UNION CARBIDE CORPORATION
MATERIAL SAFETY DATA SHEET

EFFECTIVE DATE 04/21/98

Union Carbide urges each customer or recipient of this MSDS to study it carefully to become aware of and understand the hazards associated with the product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology, and fire prevention, as necessary or appropriate to use and understand the data contained in this MSDS.

To promote safe handling, each customer or recipient should: (1) notify its employees, agents, contractors and others whom it knows or believes will use this material or the information in this MSDS and any other information regarding hazards or safety; (2) furnish this same information to each of its customers for the product; and (3) reqeust its customers to notify their employees, customers, and other users of the product of this information.

I. IDENTIFICATION

PRODUCT NAME:	DIETHYLENE GLYCOL
CHEMICAL NAME:	2,2'-Oxybis-ethanol
CHEMICAL FAMILY:	Ethylene Glycol
FORMULA:	HO(C2H4O)2H
MOLECULAR WEIGHT:	106.12
SYNONYMS:	DEG; 2,2'-Dihydroxyethyl Ether; Ethanol,2,2'-oxybis-; Diglycol; Ethylene Diglycol; See Section IX
CAS # AND NAME:	111-46-6 Ethanol,2,2'-Oxybis-

II. PHYSICAL DATA(Determined on Typical Material)

BOILING POINT, 760 mm Hg:	245.3 C (473.5 F)
SPECIFIC GRAVITY(H2O = 1):	1.1182 at 20/20 C
FREEZING POINT:	-9.0 C (15.8 F)
VAPOR PRESSURE AT 20'C:	0.002 mmHg

EMERGENCY PHONE NUMBERS: 1-800-UCC-HELP (NUMBER AVAILABLE AT ALL TIMES) OR (304) 744-3487

UNION CARBIDE CORPORATION
39 Old Ridgebury Road, Danbury, CT 06817-0001

PRODUCT NAME: DIETHYLENE GLYCOL

EVAPORATION RATE (Butyl Acetate = 1): <0.001

VAPOR DENSITY (AIR = 1): 3.65

SOLUBILITY IN WATER by wt: 100% at 20 C

APPEARANCE: Transparent colorless

ODOR: Under normal conditions-
No detectable odor
Under high vapor concentrations-
Mild sweet
Odor
May be detected

PHYSICAL STATE: Liquid

III. INGREDIENTS

%	MATERIAL	CAS#	EXPOSURE LIMIT
>99.5	Diethylene Glycol	111-46-6	See Section V
0.2	Ethylene Glycol	107-21-1	See Section V

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT(test method(s)): 310 F (154.4 C)
Pensky-Martens Closed Cup ASTM D 93

325 F (162.7 C)
Cleveland Open Cup ASTM D 92

FLAMMABLE LIMITS IN AIR % by volume: LOWER: 2.0 Calculated
UPPER: 12.3 Estimated

SPECIAL FIRE FIGHTING PROCEDURES: Do not direct a solid stream of water or foam into hot, burning pools; this may cause frothing and increase fire intensity.
Use self-contained breathing apparatus, eye protection and protective clothing.

EXTINGUISHING MEDIA: Apply alcohol-type or all-purpose-type foam by manufacturer's recommended techniques for large fires. Use carbon dioxide or dry chemical media for small fires.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Spontaneous Combustion in Porous Insulation:
Leaks into porous insulation material may ignite at temperatures far below published autoignition or ignition temperatures, potentially even below the normal flash point.
See "Other Precautions" in Section IX.

V. HEALTH HAZARD DATA

EXPOSURE LIMIT(S):

Diethylene Glycol: AIHA WEEL
50 ppm TWA 8hr. vapor and aerosol
10 mg/m3 TWA 8hr. aerosol
Ethylene glycol: 100 mg/m3 (39.4 ppm) Ceiling, Aerosol, ACGIH
125 mg/m3 (50 ppm) Ceiling, Vapor and Mist, OSHA
Internal Exposure Limit:
100 mg/m3 (39.4 ppm) Ceiling, Aerosol and Vapor

EFFECTS OF SINGLE OVEREXPOSURE:

SWALLOWING: Moderately high toxicity. May cause pain or discomfort in the abdomen, pain in the lumbar region, nausea, vomiting, diarrhea, dizziness, drowsiness, decreased urine production, malaise, and loss of consciousness. Severe kidney damage may occur which can be fatal if not promptly and adequately treated. Liver injury may also occur.

