Brenntag Canada Inc.

BRENNTAG

MATERIAL SAFETY DATA SHEET

ETHYLENE GLYCOL (ALL GRADES)

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Brenntag Canada Inc.
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WHMIS#: 00060325
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EMERGENCY TELEPHONE NUMBERS (FOR EMERGENCIES INVOLVING CHEMICAL SPILLS OR RELEASE)

Toronto, ON (416) 226-6117	Montreal, QC (514) 861-1211	Winnipeg, MB (204) 943-8827
Edmonton, AB (780) 424-1754	Calgary, AB (403) 263-8660	Vancouver, BC (604) 685-5036

PRODUCT IDENTIFICATION

Product Name:	Ethylene Glycol (All Grades).
Chemical Name:	1,2-Ethanediol.
Synonyms:	Ethylene Glycol 100%, 90%, 85%, 80%, 70%, 60%, (I&C Free), Inhibited, Reclaimed; EG; Monoethylene Glycol, MEG; Ethylene Glycol 40 % (8454); Ethylene Glycol 50 % (8296); Ethylene Glycol 55 % 8401; Ethylene Glycol 60 % (8302); Ethylene Glycol Inhibited 35 % (8684).
Chemical Family:	Glycols.
Molecular Formula:	C2H6O2; HO-CH2-CH2-OH.
Product Use:	Industrial solvent, cleaner, degreaser. Automotive coolant/antifreeze. Chemical intermediate. Heat transfer fluid. Do not use in the manufacture or preparation of foods or pharmaceuticals. Do not use in aircraft de-icing applications. Glycols are not intended for the production of theatrical fog or artificial smoke. The normal use of glycols in the workplace usually includes preventative measures to reduce or minimize personnel contact. Such measures may not be consistent with theatrical or entertainment settings where these special effects may be produced. Do not use in theatrical fogs or other artificial smoke generator applications.

WHMIS Classification / Symbol:

D-2A: Very Toxic (teratogen)
D-2B: Toxic (skin and eye irritant)

READ THE ENTIRE MSDS FOR THE COMPLETE HAZARD EVALUATION OF THIS PRODUCT.

2. COMPOSITION, INFORMATION ON INGREDIENTS (Not Intended As Specifications)

Ingredient	*CAS#*	*ACGIH TLV*		*% Concentration*
Ethylene Glycol	107-21-1	—	*A4	30 - 100

A4 = Not classifiable as a human carcinogen. (ACGIH-A4).

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:	Harmful if inhaled, absorbed through skin, or swallowed. High vapour concentrations may cause drowsiness. Causes skin and eye irritation. Can cause teratogenic effects. See "Other Health Effects" Section. Can decompose at high temperatures forming toxic gases. Contents may develop pressure on prolonged exposure to heat.

POTENTIAL HEALTH EFFECTS

Inhalation:	This product has a low vapour pressure and is not expected to present an inhalation hazard at ambient conditions. Caution should be taken to prevent aerosolization or misting of this product. (3) Excessive contact with mist or spray may cause irritation of mucous membranes, coughing and difficulty in breathing. See "Other Health Effects" Section.
Skin Contact:	Prolonged, confined (especially under the finger nails, under rings or watch bands) or repeated exposure may cause skin irritation. May cause defatting, drying and cracking of the skin. Prolonged and repeated contact may lead to dermatitis. May cause skin sensitization or other allergic responses. See Section 11, "Toxicological Information".
Skin Absorption:	May be readily absorbed through broken or damaged skin. (4)
Eye Contact:	Splashes to the eye may cause irritation, redness and pain.
Ingestion:	Ingestion of large amounts may cause nausea, gastrointestinal upset and abdominal pain.
Other Health Effects:	Effects (irritancy) on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following any exposure is essential. May cause metabolic acidosis, liver damage, kidney damage, systemic poisoning and death. Ethylene Glycol poisoning occurs in three stages: central nervous system (CNS) depression, cardiopulmonary failure and kidney failure. The severity of those stages, and advancement from one stage to another depends upon the dose ingested. CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure. Survival of CNS depression may be followed by cardiopulmonary failure, which is initiated by the onset of coma and is characterized by quick, shallow breathing, excessively fast heart beat, mild hypertension and cyanosis. Survival of cardiopulmonary failure may be followed by kidney damage, which may range from a mild increase in blood urea nitrogen to complete kidney failure and possible death. In severe cases of overexposure, pulmonary oedema, bronchopneumonia, cardiac enlargement and possible death may occur. Pulmonary oedema is the exposure to high concentrations of a substance causing the build-up of fluid in the lungs that might be fatal. Symptoms of pulmonary oedema, such as shortness of breath, may not appear until several hours after exposure and are aggravated by physical exertion. There may be cranial nerve involvement in the late stages of toxicity from swallowed Ethylene Glycol. In particular, effects have been reported from the seventh, eighth and ninth cranial nerves, presenting with bilateral facial paralysis, diminished hearing and difficulty in swallowing (dysphagia). (3) Liver damage is characterized by the loss of appetite, jaundice (yellowish skin colour), and occasional pain in the upper left-hand side of the abdomen. Signs and symptoms of kidney damage generally progress from oliguria, to blood in the urine, to total renal failure. Metabolic acidosis is a condition that describes a decreased pH and bicarbonate concentration in the body fluids.

