accidentally released. Distant ignition and flashback are possible. When heated to decomposition, Dimethyl Ether emits acrid smoke and irritating fumes. Flame or high temperature impinging on a localized area of the cylinder of Dimethyl Ether can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of overexposure for Dimethyl Ether are by inhalation or contact. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: The main effect of inhalation exposure to Dimethyl Ether is central nervous system depression. Symptoms of such overexposure to Dimethyl Ether can produce anesthetic effects (sleepiness, loss of coordination, fatigue), as well as headaches, dizziness, nausea, and unconsciousness. The following information summarizes the effects of Dimethyl Ether inhalation on humans:

<u>CONCENTRATION</u>	<u>EXPOSURE</u>	<u>SYMPTOMS</u>
5-7.5 %	12 minutes	Mild intoxication.
8.2%	20-30 minutes	Loss of coordination, blurring of vision, loss of feeling in the appendages.
10%	10-20 minutes	Narcosis (drowsiness, fatigue, loss of coordination).
14.4%	36 minutes	Unconsciousness.
20%	17 minutes	Unconsciousness.

Exposure to high concentrations of this gas can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in the ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of overexposure, death may occur. The effects associated with various levels of oxygen are as follows:

<u>CONCENTRATION</u>	<u>SYMPTOM OF EXPOSURE</u>
2-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea and vomiting, collapse or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.



OTHER POTENTIAL HEALTH EFFECTS: Contact with 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 such contact can quickly subside.

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

ACUTE: The most significant hazard associated with Dimethyl Ether is inhalation of vapors. Symptoms of such overexposure to Dimethyl Ether can produce anesthetic effects (sleepiness, loss of coordination, fatigue), as well as headaches, dizziness, nausea, and unconsciousness. Severe inhalation exposure can be fatal, due to Dimethyl Ether overexposure or asphyxiation. Contact with liquid or rapidly expanding gases may cause frostbite.

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

TARGET ORGANS: Central nervous system, liver, cardiovascular system, respiratory system.

HAZARDOUS MATERIAL INFORMATION SYSTEM			
HEALTH		(BLUE)	1
FLAMMABILITY		(RED)	4
REACTIVITY		(YELLOW)	1
PROTECTIVE EQUIPMENT			C
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 DIMETHYL ETHER WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations.

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.

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.

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). Refer to "Recommendations to Physicians", Section 11 (Toxicological Information) for additional information on first-aid measures.

5. FIRE-FIGHTING MEASURES

FLASH POINT (Tag Open Cup): -41°C (-42°F)

AUTOIGNITION TEMPERATURE: 350°C (662°F)

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 3.4%

Upper (UEL): 27.0%

FIRE EXTINGUISHING MATERIALS: Extinguish Dimethyl Ether fires by shutting off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment. Extinguishing media recommended for Dimethyl Ether are: water spray, water fog, dry chemical or carbon dioxide.

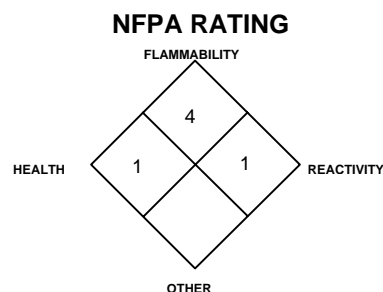
UNUSUAL FIRE AND EXPLOSION HAZARDS: Dimethyl Ether is a flammable gas. Old cylinders of Dimethyl Ether, or cylinders in which the contents may have been exposed to air for extended time periods, may contain unstable peroxides which may rupture spontaneously or when heated. Vapor may travel considerable distance to source of ignition and flash back. **See Section 16 for Definition of Ratings**

DANGER! Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of Dimethyl Ether can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion either by BLEVE (Boiling Liquid Expanding Vapor Explosion), or by exothermic decomposition. This is a catastrophic failure of the vessel releasing the contents into a massive fireball and explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the vessel. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Static discharge may cause Dimethyl Ether to ignite and the cylinder to rupture.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the leaking gas could re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable mixture formation. Because of the potential for a BLEVE, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of vessel exposures, evacuate the area. Refer to the North American Emergency Response Guidebook (Guide #115) for additional information.



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 release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided. Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, mechanical resistant gloves and Self-Contained Breathing Apparatus**. Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray or fog. Allow the gas to dissipate. Monitor the surrounding area for combustible gas and oxygen levels. Combustible gas concentration must be below 10% of the LEL (LEL = 3.4%) prior to entry. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. 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 FLAMMABLE 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 Dimethyl Ether IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of exposure as indicated in Section 3 (Hazard Identification); exposures to fatal concentrations of Dimethyl Ether could occur rapidly.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat sparks and open flame. Protect against physical damage. Outside or detached storage is preferred. Inside storage should be in cool, well ventilated location away from all sources of ignition. Ensure that the valves of cylinders are kept tightly closed. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Store away from strong oxidizing agents (e.g., bromine, bromine pentafluoride), corrosives and other incompatibles such as ozone, fluorine, and chromic anhydride. Post "No Smoking or Open Flames" signs in storage or use areas.