SKIN ABSORPTION: No evidence of harmful effects from available information.

INHALATION: Short-term harmful health effects are not expected from vapor generated at ambient temperature.
Vapor or mist from heated material may cause nausea and headache.

SKIN CONTACT: No evidence of harmful effects from available information.

EYE CONTACT: May cause irritation, experienced as stinging with excess blinking and tear production.
Excess redness of the conjunctiva may occur.

EFFECTS OF REPEATED OVEREXPOSURE:

Repeated overexposure to vapor or mist may cause headache, nausea, and dizziness.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

A knowledge of the available toxicology information and of the physical and chemical properties of the material suggests that overexposure is unlikely to aggravate existing medical conditions.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

A chronic dietary feeding study of diethylene glycol with rats showed mild kidney injury at 1%, while concentrations of 2% and 4% caused more marked kidney injury. In addition, at 2% and 4% of diethylene glycol in the diet, some rats developed benign papillary tumors in the urinary bladder. These have

PRODUCT NAME: DIETHYLENE GLYCOL

been attributed to the presence of urinary bladder calcium oxalate stones. No evidence for carcinogenicity was found with a chronic skin-painting study with diethylene glycol in mice. The absence of a direct chemical carcinogenic effect accords with the results in in vitro genotoxicity studies which show that it does not produce mutagenic or clastogenic effects. A feeding study employing up to 5.0% diethylene glycol in the diet failed to produce any teratogenic effects.
In a mouse continuous breeding study with large doses of diethylene glycol in drinking water, there was evidence for reproductive toxicity at 3.5% (equivalent to 6.1 g/kg/day) as reduced number of litters, live pups per litter, and live pup weight. No such effects were seen at 1.75% (approximately 3.05 g/kg/day). The relevance of these very high dosages to human health is uncertain.
Pregnant rats receiving undiluted diethylene glycol by gavage over the period of organogenesis had toxic effects at 4.0 and 8.0 ml/kg/day as mortality, decreased body weight, decreased food consumption, increased water consumption, and increased liver and kidney weights. Fetotoxicity was seen only at these maternally toxic dosages. Decreased fetal body weight occurred at 8.0 ml/kg/day, and increased skeletal variants at 4.0 and 8.0 ml/kg/day. No embryotoxic or teratogenic effects were seen. Neither maternal toxicity nor fetotoxicity occurred at 1.0 ml/kg/day. In a study with mice also receiving undiluted diethylene glycol over the period of organogenesis, maternal toxicity occurred at 2.5 and 10.0 ml/kg/day, but not at 0.5 ml/kg/day. Definitive developmental toxicity was not seen in this species.

OTHER EFFECTS OF OVEREXPOSURE:

Short-term repeated ingestion of diethylene glycol may produce renal failure.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING: If patient is fully conscious, give two glasses of water. Induce vomiting. This should be done only by medical or experienced first-aid personnel. Obtain medical attention without delay. If medical advice is delayed, and if the person has swallowed a moderate volume of material (a few ounces), then give three to four ounces of hard liquor, such as whiskey. For children, give proportionally less liquor, according to weight.

SKIN: Wash skin with soap and water.

INHALATION: Remove to fresh air.

EYES: Immediately flush eyes with water and continue washing for several minutes. Remove contact lenses, if worn. Obtain medical attention.

