



MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, European Union CLP EC 1272/2008, and the Global Harmonization Standard

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

CHEMICAL NAME; CLASS: BLAK-RAY® A-946 INVISIBLE NON-POROUS INK

UVP PRODUCT CODE: 96-0057-04

SYNONYMS: None/Mixture

CHEMICAL FAMILY NAME: Solvent-Based Ink

PRODUCT USE:	Industrial Fluorescent Coding On Non-Porous Materials
U.S. MANUFACTURER/DISTRIBUTOR:	UVP, LLC
ADDRESS:	2066 W. 11th Street, Upland, CA 91786 USA
BUSINESS PHONE:	Toll Free Phone in US/Canada: (800) 452-6788 (8 am to 5 pm PST) or (909) 946-3197
FAX PHONE:	(909) 946-3597
GENERAL E-Mail:	info@uvp.com
EUROPEAN SALES OPERATIONS:	Ultra-Violet Products Ltd
ADDRESS:	Unit 1, Trinity Hall Farm Estate, Nuffield Road, Cambridge CB4 1TG UK
BUSINESS PHONE:	+44(0)1223-420022
FAX PHONE:	+44(0)1223-420561
E-Mail:	uvp@uvp.co.uk
EMERGENCY PHONE:	Infotrac: U.S./Canada/Puerto Rico/U.S. Virgin Islands: 1-800-457-4280 (24 hrs) (International) +1-708-918-1900 (collect-24 hrs)

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION AND EU CLP REGULATION (EC) 1272/2208 LABELING AND CLASSIFICATION: This product has been classified per GHS Standards under European regulations. For information on EU classification under (67/548/EEC), see below.

Classification: Flammable Liquid Cat. 3, Acute Inhalation Toxicity Cat. 4, Acute Dermal Toxicity Cat. 4, Acute Oral Toxicity Cat. 4, Eye Irritant Cat. 2, Skin Irritant Cat. 2, STOT (Central Nervous System, Blood) SE (via Inhalation) Cat. 3

Hazard Statement Codes: H226, H332, H312, H302, H319, H315, H336

Precautionary Codes: P210, P233, P240, P241, P242, P243, P261, P264, P270, P271, P280, P303 + P361 + P353, P370 + P378, P304 + P340, P302 + P352, P301 + P312, P330, P305 + P351 + P338, P337 + P313, P332 + P313, P321, P403 + P235, P403 + P333, P405, P501

Signal Word: Warning

Hazard Symbol/Pictograms: GHS02, GHS07



EU LABELING AND CLASSIFICATION: This product has been classified as per European Union Council Directive 67/548/EEC or subsequent Directives.

Classification: Highly Flammable, Harmful, Irritant

Risk Phrases: R11, R20/21/22, R36, R66, R67

Safety Phrases: S2, S3/7/9, S16, S23, S24/25, S26, S36/37, S46

Hazard Symbols: F, Xn/Xi



See Section 16 for Full Text of all Hazard and Precautionary Statement Codes and Risk and Safety Phrases

EMERGENCY OVERVIEW: Product Description: This product is a clear, colorless liquid with an aromatic odor. Under exposure to UV light, this product fluoresces blue. **Health Hazards:** Ingestion and inhalation may be harmful or fatal. May cause respiratory system, eye, and skin irritation; eye irritation may be severe. Ingestion and inhalation may cause adverse central nervous system and blood effects. Repeated skin contact may cause dermatitis. Contains materials that can be absorbed via intact skin and may cause adverse effect by this route of exposure. Contains materials that are suspect carcinogens. **Flammability Hazards:** This product is flammable and may be ignited if exposed to temperature above 28.3°C (83°F). When involved in a fire, this product may decompose and produce irritating fumes and toxic gases (e.g., carbon monoxide, carbon dioxide, nitrogen oxides, acetic acid, n-butanol, peroxides). **Reactivity Hazards:** This product is not reactive.

2. HAZARD IDENTIFICATION (Continued)

EMERGENCY OVERVIEW (continued): Environmental Hazards: This product may cause harm to the environment if a large quantity is accidentally released to an aquatic environment. **Emergency Response Procedures:** Emergency responders must wear the proper personal protective equipment (and have appropriate fire-suppression equipment) suitable for the situation to which they are responding.

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical Name	CAS #	EINECS or ELNICS #	WT%	EU Classification (67/548/EEC) GHS & EU Classification (1272/2008) Risk Phrases/Hazard Statements
Isopropyl Alcohol	67-63-0	200-661-7	30-60%	EU 67/548 Hazard Classification: Highly Flammable, Irritant EU 67/548 Risk Phrase Codes: R11, R36, R67 EU 67/548 Hazard Symbols: F, Xi GHS & EU 1272/2008 Classification: Flammable Liquid Cat. 2, Eye Irritant Cat. 2, STOT Inhalation SE Cat. 3 GHS & EU 1272/2008 Hazard Codes: H225, H319, H336 GHS & EU 1272/2008 Hazard Symbols/Pictograms: GHS02, GHS07
Glycol Ether	Proprietary	Proprietary	15-40%	EU 67/548 Hazard Classification: Harmful, Irritant EU 67/548 Risk Phrase Codes: R20/21/22 EU 67/548 Hazard Symbols: Xn GHS & EU 1272/2008 Classification: Acute Inhalation Toxicity Cat. 4, Acute Dermal Toxicity Cat. 4, Acute Oral Toxicity Cat. 4, Eye Irritant Cat. 2, Skin Irritant Cat. 2 GHS & EU 1272/2008 Hazard Codes: H332, H312, H302, H319, H315 GHS & EU 1272/2008 Hazard Symbols/Pictograms: GHS07
Butyl Ester	Proprietary	Proprietary	3-7%	EU 67/548 Hazard Classification: Flammable EU 67/548 Risk Phrase Codes: R10, R66, R67 EU 67/548 Hazard Symbols: None GHS & EU 1272/2008 Classification: Flammable Liquid Cat. 3, STOT Inhalation SE Cat. 3 GHS & EU 1272/2008 Hazard Codes: H226, H336 GHS & EU 1272/2008 Hazard Symbols/Pictograms: GHS02, GHS07
Cellulose, Butyrate	Proprietary	Proprietary	3-7%	EU 67/548 Hazard Classification: Not Classified GHS & EU 1272/2008 Classification: Not Classified
UV Pigment	Proprietary	Proprietary	< 1%	EU 67/548 Hazard Classification: Not Classified GHS & EU 1272/2008 Classification: Not Classified

See Section 16 for Full Text of all Hazard Codes and Precautionary Statements, Hazard Codes and Precautionary Statements

4. FIRST-AID MEASURES

PROTECTION OF FIRST AID RESPONDERS: RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS MATERIAL WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. Rescuers should be taken for medical attention, if necessary. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

IMMEDIATE MEDICAL ATTENTION NEEDED: If adverse effect occurs.