4. FIRST AID MEASURES

FIRST AID PROCEDURES

Inhalation:	If respiratory problems arise, move the victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.
Skin Contact:	Start flushing while removing contaminated clothing. Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.
Eye Contact:	Immediately flush eyes thoroughly for 5 minutes with running water. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention.
Ingestion:	Do not attempt to give anything by mouth to an unconscious person. If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. IMMEDIATELY contact local Poison Control Centre. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY transport victim to an emergency facility.

Note to Physicians:	This product contains materials that may cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage; use endotracheal cuff if available, to prevent aspiration. Observe patient for respiratory difficulty from aspiration pneumonitis. Give artificial resuscitation and appropriate chemotherapy if respiration is depressed. Ethylene Glycol is metabolized by alcohol dehydrogenase to various metabolites including glycoaldehyde, glycolic acid, and oxalic acid which cause an elevated anion-gap metabolic acidosis and renal tubular injury. Urinalysis may show albuminuria, hematuria and oxaluria. Clinical chemistry may reveal anion-gap metabolic acidosis and uremia. (3) The currently recommended medical management of Ethylene Glycol poisoning includes elimination of Ethylene Glycol and 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 renal function tests. A continuous infusion of 5% Sodium Bicarbonate with frequent monitoring of electrolytes and fluid balance is used to achieve correction of metabolic acidosis and forced diuresis. (3) Pulmonary oedmea with low arterial oxygen levels (hypoxemia) has been described in a number of patients following poisoning with Ethylene Glycol. The mechanism of production has not been elucidated, but it appears to be not carcinogenic in origin in several cases. Respiratory support with mechanical ventilation and positive end-expiratory pressure may be required. (3) As a competitive substrate for alcohol dehydrogenase, Ethyl Alcohol is antidotal. Given in the early stages of intoxication, it blocks the formation of nephrotoxic metabolites. A therapeutically effective blood concentration of ethanol is in the range of 100-150 mg/dL, and should be achieved by a rapid loading dose and maintained by intravenous infusion. (3) 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 Ethylene Glycol concentration greater than 25 mg/dL, or compromise of renal function. (3) 4-Methylpyrazole, a potent inhibitor of alcohol dehydrogenase, has been effectively used to decrease the metabolic consequences of Ethylene Glycol poisoning before metabolic acidosis, coma, seizures and renal failure have occurred. (3) Additional therapeutic measures may include the administration of cofactors involved in the metabolism of Ethylene Glycol. Thiamine (100 mg) and pyridoxine (50 mg) should be given every six hours. (3) Medical conditions that may be aggravated by exposure to this product include neurological and cardiovascular disorders, diseases of the skin, eyes or respiratory tract, preexisting liver and kidney disorders.

5. FIRE-FIGHTING MEASURES

Flashpoint (°C)	***AutoIgnition Temperature (°C)***	**Flammability Limits in Air (%):** ***LEL***	***UEL***
116 - 121. (3)	398 - 417. (4)	3.2. (3)	15.3. (3)

Flammability Class (WHMIS):	Not regulated.
Hazardous Combustion Products:	Thermal decomposition products are toxic and may include: oxides of carbon. Heating in air may produce irritating aldehydes, acids and ketones.
Unusual Fire or Explosion Hazards:	Not normally a fire hazard. Water content of product prevents ignition. Do not direct a solid stream of foam into hot, burning pools. This may cause spattering and increase fire intensity. Closed containers exposed to heat may explode. Spilled material may cause floors and contact surfaces to become slippery.
Sensitivity to Mechanical Impact:	Not expected to be sensitive to mechanical impact.
Rate of Burning:	Not available.
Explosive Power:	Not available.
Sensitivity to Static Discharge:	Not expected to be sensitive to static discharge.
EXTINGUISHING MEDIA	
Fire Extinguishing Media:	Use carbon dioxide or dry chemical media for small fires. If only water is available, use it in the form of a fog. Use media appropriate for surrounding fire and/or materials.