NOTES TO PHYSICIAN: It is estimated that the lethal oral dose to adults is of the order of 1.0-1.2 ml/kg. Diethylene glycol produces metabolites that cause an elevated anion-gap metabolic acidosis and renal tubular injury. Liver injury may occur, but not as severe as kidney injury. The signs and symptoms in diethylene glycol poisoning are those of metabolic acidosis, CNS depression, and kidney injury. Urinalysis may show albuminuria, hematuria, and oxaluria.
The currently recommended medical management of diethylene glycol poisoning includes elimination of diethylene glycol and its metabolites, correction of metabolic acidosis, and prevention of kidney injury. It is essential to have immediate and follow-up urinalysis and clinical chemistry. There should be particular emphasis on acid-base balance, and liver and kidney function tests. A continuous infusion of 5% sodium bicarbonate with frequent monitoring of electrolytes and fluid balance status is used to achieve correction of metabolic acidosis and forced diuresis. For severe and/or deteriorating cases,

hemodialysis may be required. Dialysis should be considered for patients who are symptomatic, have severe metabolic acidosis, a blood diethylene glycol concentration greater than 25 mg/dl, or compromise of renal function. There are no reported cases in which ethanol has been used antidotally, although a limited number of laboratory animal studies suggest that it may be effective. If used clinically, a therapeutically effective blood concentration is probably around 100-150 mg/dl, although this is unproven; this concentration should be achieved by a rapid loading dose and maintained by intravenous infusion. One animal study has suggested that pyrazole may be an effective early antidote, but its value in human diethylene glycol poisoning is unproven.

VI. REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: None known.

INCOMPATIBILITY (materials to avoid):

Explosive decomposition may occur if combined with strong acids or strong bases and subjected to elevated temperatures. Therefore, avoid strong acids and strong bases at elevated temperatures. Avoid contamination with strong oxidizing agents and materials reactive with hydroxyl compounds.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS:

Burning can produce the following products:
Carbon monoxide and/or carbon dioxide.
Carbon monoxide is highly toxic if inhaled; carbon dioxide in sufficient concentrations can act as an asphyxiant.
If the fluid is heated above the temperature of the onset of initial decomposition, 287 C, thermal degradation may result in the formation of volatile organic compounds such as aldehydes including formaldehyde and acetaldehyde, and other potentially harmful decomposition products.
Respiratory protection may be required.

HAZARDOUS POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID: None known.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Small spills can be flushed with large amounts of water; larger spills should be collected for disposal.

WASTE DISPOSAL METHOD:

Incinerate in a furnace where permitted under Federal, State, and local regulations.
See Section IX, "Other Precautions."

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type):

None expected to be needed at low temperatures.

PRODUCT NAME: DIETHYLENE GLYCOL

VENTILATION: General (mechanical) room ventilation is expected to be satisfactory.

PROTECTIVE GLOVES: Neoprene, Nitrile, Natural rubber, Butyl rubber, PVC-coated or Polyethylene

EYE PROTECTION: Monogoggles

OTHER PROTECTIVE EQUIPMENT:
Eye Bath, Safety Shower

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

DANGER!
HARMFUL OR FATAL IF SWALLOWED.
CAUSES EYE IRRITATION.
PROLONGED OR REPEATED BREATHING OF AEROSOL OR VAPOR FROM HEATED MATERIAL IS HARMFUL.

MAY CAUSE LIVER AND KIDNEY DAMAGE.

Do not swallow.
Avoid contact with eyes.
Avoid prolonged or repeated breathing of aerosol and vapor.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

FOR INDUSTRY USE ONLY

OTHER PRECAUTIONS:

DISPOSAL - This product is resistant to rapid biodegradation, but it does degrade slowly. It should be feasible to dispose of small amounts by flushing to a wastewater treatment plant. For large amounts, incineration is the preferred method of disposal.

ADDITIONAL INFORMATION: Additional product safety information on this product may be obtained by calling your Union Carbide Corporation Sales or Customer Service contact.
Ask for the brochure:
Product Information Bulletin on Diethylene Glycol.

PROCESS HAZARD: Sudden release of hot organic chemical vapors or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into hot equipment under a vacuum, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions.