INHALATION: If mists, sprays or fumes of this material are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if adverse effect occurs after removal to fresh air.

SKIN EXPOSURE: If the material contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 20 minutes. Do not interrupt flushing. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention if adverse effects occur after flushing.

EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 20 minutes. Do not interrupt flushing. Seek medical attention if adverse effect occurs after flushing.

INGESTION: If this material is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING, unless directly by medical personnel. Have victim rinse mouth with water or give several cupfuls of water, if conscious. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Seek medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin, and respiratory conditions and central nervous system and blood disorders may be aggravated by overexposure to this product.

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT IF NEEDED: Treat symptoms and eliminate exposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT (TOC): 28.3°C (83°F)

AUTOIGNITION TEMPERATURE: Not available.

FLAMMABLE LIMITS (in air by volume, %): LEL = 2.5% UEL: 12.0%

5. FIRE-FIGHTING MEASURES

FIRE EXTINGUISHING MEDIA: Water fog or fine spray, appropriate foam for solvent solutions, carbon dioxide and dry chemical. Water or foam may cause frothing and must be used correctly.

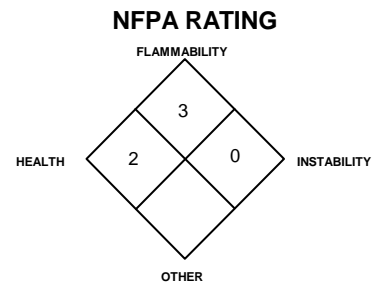
UNSUITABLE FIRE EXTINGUISHING MEDIA: None known.

SPECIAL FIRE AND EXPLOSION HAZARDS: This product is flammable and can ignite when exposed to temperature of its flash point. Both liquid and vapors pose fire hazard. When involved in a fire, this material may ignite and produce toxic gases (including carbon monoxide, carbon dioxide, nitrogen oxides, acetic acid, n-butanol, peroxides). Vapors can travel to distant locations and flashback to source of fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: May be sensitive, may accumulate static charge by agitation or pouring.

ADVICE TO FIRE-FIGHTERS: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Water spray can be used to cool fire-exposed containers. If this material is involved in a fire, fire runoff water should be contained to prevent possible environmental damage. If necessary, decontaminate fire-response equipment with soap and water solution.



Hazard Scale: 0 = Minimal 1 = Slight
2 = Moderate 3 = Serious 4 = Severe

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. Eliminate all sources of ignition. Use non-sparking tools. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Avoid allowing water runoff to contact spilled material. The atmosphere must at least 19.5 percent Oxygen before non-emergency personnel can be allowed in the area without Self-Contained Breathing Apparatus. Spills on certain surfaces may be slippery and present a slip hazard.

PERSONAL PROTECTIVE EQUIPMENT: Proper protective equipment should be used.

Small Spills: Wear rubber gloves, splash goggles, and appropriate body protection.

Large Spills: Minimum Personal Protective Equipment should be rubber gloves, rubber boots, face shield, and Tyvek suit. Minimum level of personal protective equipment for releases in which the level of oxygen is less than 19.5% or is unknown must be **Level B:** Full-face or half-mask, air purifying respirators (NIOSH approved); hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls); coveralls; gloves, outer, chemical-resistant; gloves, inner, chemical-resistant; boots (outer), chemical-resistant steel toe and shank; boot-covers, outer, chemical-resistant (disposable); hard hat; escape mask; face shield.

METHODS FOR CLEAN-UP AND CONTAINMENT: Eliminate all sources of ignition before cleanup begins.

Small Spills: Absorb spilled liquid with paper towels or other suitable absorbent materials. Wash contaminated area with soap and water, absorb with paper towels, and rinse with water. Place spill material and all clean-up materials in appropriate container for disposal.

Large Spills: Dike spill to prevent spread. Absorb spill with polypads or other non-reactive material. Monitor area for combustible vapor levels from potential and confirm levels are below exposure limits given in Section 8 (Exposure Controls-Personal Protection), if applicable, before non-response personnel are allowed into the spill area. Place spill material and all clean-up materials in appropriate container for disposal. Decontaminate area thoroughly.

All Spills: Place all spill residue in a double plastic bag or other containment and seal. Decontaminate the area thoroughly. Do not mix with wastes from other materials. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations). For spills on water, contain, minimize dispersion and collect. Dispose of recovered material and report spill per regulatory requirements.

ENVIRONMENTAL PRECAUTIONS: Avoid release to the environment. Run-off water may be contaminated by other materials and should be contained to prevent possible environmental damage. Spills on water can cover water surface and cause oxygen-deprivation in the aquatic environment, as well as coat marine life. All effort must be made to avoid spills to the marine environment.

REFERENCE TO OTHER SECTIONS: See information in Section 8 (Exposure Controls – Personal Protection) and Section 13 (Disposal Considerations) for additional information.

7. HANDLING and USE

PRECAUTIONS FOR SAFE HANDLING: All employees who handle this material should be trained to handle it safely. As with all chemicals, avoid getting this product ON YOU or IN YOU. Use in a well-ventilated location, segregated from other materials and operations. Minimize all exposures to this substance, including airborne aerosols. Do not eat, drink, smoke, or apply cosmetics while handling this product. Remove contaminated clothing immediately. Wash thoroughly after handling this product. Containers of this product must be properly labeled. Use non-sparking tools. Bond and ground containers during transfers of material. Spills of this product on certain surfaces may present a slip hazard.