FIRE FIGHTING INSTRUCTIONS

Instructions to the Fire Fighters:	Fire-exposed containers should be kept cool by spraying with water to reduce pressure. This should be done from a safe distance since containers may rupture. Isolate materials that are not involved in the fire and protect personnel. The heat from a fire can cause a build-up of pressure inside the containers which may explode. No part of a container should be exposed to temperatures above 50° Celsius. Cool containers with flooding quantities of water until well after the fire is out. (4)
Fire Fighting Protective Equipment:	Use self-contained breathing apparatus and protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Information in this section is for responding to spills, leaks or releases in order to prevent or minimize the adverse effects on persons, property and the environment. There may be specific reporting requirements associated with spills, leaks or releases, which change from region to region.

Containment and Clean-Up Procedures:	In all cases of leak or spill contact vendor at Emergency Number shown on the front page of this MSDS. Wear protective clothing. Recover spilled material on non-combustible absorbents, such as sand or vermiculite, and place in covered containers for disposal. Collect product for recovery or disposal. For release to land, or storm water runoff, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment.

7. HANDLING AND STORAGE

HANDLING

Handling Practices:	Use normal "good" industrial hygiene and housekeeping practices. Drums which have been exposed to heat may be under internal pressure. These should be cooled and carefully vented before opening. A face shield and apron should be worn. Vent container frequently, and more often in warm weather, to relieve pressure.
Ventilation Requirements:	See Section 8, "Engineering Controls".
Other Precautions:	Use only with adequate ventilation and avoid breathing vapours and aerosols. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use. Do not use cutting or welding torches on empty drums that contained this material/product. Sudden release of hot organic chemical vapours or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, 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.

STORAGE

Storage Temperature (°C):	See below.
Ventilation Requirements:	General exhaust is acceptable. Local exhaust ventilation preferred.
Storage Requirements:	Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 40° C. Protect from direct sunlight. Protect against physical damage. Avoid moisture contamination. Hygroscopic.
Special Materials to be Used for Packaging or Containers:	Materials of construction for storing the product include: steel. Equipment for storage, handling or transport should NOT be made from the following material, or, where applicable, its alloys: Epoxy or aluminum. Confirm suitability of any material before using.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment, which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

ENGINEERING CONTROLS

Engineering Controls:	Local exhaust ventilation required. Make up air should be supplied to balance air that is removed by local or general exhaust ventilation. Ventilate low lying areas such as sumps or pits where dense vapours may collect. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper procedure must be followed. It must include consideration of, among other things, ventilation, testing of tank atmosphere, provision and maintenance of SCBA, and emergency rescue. Use the "buddy" system. The second person should be in view and trained and equipped to execute a rescue. (4)
PERSONAL PROTECTIVE EQUIPMENT (PPE)	
Eye Protection:	Use full face-shield or chemical safety goggles when there is potential for contact. Contact lenses should not be worn when working with this material.
Skin Protection:	Gloves and protective clothing made from PVC, butyl rubber, natural rubber, viton, neoprene or nitrile rubber should be impervious under conditions of use. Prior to use, user should confirm impermeability. Discard contaminated gloves.
Respiratory Protection:	No specific guidelines available. A NIOSH/MSHA-approved air-purifying respirator equipped with organic vapour cartridges for concentrations up to 1 000 ppm. An air-supplied respirator if concentrations are higher or unknown. If while wearing a respiratory protection, you can smell, taste or otherwise detect anything unusual, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator to face seal is still good. If it is, replace the filter, cartridge or canister. If the seal is no longer good, you may need a new respirator. (4)
Other Personal Protective Equipment:	Wear an impermeable apron and boots. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact.

EXPOSURE GUIDELINES

SUBSTANCE	***ACGIH TLV***	***OSHA PEL***		***NIOSH REL***	
	(STEL)	***(TWA)***	***(STEL)***	***(TWA)***	***(STEL)***
Ethylene Glycol	100 mg/m³ (Ceiling)	---	---	---	---