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. 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 in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to work 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".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Dimethyl Ether. 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".

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. Local exhaust ventilation is preferred, because it prevents Dimethyl Ether dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the presence of potentially flammable air-gas mixtures and the level of oxygen.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION: Maintain exposure levels of Dimethyl Ether below the levels listed in Section 2 (Composition and Information on Ingredients) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if Dimethyl Ether levels exceed exposure limits and if oxygen level is below 19.5% or during emergency response to a release of Dimethyl Ether. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards.

EYE PROTECTION: Splash goggles, chemical safety glasses or preferably a full face shield for protection from rapidly expanding gases.

HAND PROTECTION: Mechanical resistant gloves should be worn when handling cylinders of Dimethyl Ether. Chemically resistant gloves should be worn when using Dimethyl Ether in situations where skin contact may be anticipated. Buna-N rubber gloves are recommended.

BODY PROTECTION: Use body protection appropriate for task. An apron or coveralls may be necessary if splashes of liquid may be anticipated. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from gas spraying, as well as fire-retardant items.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 1.918 kg/m³ (0.1197 lb/ft³)

SPECIFIC GRAVITY (air = 1): 1.612

SOLUBILITY IN WATER @17.8°C (64°F): 7%

EVAPORATION RATE (nBuAc = 1): Not determined.

ODOR THRESHOLD: Not determined.

COEFFICIENT WATER/OIL DISTRIBUTION: Log K_{ow} = 0.10, 0.12.

pH: Not applicable.

FREEZING POINT: -141.5°C (-222.7°F)

BOILING POINT @ 1 atm: -24.8°C (-12.7°F)

EXPANSION RATIO: Not applicable

VAPOR PRESSURE (psia): 77.0

SPECIFIC VOLUME (ft³/lb): 8.4

APPEARANCE AND COLOR: Colorless gas at room temperature, or colorless liquid under pressure, both with an ethereal odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): The odor is a distinct characteristic of this gas; however, it should not be relied on to provide an adequate warning of a release. 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.

10. STABILITY and REACTIVITY

STABILITY: Reactive peroxides may be formed upon prolonged exposure of the contents of the cylinder to air. Distillation or evaporation can concentrate peroxides. The peroxides which are formed can decompose violently, which can result in a fire and cylinder rupture.

DECOMPOSITION PRODUCTS: Decomposes to form carbon monoxide and carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Dimethyl Ether is incompatible with the following materials: strong oxidizers, (e.g., bromine, bromine azide), oxygen, carbon monoxide, acetic acid, organic acid anhydrides and halogens. This gas reacts violently with ozone, fluorine and chromic anhydride.

HAZARDOUS POLYMERIZATION: Not expected to occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks and other sources of ignition. If cylinders are exposed to extremely high temperatures, the cylinders may rupture. Do not store Dimethyl Ether for prolonged periods of time.

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

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is for Dimethyl Ether:

LC₅₀ (inhalation, rat) = 164,000 ppm/4H

LC₅₀ (inhalation, rat) = 308 g/m³

TCLo (inhalation, rat) = 2 ppb/6 hours/30 weeks-intermittent

Probable LD (oral, human) = 0.5-5 g/kg

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

ACUTE INHALATION EFFECTS/ CHRONIC INHALATION EFFECTS FOR ANIMALS: Toxicity demonstrated in animals exposed by inhalation for short-term exposures include anesthetic effects, and depression of arterial blood pressure. Cardiac sensitization occurred in dogs exposed to concentrations of 20% in air and greater. Toxicity experienced in animals from repeated exposure by inhalation include changes in white blood cell counts, anesthetic effects, increase in relative body/organ weight ratios for liver, spleen and testes and weight-gain suppression. Toxicity demonstrated in rats upon long-term, repeated exposure at 200, 2000, 20000 ppm by inhalation include liver-weight reduction, and alterations of liver enzymes level in the high group. In a different study in which rats were exposed to concentrations of 2000, 10000, or 25000 ppm observations include decreased red blood cell counts, spleen changes, decreased survival of males at the two higher exposure levels and hemolytic effects at 25,000 ppm. Tests in animals demonstrate no carcinogenic or developmental toxicity.

EYE IRRITATION: No studies available for Dimethyl Ether.

SUSPECTED CANCER AGENT: Dimethyl Ether is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CALOSHA, and therefore is neither considered to be nor suspected to be a cancer-causing agent by these agencies. Tests in animals demonstrate no carcinogenic toxicity.

IRRITANCY OF PRODUCT: Dimethyl Ether is not irritating; however, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: Dimethyl Ether is not known to cause sensitization in humans. Cardiac sensitization has been noted in clinical studies involving test animals exposed to relatively high doses of Dimethyl Ether.

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

Mutagenicity: No human mutagenicity effects have been described for Dimethyl Ether. Dimethyl Ether does not produce genetic damage in bacterial cell cultures but has not been tested in animals.