CONDITIONS FOR SAFE STORAGE: Keep away from heat, sparks, and other sources of ignition. Keep from freezing. Keep away from food and drinking water. Keep container tightly closed when not in use. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible.

7. HANDLING and USE (Continued)

CONDITIONS FOR SAFE STORAGE (continued): Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Containers should be separated from oxidizing 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 0.5 hours. Storage areas should be made of fire resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Have appropriate extinguishing equipment in the storage area (e.g., sprinkler system, portable fire extinguishers). Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged. Refer to NFPA 30, *Flammable and Combustible Liquids Code*, for additional information on storage. Empty containers may contain residual liquid or vapors that are flammable; therefore, empty containers should be handled with care.

SPECIFIC END USE(S): This product is used for industrial fluorescent coding on non-porous materials. Follow all industry standards for use of this product.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment thoroughly, before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures, or applicable standards.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/CONTROL PARAMETERS:

VENTILATION AND ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits provided in this section, if applicable. Exhaust directly to the outside, taking necessary precautions for environmental protection. An eyewash and safety shower should be readily accessible.

OCCUPATIONAL EXPOSURE LIMITS:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							OTHER ppm
		ACGIH-TLVS		OSHA-PELs		NIOSH-RELS		NIOSH IDLH ppm	
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Proprietary Glycol Ether		20	NE	50 (skin) 25 (skin) 1989 Vacated PEL	NE	5 (skin)	NE	700	DFG MAKs: TWA = 10 (sum of concentration of) [skin] PEAK = 2•MAK 15 min. average value, 1-hr interval, 4 per shift DFG MAK Pregnancy Risk Classification: C Carcinogen: EPA-CBD, EPA-C, IARC-3, MAK-4, TLV-A3
Proprietary Butyl Ester		150	200	150	200 (Vacated 1989 PEL)	150	200	1700 (based on 10% of LEL)	DFG MAKs: TWA = 100 PEAK = 2•MAK 15 min. average value, 1-hr interval, 4 per shift DFG MAK Pregnancy Risk Classification: C
Proprietary Cellulose, Butyrate Exposure limits given are for cellulose		10 mg/m ³	NE	15 mg/m ³ (total dust), 5 mg/m ³ (resp. fraction)	NE	10 mg/m ³ (total dust), 5 mg/m ³ (resp. fraction)	NE	NE	NE
Isopropyl Alcohol	67-63-0	200	400	400	500 (Vacated 1989 PEL)	400	500	2000 (based on 10% of LEL)	DFG MAKs: TWA = 200 PEAK = 2•MAK 15 min. average value, 1-hr interval, 4 per shift DFG MAK Pregnancy Risk Classification: C Carcinogen: IARC-3, TLV-A4
Proprietary UV Pigment		NE	NE	NE	NE	NE	NE	NE	NE

NE = Not Established. See Section 16 for Definition of Terms Used

INTERNATIONAL EXPOSURE LIMITS: Currently, the following international exposure limits are in place components of this product. Exposure limits can change and should be checked for currency.

GLYCOL ETHER:

Australia: TWA = 20 ppm (96.9 mg/m³), STEL = 50 ppm (242 mg/m³), JUL 2008
Belgium: TWA = 20 ppm (98 mg/m³), MAR 2002
Belgium: STEL = 50 ppm (246 mg/m³), Skin, MAR 2002
Denmark: TWA = 20 ppm (98 mg/m³), OCT 2002
EC: TWA = 98 mg/m³ (20 ppm); STEL = 246 mg/m³ (skin), FEB 2006

GLYCOL ETHER (continued):

Finland: TWA = 20 ppm (98 mg/m³), STEL = 50 ppm (250 mg/m³), Skin, SEP 2009
France: VME = 2 ppm (9.8 mg/m³), VLE = 30 ppm (147.6 mg/m³), Skin, FEB 2006
Germany: MAK = 98 mg/m³ (20 mL/m³), 2005
Hungary: TWA = 98 mg/m³, STEL = 246 mg/m³, Skin, SEP 2000

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS (continued): INTERNATIONAL EXPOSURE LIMITS (continued):

GLYCOL ETHER (continued):

Korea: TWA = 25 ppm (120 mg/m³), skin, 2006
 Mexico: TWA = 26 ppm (120 mg/m³); STEL = 75 ppm (skin), 2004
 The Netherlands: MAC-TGG = 100 mg/m³, Skin, 2003
 New Zealand: TWA = 25 ppm (121 mg/m³), skin, JAN 2002
 Norway: TWA = 20 ppm (100 mg/m³), JAN 1999
 The Philippines: TWA = 50 ppm (240 mg/m³), Skin, JAN 1993
 Poland: MAC(TWA) = 100 mg/m³, MAC(STEL) = 360 mg/m³, JAN 1999
 Russia: STEL = 5 mg/m³, JUN 2003
 Sweden: TWA = 10 ppm (50 mg/m³); STEL = 20 ppm (100 mg/m³), Skin, JUN 2005
 Switzerland: MAK-W = 10 ppm (49 mg/m³); KZG-W = 20 ppm (98 mg/m³), Skin, DEC 2006
 Turkey: TWA = 50 ppm (240 mg/m³), JAN 1993
 United Kingdom: TWA = 25 ppm; STEL = 50 ppm (skin), 2005
 In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

BUTYL ESTER:

Australia: TWA = 150 ppm (710 mg/m³), STEL = 200 ppm (950 mg/m³), JUL 2008
 Belgium: TWA = 150 ppm(723 mg/m³), STEL = 200 ppm(964 mg/m³), MAR 2002
 Denmark: TWA = 150 ppm (710 mg/m³), OCT 2002
 Finland: TWA = 150 ppm (720 mg/m³), STEL = 200 ppm (960 mg/m³), SEP 2009
 France: VME = 150 ppm (710 mg/m³), VLE = 200 ppm (940 mg/m³), FEB 2006
 Germany: MAK = 480 mg/m³ (100 mL/m³), 2005
 Hungary: TWA = 950 mg/m³, STEL = 950 mg/m³, SEP 2000
 Japan: OEL = 100 ppm (475 mg/m³), APR 2007
 Korea: TWA = 150 ppm (710 mg/m³), STEL = 200 ppm (950 mg/m³), 2006
 Mexico: TWA = 150 ppm (710 mg/m³); STEL = 200 ppm (950 mg/m³), 2004
 The Netherlands: MAC-TGG = 710 mg/m³, 2003
 New Zealand: TWA = 150 ppm (713 mg/m³); STEL = 200 ppm (950 mg/m³), JAN 2002
 Norway: TWA = 75 ppm (355 mg/m³), JAN 1999
 The Philippines: TWA = 150 ppm (710 mg/m³), JAN 1993
 Poland: MAC(TWA) = 200 mg/m³, MAC(STEL) = 950 mg/m³, JAN 1999

BUTYL ESTER (continued):

Russia: TWA = 50 mg/m³, STEL = 200 mg/m³, JUN 2003
 Sweden: TWA = 100 ppm (500 mg/m³); STEL = 150 ppm (700 mg/m³), JUN 2005
 Switzerland: MAK-W = 100 ppm (480 mg/m³); KZG-W = 200 ppm (960 mg/m³), DEC 2006
 Turkey: TWA = 150 ppm (710 mg/m³), JAN 1993
 United Kingdom: TWA = 150 ppm (724 mg/m³); STEL = 200 ppm, 2005
 In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

ISOPROPYL ALCOHOL:

Australia: TWA = 400 ppm (983 mg/m³), STEL = 500 ppm (1230 mg/m³), JUL 2008
 Belgium: TWA = 400 ppm (997 mg/m³), MAR 2002
 Belgium: STEL = 500 ppm (1248 mg/m³), MAR 2002
 Denmark: TWA = 200 ppm (490 mg/m³), OCT 2002
 Finland: TWA = 200 ppm (500 mg/m³), STEL = 250 ppm (620 mg/m³), SEP 2009
 France: VLE = 400 ppm (980 mg/m³), FEB 2006
 Germany: MAK = 500 mg/m³ (200 mL/m³), 2005
 Hungary: TWA = 500 mg/m³, STEL = 2000 mg/m³, Skin, SEP 2000
 Japan: OEL-C = 400 ppm (980 mg/m³), APR 2007
 Korea: TWA = 400 ppm (980 mg/m³), STEL = 500 ppm (1225 mg/m³), 2006
 Mexico: TWA = 400 ppm (980 mg/m³); STEL = 500 ppm (1225 mg/m³), 2004
 The Netherlands: MAC-TGG = 650 mg/m³, 2003
 New Zealand: TWA = 400 ppm (983 mg/m³); STEL = 500 ppm (1230 mg/m³), JAN 2002
 The Philippines: TWA = 400 ppm (980 mg/m³), JAN 1993
 Poland: MAC(TWA) = 900 mg/m³, MAC(STEL) = 1200 mg/m³, JAN 1999
 Russia: TWA = 10 mg/m³, STEL = 50 mg/m³, JUN 2003
 Sweden: TWA = 150 ppm (350 mg/m³); STEL = 250 ppm (600 mg/m³), JUN 2005
 Switzerland: MAK-W = 200 ppm (500 mg/m³), KZG-W = 400 ppm (1000 mg/m³), DEC 2006
 Turkey: TWA = 200 ppm (500 mg/m³), JAN 1993
 United Kingdom: TWA = 400 ppm (999 mg/m³); STEL = 500 ppm, 2005
 In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

PERSONAL PROTECTIVE EQUIPMENT:

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with regulations found in U.S. OSHA 29 CFR Subpart I (beginning at 1910.132), equivalent standards of Canada (including CSA Standard Z94.4-02 and CSA Standard Z94.3-02) or standards of EU member states (including EN 529:2005 for respiratory PPE, CEN/TR 15419:2006 for hand protection, and CR 13464:1999 for face/eye protection). Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in this section, if applicable. Use a NIOSH air purifying respirator with amine/organic vapor/high-efficiency particulate (HEPA) filter cartridges when exposure is likely. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) and equivalent U.S. State standards, Canadian CSA Standard Z94.4-93 and the European Standard EN 529:2005 and Respiratory Protection Standards of EU member states. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). The following are NIOSH respiratory protection guidelines for the main solvent components.

GLYCOL ETHER CONCENTRATION

RESPIRATORY PROTECTION

Up to 50 ppm:	Any Chemical Cartridge Respirator with organic vapor cartridge(s), or any Supplied-Air Respirator (SAR).
Up to 125 ppm:	Any SAR operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with organic vapor cartridge.
Up to 250 ppm:	Any Chemical Cartridge Respirator with a full facepiece and organic vapor cartridge(s), or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any PAPR with a tight-fitting facepiece and organic vapor cartridge(s), or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR with a full facepiece.
Up to 700 ppm:	Any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Emergency or Planned Entry Into Unknown Concentrations or IDLH Conditions:	Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.
Escape:	Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any appropriate escape-type, SCBA.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

PERSONAL PROTECTIVE EQUIPMENT (continued):

RESPIRATORY PROTECTION (continued):

ISOPROPANOL

CONCENTRATION

Up to 2000 ppm:

RESPIRATORY PROTECTION

Any Supplied-Air Respirator (SAR) operated in a continuous-flow mode, or any Chemical Cartridge Respirator with a full facepiece and organic vapor cartridge(s), or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any Powered, Air-Purifying Respirator (PAPR) with organic vapor cartridge(s), or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR with a full facepiece.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.

Escape: Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any appropriate escape-type, SCBA.

EYE PROTECTION: Not normally needed for handling of small quantities. If handling more than several ounces, wear splash goggles or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133, the Canadian CSA Standard Z94.3-M1982, *Industrial Eye and Face Protectors* or the European Standard CR 13464:1999 for further information.

HAND PROTECTION: Wear rubber or other appropriate glove to avoid skin contact. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS. If necessary, refer to U.S. OSHA 29 CFR 1910.138, appropriate Standards of Canada or the European Standard CEN/TR 15419:2006.