9. PHYSICAL AND CHEMICAL PROPERTIES (Not intended as Specifications)

Physical State:	Liquid.
Appearance:	Clear, colourless liquid.
Odour:	Mild, sweet odour.
Odour Threshold (ppm):	0.08 - 25. (4)
Boiling Range (°C):	190 - 240. (3)
Melting/Freezing Point (°C):	-35 -- -13. (3)
Vapour Pressure (mm Hg at 20° C):	0.06 - 0.12. (3)
Vapour Density (Air = 1.0):	2.1. (3)
Relative Density (g/cc):	1.04 - 1.12. (3)
Bulk Density:	1 040 - 1 120 kg/m³
Viscosity:	21 cPs (20°C). (4)
Evaporation Rate (Butyl Acetate = 1.0):	0.01. (3)
Solubility:	Soluble in water, alcohols, and ethers. Practically insoluble in aromatic hydrocarbons, aliphatic hydrocarbons and chlorinated solvents.
% Volatile by Volume:	Expected to evaporate very slowly at ambient temperatures.
pH:	6 - 8.
Coefficient of Water/Oil Distribution:	< 0.
Volatile Organic Compounds (VOC):	1111.0 g/l. (3)

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY

Under Normal Conditions:	Stable.
Under Fire Conditions:	Not normally a fire hazard. Water content of product prevents ignition.

Hazardous Polymerization:	Will not occur.
Conditions to Avoid:	High temperatures, sparks, open flames and all other sources of ignition. Keep tightly closed to protect quality. Temperatures above 165 °C. (3) Avoid moisture contamination. Hygroscopic.
Materials to Avoid:	Strong oxidizers. At elevated temperatures : Product can react explosively with Strong bases and Acids. Epoxy. Materials reactive with hydroxyl bearing compounds. Aluminum and its alloys Perchloric Acid. Isocyanates.
Decomposition or Combustion Products:	Thermal decomposition products are toxic and may include: oxides of carbon. Heating in air may produce irritating aldehydes, acids and ketones.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL DATA:

SUBSTANCE	***LD50 (Oral, Rat)***	***LD50 (Dermal, Rabbit)***	***LC50 (Inhalation, Rat, 4h)***
Ethylene Glycol	4 700 mg/kg (1)	9 530 mg/kg (1)	10 876 mg/m³ (1)

Carcinogenicity Data:	The ingredient(s) of this product is (are) not classed as carcinogenic by ACGIH, IARC, OSHA or NTP.
Reproductive Data:	Ingestion of large amounts of Ethylene Glycol has been shown to interfere with reproduction in animals. Specifically, growth retardation, decreased litter size in rats and mice, and decrease in mating frequency in mice were observed. (3) See "Other Studies Relevant to Material".
Mutagenicity Data:	In vitro mutagenicity studies were negative. Animal mutagenicity studies were negative. (3)
Teratogenicity Data:	Based on animal studies, ingestion of very large amounts of Ethylene Glycol appears to be the major and possibly the only route of exposure to produce birth defects. (3) See "Other Studies Relevant to Material".
Respiratory / Skin Sensitization Data:	Repeated skin contact with Ethylene Glycol may, in a very small proportion of cases, cause skin sensitization with the development of allergic contact dermatitis. The incidence is significantly less than 1% with the undiluted material. (3) Sensitization is the process whereby a biological change occurs in the individual because of previous exposure to a substance and, as a result, the individual reacts more strongly when subsequently exposed to the substance. Once sensitized, an individual can react to extremely low airborne levels, even below the TLV, or to skin contact.
Synergistic Materials:	Alcohols/Glycols : Alcohols may interact synergistically with chlorinated solvents (example - carbon tetrachloride, chloroform, bromotrichloromethane), dithiocarbamates (example - disulfiram), dimethylnitrosamine and thioacetamide. (4)

Other Studies Relevant to Material:

Ethylene Glycol has been shown to produce dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. The no-effect dose for developmental toxicity for Ethylene Glycol given by gavage over the period of organogenesis has been shown to be 150 mg/Kg/day for the mouse and 500 mg/Kg/day for the rat. Also, in a preliminary study to assess the effects of exposure of pregnant rats and mice to aerosols at concentrations 150, 1000, and 2500 mg/M3 for 6 hours a day throughout the period of organogenesis, teratogenic effects were produced at the highest concentration, but only in mice. The conditions of these latter experiments did not allow a conclusion as to whether the developmental toxicity was mediated by inhalation of aerosol, percutaneous absorption of Ethylene Glycol from contaminated skin, or swallowing of Ethylene Glycol as a result of grooming the wetted coat. (3)

In a further study, comparing effects from high aerosol concentration by whole-body or nose-only exposure, it was shown that nose-only exposure resulted in maternal toxicity (1000 and 2500 mg/M3) and developmental toxicity with minimal evidence of teratogenicity (2500 mg/M3). The no-effect concentration (based on maternal toxicity) was 500 mg/M3. (3)

In a further study in mice, no teratogenic effects could be produced when Ethylene Glycol was applied to the skin of pregnant mice over the period of organogenesis. (3)