Any use of this product in elevated-temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions. Further information is available in a technical bulletin entitled "Ignition Hazards of Organic Chemical Vapors."

ADDITIONAL SYNONYMS: 3-Oxapentane-1,5-diol; 2,2'-Oxydiethanol; Bis(.beta.-hydroxyethyl) ether; Bis(2-hydroxyethyl) ether; 2,2'-Oxyethanol; 2-(2-Hydroxyethoxy)ethanol; 3-

Oxapentamethylene-1,5-diol; Glycol
Ethyl Ether

X. REGULATORY INFORMATION

STATUS ON SUBSTANCE LISTS:

The concentrations shown are maximum or ceiling levels (weight %) to be used for calculations for regulations.
Trade Secrets are indicated by "TS".

FEDERAL EPA

Comprehensive Environmental Response Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center of release of quantities of Hazardous Substances equal to or greater than the reportable quantities (RQs) in 40 CFR 302.4.

Components present in this product at a level which could require reporting under the statute are:

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Ethylene Glycol	107-21-1	0.2
1,4-Dioxane	123-91-1	0.0001
Acetic Acid	64-19-7	0.005

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires emergency planning based on Threshold Planning Quantities (TPQs) and release reporting based on Reportable Quantities (RQs) in 40 CFR 355 (used for SARA 302, 304, 311 and 312).

Components present in this product at a level which could require reporting under the statute are:

*** NONE ***

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372 (for SARA 313). This information must be included in all MSDSs that are copied and distributed for this material.

Components present in this product at a level which could require reporting under the statute are:

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %

This product does not contain toxic chemicals at levels which require reporting under the statute.

Toxic Substances Control Act (TSCA) STATUS:
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements.

STATE RIGHT-TO-KNOW

CALIFORNIA Proposition 65

This product contains ETHYLENE GLYCOL MONOMETHYL ETHER known to the State of California to cause birth defects or other reproductive harm and 1,4-DIOXANE known to the State of California to cause cancer.

PRODUCT NAME: DIETHYLENE GLYCOL

See Massachusetts listing for amounts.

MASSACHUSETTS Right-To-Know, Substance List (MSL) Hazardous Substances and Extraordinarily Hazardous Substances on the MSL must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:

EXTRAORDINARILY HAZARDOUS SUBSTANCES (= > 0.0001%)

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
1,4-Dioxane	123-91-1	0.0001

HAZARDOUS SUBSTANCES (= > 1%)

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Ethylene Glycol Monomethyl Ether	109-86-4	0.00001

PENNSYLVANIA Right-to-Know, Hazardous Substance List Hazardous Substances and Special Hazardous Substances on the List must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:

HAZARDOUS SUBSTANCES (= > 1%)

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Diethylene Glycol	111-46-6	100

CALIFORNIA SCAQMD RULE 443.1 VOC'S:

VOC 1116.21 G/L; Vapor Pressure 0.002 mm Hg at 20C.

OTHER REGULATORY INFORMATION:

EPA Hazard Categories: Immediate Health, Delayed Health
New York State Bulk Storage Regulations (6 NYCRR parts 595-599).
This product is covered be 6 NYCRR for bulk storage and release reporting and response. Technical guidances and recommended practices are as follows:
Storage System Design
Should also comply with NYS/DEC Chemical Bulk Storage Regulations Parts 598.1, 598.2, 598.3, and 598.5 (for existing tanks) or parts 599.1 to 599.10 (for new or substantially modified tanks).
Inspection and Maintenance
Inspection and Maintenance Procedures and testing of equipment should comply with NYS/DEC Regulations Parts 598.6 to 598.10.
Transfer and Unloading
These operations should comply with NYS/DEC Regulations Part 598.4.

NOTE —

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of the use of the product are not under the control of Union Carbide, it is the user's obligation to determine conditions of safe use of the product.

REVISED SECTIONS:

The information in this MSDS has been updated.
Please review all sections.

PRODUCT: 26018
F NUMBER: N0119L