BODY PROTECTION: Coveralls or apron when handling large quantity. If necessary, refer to appropriate Standards of Canada for further information or the European Standard CEN/TR 15419:2006. 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 and the Canadian CSA Standard Z195-M1984, *Protective Footwear*.

9. PHYSICAL and CHEMICAL PROPERTIES

FORM: Liquid.

ODOR: Aromatic.

ODOR THRESHOLD: For Glycol Ether: 0.10 ppm (detection); 0.48 ppm (100% recognition)

VAPOR DENSITY (air = 1): 2

BOILING POINT: 126.7°C (260°F)

SPECIFIC GRAVITY (water = 1): 0.85

SOLUBILITY IN WATER: Immiscible.

LOG COEFFICIENT WATER/OIL DISTRIBUTION: Not determined.

HOW TO DETECT THIS SUBSTANCE (identification properties): The appearance or odor may be a method to identify this product in event of an accidental release.

COLOR: Clear; fluoresces blue in UV light.

EVAPORATION RATE (nBuAc): 1.2

VAPOR PRESSURE @ 20°C: 8-12

FREEZING POINT: Not available.

pH: Not available.

OTHER SOLUBILITIES: Not available.

10. STABILITY and REACTIVITY

REACTIVITY/CHEMICAL STABILITY: This product is stable under normal conditions. Due to the Glycol Ether component, prolonged storage of this product which is in contact with air, may produce unstable peroxides. These peroxides are unlikely to be hazardous unless they are concentrated during distillation or allowed to evaporate to dryness.

DECOMPOSITION PRODUCTS: *Hydrolysis:* None. *Combustion:* Carbon monoxide, carbon dioxide, nitrogen oxides, acetic acid, n-butanol, peroxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product is incompatible with strong oxidizing agents, strong acids, potassium tert-butoxide, bases, perchloric acid. Due to the Glycol Ether component, this product may attack some forms of stainless steels (types 301, 302 and 440) and copper and may attack plastics such as chlorinated polyvinyl chloride (CPVC), polyvinyl chloride (PVC), polyethylene terephthalate, high-density polyethylene, and ethylene vinyl acetate; elastomers, like Viton (FKM), nitrile Buna-N (NBR), chloroprene, isoprene, natural rubber, polymethacrylate (acrylic) and silicone; and coatings, such as coal tar epoxy, epoxy general purpose and epoxy chemical resistant.

POSSIBILITY OF HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials, and exposure to excessive temperatures.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational overexposure are anticipated to be by inhalation, skin and eye contact. The following symptoms of overexposure to this product are anticipated to be as follows:

INHALATION: Inhalation of vapors, mists or sprays from this product may irritate the tissues of the nose, mouth, throat, and upper respiratory system. Inhalation may also lead to adverse central nervous system effects, such as headache, dizziness, drowsiness, incoordination, nausea and vomiting.

11. TOXICOLOGICAL INFORMATION (Continued)

INHALATION (continued): Due to the presence of the Glycol Ether component, inhalation at low concentrations may cause severe blood system effects (red blood cell fragility, hemoglobinuria), adverse liver effects, reduced respiratory rates, based on animal test results. Exposure to the concentration that produced these effects is expected to produce intolerable eye, nose and throat irritation (sensory irritation) in humans.

CONTACT WITH SKIN or EYES: Skin contact with this product may be irritating, especially if prolonged. Chronic or repeated skin exposure may cause dermatitis (dry, red, itchy skin). Eye contact can be moderately to severely irritating, causing stinging, redness and tearing.

SKIN ABSORPTION: Components of this product can be absorbed via intact skin. If large area of the skin is involved, adverse systemic effects as described under 'Inhalation' may occur.

INGESTION: Ingestion is not anticipated to be a likely route of occupational overexposure for this product. Ingestion may be harmful or fatal. Adverse blood effects may occur. Ingestion may cause adverse central nervous system effects such as described under 'Inhalation'.

INJECTION: Injection is not anticipated to be a significant route of overexposure for this product. If this product is "injected" (as may occur through punctures by contaminated, sharp objects), local swelling and irritation can occur.

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

ACUTE: Contact via inhalation and skin or eye contact may cause irritation. Eye irritation may be severe. Ingestion or inhalation exposure may be harmful or fatal.

CHRONIC: Chronic skin contact may cause dermatitis. Chronic exposure may cause adverse effects on the blood system.

TARGET ORGANS: Acute: Skin, eyes, respiratory system, blood system, central nervous system. **Chronic:** Skin, blood system.

TOXICITY DATA: The following data are available for components of greater than 1% concentration. Only available human data, LD₅₀ Oral-Rat, Oral-Mouse and Skin-Rabbit, LC₅₀ Inhalation-Rat and Inhalation-Mouse, Draize data and mutagenic data is provided in this MSDS. Contact UVP for more information.

BUTYL ESTER:

Standard Draize Test (Eye-Human) 300 ppm
 TCLo (Inhalation-Human) 200 ppm: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Sense Organs and Special Senses (Eye): conjunctive irritation; Lungs, Thorax, or Respiration: other changes
 Standard Draize Test (Eye-Rabbit) 100 mg: Moderate
 Standard Draize Test (Skin-Rabbit) 500 mg/24 hours: Moderate
 LC₅₀ (Inhalation-Rat) 390 ppm/4 hours: Behavioral: changes in motor activity (specific assay); Lungs, Thorax, or Respiration: acute pulmonary edema; Blood: hemorrhage
 LC₅₀ (Inhalation-Mouse) 6 gm/m³/2 hours
 LD₅₀ (Oral-Rat) 10,768 mg/kg: Behavioral: somnolence (general depressed activity); Lungs, Thorax, or Respiration: other changes; Liver: other changes
 LD₅₀ (Oral-Mouse) 6 gm/kg
 LD₅₀ (Oral-Rabbit) 3200 mg/kg
 LD₅₀ (Skin-Rabbit) > 17,600 mg/kg

GLYCOL ETHER:

Open Irritation Test (Skin-Rabbit) 500 mg: Mild
 Standard Draize Test (Eye-Rabbit) 100 mg: Severe
 Standard Draize Test (Eye-Rabbit) 100 mg/24 hours: Moderate
 LDLo (Oral-Human) 143 mg/kg
 TDLo (Oral-Woman) 600 mg/kg: Behavioral: coma; Lungs, Thorax, or Respiration: dyspnea; Nutritional and Gross Metabolic: metabolic acidosis
 TDLo (Oral-Woman) 7813 µL/kg: Behavioral: coma; Vascular: BP lowering not characterized in autonomic section; Nutritional and Gross Metabolic: metabolic acidosis
 TCLo (Inhalation-Human) 195 ppm/8 hours: Gastrointestinal: nausea or vomiting

GLYCOL ETHER (continued):

TCLo (Inhalation-Human) 100 ppm: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Sense Organs and Special Senses (Eye): effect, not otherwise specified; Lungs, Thorax, or Respiration: other changes
 TCLo (Inhalation-Human) 1500 mg/m³: Sense Organs and Special Senses (Eye): conjunctive irritation; Liver: other changes; Kidney/Ureter/Bladder: other changes
 LC₅₀ (Inhalation-Rat) 450 ppm/4 hours: Behavioral: ataxia; Nutritional and Gross Metabolic: weight loss or decreased weight gain
 LC₅₀ (Inhalation-Rat) 2900 mg/m³/7 hours: Liver: other changes; Kidney/Ureter/Bladder: other changes; Blood: other hemolysis with or without anemia
 LC₅₀ (Inhalation-Mouse) 3380 mg/m³/7 hours: Liver: other changes; Kidney/Ureter/Bladder: other changes; Blood: other hemolysis with or without anemia
 LC₅₀ (Inhalation-Mouse) 700 ppm/7 hours: Behavioral: analgesia; Lungs, Thorax, or Respiration: dyspnea; Kidney/Ureter/Bladder: hematuria
 LD₅₀ (Oral-Rat) 470 mg/kg
 LD₅₀ (Oral-Rat) 917 mg/kg: Liver: other changes; Kidney/Ureter/Bladder: other changes; Blood: other hemolysis with or without anemia
 LD₅₀ (Oral-Mouse) 1230 mg/kg: Behavioral: altered sleep time (including change in righting reflex), somnolence (general depressed activity); Skin and Appendages: hair
 LD₅₀ (Oral-Mouse) 1167 mg/kg: Liver: other changes; Kidney/Ureter/Bladder: other changes; Blood: other hemolysis with or without anemia
 LD₅₀ (Skin-Rabbit) 220 mg/kg
ISOPROPYL ALCOHOL:
 TDLo (Oral-Man) 14,432 mg/kg: Behavioral: coma; Vascular: BP lowering not characterized in autonomic section; Lungs, Thorax, or Respiration: dyspnea

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	2*
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FLAMMABILITY HAZARD	(RED)	3
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PHYSICAL HAZARD	(YELLOW)	0
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PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
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SEE SECTION 8

For Routine Industrial Use and Handling Applications

Hazard Scale: 0 = Minimal 1 = Slight
 2 = Moderate 3 = Serious 4 = Severe *Chronic Hazard

ISOPROPYL ALCOHOL (continued):

TDLo (Oral-Human) 223 mg/kg: Behavioral: hallucinations, distorted perceptions; Cardiac: pulse rate; Vascular: BP lowering not characterized in autonomic section
 TDLo (Oral-Human) 286 mg/kg: Cardiac: arrhythmias (including changes in conduction); Behavioral: coma; Kidney/Ureter/Bladder: other changes
 TDLo (Oral-Infant) 13 gm/kg: Behavioral: somnolence (general depressed activity), irritability; Gastrointestinal: nausea or vomiting
 TDLo (Oral-Human) 1375 mg/kg: Sense Organs and Special Senses (Eye): effect, not otherwise specified; Behavioral: somnolence (general depressed activity), hallucinations, distorted perceptions
 LDLo (Oral-Man) 5272 mg/kg: Behavioral: coma; Vascular: BP lowering not characterized in autonomic section; Lungs, Thorax, or Respiration: chronic pulmonary edema
 LDLo (Oral-Human) 3570 mg/kg: Behavioral: coma; Lungs, Thorax, or Respiration: respiratory depression; Gastrointestinal: nausea or vomiting
 LDLo (Oral-Human) 571 mL/kg
 LDLo (Unreported-Human) 2 mL/kg
 LDLo (Unreported-Human) 2770 mg/kg
 TCLo (Inhalation-Human) 35 ppm/4 hours: Cardiac: pulse rate; Lungs, Thorax, or Respiration: other changes
 TCLo (Inhalation-Human) 150 ppm/2 hours: Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: other Enzymes
 Standard Draize Test (Skin-Rabbit) 500 mg: Mild
 Standard Draize Test (Eye-Rabbit) 100 mg: Severe
 Standard Draize Test (Eye-Rabbit) 10 mg: Moderate
 Standard Draize Test (Eye-Rabbit) 100 mg/24 hours: Moderate
 LD₅₀ (Oral-Rat) 5045 mg/kg: Behavioral: altered sleep time (including change in righting reflex), somnolence (general depressed activity)

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

ISOPROPYL ALCOHOL (continued):

LD₅₀ (Skin-Rabbit) 12,800 mg/kg
 LD₅₀ (Oral-Rat) 5000 mg/kg: Behavioral: general anesthetic

ISOPROPYL ALCOHOL (continued):

LD₅₀ (Oral-Mouse) 3600 mg/kg: Behavioral: altered sleep time (including change in righting reflex), somnolence (general depressed activity)
 LD₅₀ (Oral-Mouse) 3600 mg/kg: Behavioral: general anesthetic

ISOPROPYL ALCOHOL (continued):

PROPRIETARY UV PIGMENT:
 LD₅₀ (Oral-Rat) 5 gm/kg
 LD₅₀ (Oral-Mouse) 1780 mg/kg: Behavioral: somnolence (general depressed activity), ataxia

CARCINOGENIC POTENTIAL: The components of this product are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

GLYCOL ETHER: ACGIH TLV-A3 (Confirmed Animal Carcinogen); EPA-CBD (Cannot Be Determined); EPA-C (Possible Human Carcinogen); IARC-3 (Unclassifiable as to Carcinogenicity in Humans); MAK-4 (Substances with Carcinogenic Potential which genotoxicity plays no at most a minor role.)