Embryotoxicity: No embryotoxic effects have been described for Dimethyl Ether.

Teratogenicity: No human teratogenicity effects have been described for Dimethyl Ether.

Reproductive Toxicity: No human reproductive toxicity effects have been described for Dimethyl Ether. Tests in animals demonstrate no developmental toxicity.

*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: Individuals with pre-existing diseases of the central nervous system or cardiovascular system may have increased susceptibility to exposures to Dimethyl Ether.

RECOMMENDATIONS TO PHYSICIANS: Physicians should use special caution in situations of emergency life-support before administering catecholamine drugs, such as epinephrine, as a stimulant in cases of Dimethyl Ether poisoning because of possible increased risk of eliciting cardiac dysrhythmias. Administer oxygen, if necessary. Treat symptoms and reduce or eliminate exposure.

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

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. Additional environmental data are available for Dimethyl Ether as follows:

Solubility: 35,300 mg/L in water at 25°C. Biodegradation: May be resistant to biodegradation, based on other ethers; estimated half-life = 2-15 days. Bioconcentration: BCF (Bioconcentration Factor) of 1.7 (estimated). Based on this BCF, dimethyl ether is not expected to bioconcentrate in aquatic organisms. Log K_{ow} = 0.10, 0.12.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This gas can be harmful to animal life. Suspected anesthetic effect on a variety of test animals during clinical studies indicate adverse effects on the central nervous system, liver and cardiovascular system. No information is currently available concerning adverse effects expected to occur to plant-life. Plants may be damaged by frost produced in the presence of rapidly expanding gases.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Aquatic toxicity data are available for Dimethyl Ether, as follows:

LC₅₀ (Daphnia) = 1852 mg/L, 96 hours
LC₅₀ (fathead minnow) = 2695 mg/L, 96 hours
LC₅₀ (rainbow trout) = 3082 mg/L, 96 hours
LC₅₀ (catfish) = 2419 mg/L, 96 hours

LC₅₀ (goldfish) = 3677 mg/L, 96 hours
LC₅₀ (bluegill) = 3429 mg/L, 96 hours
LC₅₀ (mosquito fish) = 2978 mg/L, 96 hours

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 MESA Specialty Gases & Equipment 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: Dimethyl ether
HAZARD CLASS NUMBER and DESCRIPTION: 2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1033
PACKING GROUP: Not Applicable
DOT LABEL(S) REQUIRED: FLAMMABLE GAS

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

MARINE POLLUTANT: Dimethyl Ether 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: Dimethyl Ether is not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

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

CANADIAN DSL/NDSL INVENTORY: Dimethyl Ether is listed on the DSL Inventory.

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

OTHER U.S. FEDERAL REGULATIONS: Dimethyl Ether is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity is 10,000 lbs. Compliance with the OSHA Process Safety Standard (29 CFR 1910.119) may be applicable to operations involving the use of Dimethyl Ether. Under this regulation Dimethyl Ether is not listed in Appendix A, however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lb (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

U.S. STATE REGULATORY INFORMATION: Dimethyl Ether is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: No.

California - Permissible Exposure Limits for Chemical Contaminants: No.

Florida - Substance List: Dimethyl Ether.

Illinois - Toxic Substance List: No.

Kansas - Section 302/313 List: No.

Massachusetts - Substance List: Dimethyl Ether.

Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Dimethyl Ether.

Missouri - Employer Information/Toxic Substance List: No.

New Jersey - Right to Know Hazardous Substance List: Dimethyl Ether.

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

Pennsylvania - Hazardous Substance List: No.

Rhode Island - Hazardous Substance List: Dimethyl Ether.

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): Dimethyl Ether is not on the California Proposition 65 lists.

LABELING:

DANGER: FLAMMABLE LIQUID AND GAS UNDER PRESSURE.
CAN FORM EXPLOSIVE MIXTURES WITH AIR.
MAY CAUSE ANESTHETIC EFFECTS.
MAY CAUSE IRRITATION TO SKIN, EYES, AND MUCOUS MEMBRANES.
MAY CAUSE FROSTBITE.

15. REGULATORY INFORMATION (Continued)

LABELING (continued):

Keep away from heat, flames, and sparks.
Store and use with adequate ventilation.
Cylinder temperature should not exceed 52°C (125°F)
Avoid breathing gas.
Do not get liquid in eyes, on skin or clothing.
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

FIRST-AID:

IF INHALED, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

IN CASE OF FROSTBITE, obtain immediate medical attention.

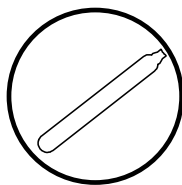
IN CASE OF CONTACT, immediately flush eyes or skin with water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician.

DO NOT REMOVE THIS PRODUCT LABEL

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas

Class B: Flammable Gas



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 Gases & 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 Gases & 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; **TD₀₁**, **LDLo**, and **LDo**, or **TC**, **TC₀₁**, **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/NDL**); 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.