The above observations suggest that Ethylene Glycol is to be regarded as an animal teratogen; there is currently no available information to suggest that Ethylene Glycol has caused birth defects in humans. (3)

Cutaneous toxicity; exposure to high aerosol concentration is only minimally effective in producing developmental toxicity; the major route for producing developmental toxicity is perorally. (3)

Two chronic feeding studies, using rats and mice, have not produced any evidence that Ethylene Glycol causes dose-related increases in tumour incidence, or a different pattern of tumours compared with untreated controls. (3)

The absence of a carcinogenic potential for Ethylene Glycol has been supported by numerous in vitro genotoxicity studies showing that it does not produce mutagenic or clastogenic effects. (3)

Ethylene Glycol caused mild skin and eye irritation when tested in rabbits. (3)

12. ECOLOGICAL INFORMATION

Ecotoxicity:

May be harmful to aquatic life.

Ethylene Glycol:
LC50 (Fathead Minnow) = 51,000 mg/L. (3)
LC50 (Bluegill) = 27,549 mg/L. (3)
LC50 (Rainbow Trout) = 18,000-46,000 mg/L. (3)
LC50 (Guppy) = 49,000 mg/L. (3)
LC50 (brine Shrimp) = 20,000 mg/L. (3)
LC50 (Goldfish) = Above 5,000 mg/L. (3)

Environmental Fate:

Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Ethylene Glycol: Bioconcentration potential is low. Biodegradation under aerobic static laboratory conditions is high. Biodegradation may occur under both aerobic and anaerobic conditions (in either the presence or absence of oxygen). Degradation is expected in the atmospheric environment within days to weeks. (3)

Biochemical Oxygen Demand (BOD): 8 to 82 % at 5 days; 58 to 75 % at 10 days; 81 to 94 % at 20 days. (3)

Chemical Oxygen Demand (COD): 1. 29 mg/mg. (3)

13. DISPOSAL CONSIDERATIONS

Deactivating Chemicals:

None required.

Waste Disposal Methods:

This information applies to the material as manufactured. Reevaluation of the product may be required by the user at the time of disposal since the product uses, transformations, mixtures and processes may influence waste classification. Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.

Safe Handling of Residues:	See "Waste Disposal Methods".
Disposal of Packaging:	Empty containers retain product residue and can be hazardous. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. Dispose of waste material at an approved landfill site.

14. TRANSPORTATION INFORMATION

CANADIAN TDG ACT SHIPPING DESCRIPTION:

This product is not regulated by TDG.

Label(s): Not applicable. Placard: Not applicable.

ERAP Index: -----. Exemptions: None known.

US DOT CLASSIFICATION (49CFR 172.101, 172.102):

This product is not regulated by DOT.

Label(s): Not applicable. Placard: Not applicable.

CERCLA-RQ: 5 000 lbs / 2 270 kg. Exemptions: None known.

15. REGULATORY INFORMATION

CANADA

CEPA - NSNR: All constituents of this product are included on the DSL.

CEPA - NPRI: Ethylene Glycol.

Controlled Products Regulations Classification (WHMIS):

D-2A: Very Toxic (teratogen)

D-2B: Toxic (skin and eye irritant)

USA

Environmental Protection Act: All constituents of this product are included on the TSCA inventory.

OSHA HCS (29CFR 1910.1200): Teratogenic and Embryotoxic, Skin and Eye Irritant.

NFPA: 2 Health, 1 Fire, 0 Reactivity (3)

HMIS: 2 Health, 1 Fire, 0 Reactivity (6)

INTERNATIONAL

The following component or components of this product appear on the European Inventory of Existing Commercial Chemical Substances: Ethylene Glycol.

16. OTHER INFORMATION

REFERENCES

1. RTECS-Registry of Toxic Effects of Chemical Substances, Canadian Centre for Occupational Health and Safety RTECS database.
2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
3. Supplier's Material Safety Data Sheet(s).
4. CHEMINFO, through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
5. Guide to Occupational Exposure Values, 2005, American Conference of Governmental Industrial Hygienists, Cincinnati, 2005.
6. Regulatory Affairs Group, Brenntag Canada Inc.
7. The British Columbia Drug and Poison Information Centre, Poison Managements Manual, Canadian Pharmaceutical Association, Ottawa, 1981.

involve other and additional considerations. No warranty of any kind is given or implied and Brenntag Canada Inc. will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein. This Material Safety Data Sheet is valid for three years.

To obtain revised copies of this or other Material Safety Data Sheets, contact your nearest Brenntag Canada Regional office.

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