ISOPROPYL ALCOHOL: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

The remaining components of this product are not specifically listed by U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, IARC, GERMAN MAK, and ACGIH and therefore is not considered to be, nor suspected to be, a cancer causing agent by these agencies.

IRRITANCY OF PRODUCT: This product may be irritating to contaminated tissue.

SENSITIZATION TO THE PRODUCT: No component of this product is known to be a human skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No component of this product is reported to cause mutagenic, embryotoxic, teratogenic or reproductive effects in humans. Animal data for some components indicated effects, but only at doses that were also fatal to test animals and so are not considered adequate evidence of reproductive effect.

ACGIH BIOLOGICAL EXPOSURE INDICES: Currently, the following Biological Exposure Indices have been determined for the components of this product.

CHEMICAL: DETERMINANT	SAMPLING TIME	BEI
Isopropanol • Acetone in urine	• End of Shift • End of Workweek	• 40 mg/L
Glycol Ether • Butoxyacetic acid in urine	• End of Shift	• 200 mg/g Creatinine

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

MOBILITY: This product has not been tested for mobility in soil; it is expected to be highly mobile. The following information is available for the main solvent components.

GLYCOL ETHER:

The Koc of this compound is estimated as 67, using a log Kow of 0.83 and a regression-derived equation. According to a classification scheme, this estimated Koc value suggests that this material is expected to have high mobility in soil.

ISOPROPYL ALCOHOL:

The Koc of this compound is estimated as 25, using a measured log Kow of 0.05 and a regression-derived equation. According to a classification scheme, this estimated Koc value suggests that this material is expected to have very high mobility in soil.

PERSISTENCE AND BIODEGRADABILITY: No specific data are available this product. The following information is available for the main solvent components.

GLYCOL ETHER:

If released to air, a vapor pressure of 0.88 mm Hg at 25°C indicates this compound will exist solely as a vapor in the ambient atmosphere. Vapor-phase material will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 16 hours. If released to soil, this material is expected to have high mobility based upon an estimated Koc of 67. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of 1.60X10⁻⁶ atm-cu m/mole. If released into water, this material is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. This compound reached 91% of its theoretical BOD in 14 days using an activated sludge inoculum. Therefore this compound has the potential to biodegrade rapidly in water. Based upon this compound's estimated Henry's Law constant it is concluded that the volatilization of from water surfaces may be an important fate process. The estimated volatilization half-lives for a model river and model lake are 25 and 185 days, respectively. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions.

ISOPROPYL ALCOHOL:

Based on a classification scheme, an estimated Koc value of 25, determined from a log Kow of 0.05 and a regression-derived equation, indicates that this compound is expected to have very high mobility in soil. Volatilization from moist soil surfaces is expected to be an important fate process given a Henry's Law constant of 8.10X10⁻⁶ atm-cu m/mole. The potential for volatilization of from dry soil surfaces may exist based upon a vapor pressure of 45.4 mmHg. This compound is readily degraded in aerobic systems; the range of half-lives for aerobic degradation using a sewage sludge inoculum are < 1 day to 48 days. This material has also been shown to be readily degraded under anaerobic conditions. Volatilization from water surfaces is expected based upon a Henry's Law constant of 8.10X10⁻⁶ atm-cu m/mole. Using this Henry's Law constant and an estimation method, volatilization half-lives for a model river and model lake are 57 hours and 29 days, respectively. This material is readily degraded in aerobic systems; the range of half-lives for aerobic degradation using a sewage sludge inoculum are < 1 day to 48 days. This compound has also been shown to be readily degraded under anaerobic conditions. According to a model of gas/particle partitioning of semi-volatile organic compounds in the atmosphere, this material, which has a vapor pressure of 45.4 mm Hg at 25°C, is expected to exist solely as a vapor in the ambient atmosphere. Vapor-phase material is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 3.2 days, calculated from its rate constant of 5.07X10⁻¹² cu cm/molecule-sec at 25°C.

BIO-ACCUMULATION POTENTIAL: This product has not been tested for bio-accumulation potential. The following information is available for the main solvent components.

GLYCOL ETHER:

An estimated BCF of 3 was calculated for this compound, using an estimated log Kow of 0.83 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low.

ISOPROPYL ALCOHOL:

An estimated BCF of 3 was calculated for Isopropanol, using a log Kow of 0.05 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low.

12. ECOLOGICAL INFORMATION (Continued)

ECOTOXICITY: This product has not been tested for aquatic or animal toxicity. The following aquatic toxicity data are available for some components. Limited data is provided on this MSDS. Contact UVP for more information.

GLYCOL ETHER:

LC₅₀ (*Daphnia magna* Waterflea) 24 hours = 1,720 mg/L; static

LC₅₀ (*Lepomis macrochirus* Bluegill) 96 hours = 1,490 mg/L; static

BUTYL ESTER:

LC₅₀ (*Lepomis macrochirus* Bluegill) 96 hours = 100 ppm at 23°C (static bioassay in fresh water, mild aeration applied after 24 hours)

ISOPROPYL ALCOHOL:

LC₅₀ (*Daphnia magna*) 24 hours = 9,500 mg/L
LC₅₀ (fathead minnow) 24 hours = 11,160 mg/L
LC₅₀ (fathead minnow) 48 hours = 11,130 mg/L
LC₅₀ (fathead minnow) 96 hours = 11,130 mg/L

RESULTS OF PBT and vPvB ASSESSMENT: No data available. PBT and vPvB assessments are part of the chemical safety report required for some substances in European Union Regulation (EC) 1907/2006, Article 14.

ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

OTHER ADVERSE EFFECTS: The components of this product are not listed as having ozone depletion potential.

13. DISPOSAL CONSIDERATIONS

WASTE TREATMENT/DISPOSAL METHODS: It is the responsibility of the generator to determine at the time of disposal whether the product meets the criteria of a hazardous waste per regulations of the area in which the waste is generated and/or disposed of. Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Shipment of wastes must be done with appropriately permitted and registered transporters.

DISPOSAL CONTAINERS: Waste materials must be placed in and shipped in appropriate 5-gallon or 55 gallon poly or metal waste pails or drums. Permeable cardboard containers are not appropriate and should not be used. Ensure that any required marking or labeling of the containers be done to all applicable regulations.

PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING: Wear proper protective equipment when handling waste materials. Dispose of in accordance with applicable Federal, State, and local procedures and standards.

U.S. EPA WASTE NUMBER: Not applicable.

EWC WASTE CODES: 16 05 08: Discarded Organic Chemicals Consisting of or Containing Dangerous Substances.

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION 49 CFR 172.101: This material is classified as Dangerous Goods, per regulations of the DOT.

UN Identification Number:

UN 1993

Proper Shipping Name:

Flammable liquid, n.o.s. (Isopropyl Alcohol)

Hazard Class Number and Description:

3 (Flammable)

Packing Group:

III

Excepted Quantities:

E1

Dot Label(s) Required:

Class 3 (Flammable)

North American Emergency Response Guidebook Number, 2008: 128

Marine Pollutant: No component of this product meets the criteria of the DOT to be a Marine Pollutant, per Appendix B to 49 CFR 172.101

NOTE: Shipments of this product may be shipped under small quantity and limited quantity exceptions as indicated under 49 CFR §173.4 and 49 CFR §173.150, if all requirements are met.

Small Quantity Exception (49 CFR 173.4): Small quantities of Class 3 material are not subjected to other requirements of the Hazardous Materials Regulations (Subchapter C) when the maximum quantity per inner receptacle is limited to 30 mL (1 oz). Refer to 49 CFR 173.4 for specific information in packaging small quantity materials.

Limited Quantity Exceptions [49 CFR 173.150(b)]: Limited quantities for Class 3, Packing Group III materials have inner packagings not over 5.0 L (1.3 gal) net capacity each, packed in strong outer packaging.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is classified 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.

UN Identification Number:

UN 1993

Proper Shipping Name:

Flammable liquid, n.o.s. (Isopropyl Alcohol)

Hazard Class Number and Description:

3 (Flammable)

Packing Group:

III

Excepted Quantities:

E1

Special Provisions:

16

Explosive Limit and Limited Quantity Index:

5

ERAP Index:

None

Passenger Carrying Ship Index:

None

Passenger Carrying Road or Rail Vehicle Index:

60

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is classified as dangerous goods, per the International Air Transport Association.

UN Identification Number:

UN 1993

Proper Shipping Name:

Flammable liquid, n.o.s. (Isopropyl Alcohol)

Hazard Class Number and Description:

3 (Flammable)

Hazard Label(s) Required:

Class 3 (Flammable)

14. TRANSPORTATION INFORMATION (Continued)

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA) [continued]:

Packing Group: III
Excepted Quantities: E1
Passenger and Cargo Aircraft Limited Quantity Packing Instruction: Y344
Passenger and Cargo Aircraft Limited Quantity Maximum Net Quantity/Pkg: 10 L
Passenger and Cargo Aircraft Packing Instruction: 355
Passenger and Cargo Aircraft Maximum Net Quantity/Pkg: 60 L
Cargo Aircraft Only Packing Instruction: 366
Cargo Aircraft Only Maximum Net Quantity/Pkg: 220 L
Special Provisions: A3
ERG Code: 3L

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is classified as dangerous goods, per the International Maritime Organization.

UN No.: 1993
Proper Shipping Name: Flammable liquid, n.o.s. (Isopropyl Alcohol)
Hazard Class Number: 3
Packing Group: III
Limited Quantities: 5 L
Excepted Quantities: E1
Special Provisions: 223, 274, 955
Packing: Instructions: P001, LP01, Provisions: None
IBCs: Instructions: IBC03, Provisions: None
Tanks: Instructions: T4, Provisions: TP1, TP29
EmS: F-E, S-E
Stowage Category: Category A.

Marine Pollutant: This product does not meet the criteria of a Marine Pollutant under UN criteria.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is classified by the Economic Commission for Europe to be dangerous goods.

UN No.: 1993
Name and Description: Flammable liquid, n.o.s. (Isopropyl Alcohol)
Class: 3
Classification Code: F1
Packing Group: III
Labels: 3
Special Provisions: 274, 601, 640E
Limited Quantities: LQ7
Excepted Quantities: E1
Packing Instructions: P001, IBC03, LP01, R001
Special Packing Provisions: None
Mixed Packing Provisions: MP19
Portable Tanks and Bulk Containers: Instructions: T4, Provisions: TP1, TP29
Hazard Identification No.: 30

TRANSPORT IN BULK ACCORDING TO THE IBC CODE: See the information under the individual jurisdiction listings for IBC information.

ENVIRONMENTAL HAZARDS: This product does not meet the criteria of environmentally hazardous according to the criteria of the UN Model Regulations (as reflected in the IMDG Code, ADR, RID, and ADN); components of this product are not specifically listed in Annex III under MARPOL 73/78.

15. REGULATORY INFORMATION

ADDITIONAL UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows.

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Glycol Ether (under glycol ether category)	No	No	N230
Isopropyl Alcohol (mfg-strong acid process)	No	No	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: The components of this product have no specific Threshold Planning Quantity. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs. (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Butyl Ester = 5000 lb (2270 kg); The Glycol Ether component does not have a specific CERCLA RQ assigned although as part of the generic or broad class of Glycol Ethers, it is a CERCLA hazardous substance. See 50 Federal Register 13456 (April 4, 1985). Values in section 313 column represent Category Codes for reporting under Section 313.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL UNITED STATES REGULATIONS (continued):

U.S. SARA HAZARD CATEGORIES (SECTION 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: Yes; FIRE: Yes; REACTIVE: No; SUDDEN RELEASE: No

U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Components of this product have requirements under other U.S. Federal regulations detailed as follows:

BUTYL ESTER

CLEAN WATER ACT REQUIREMENTS: This material is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): This product does not contain any components listed on the California Proposition 65 Lists.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: The components of this product are on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The Isopropyl Alcohol component has requirements under the CEPA as follows:

ISOPROPYL ALCOHOL

CEPA Reporting Requirements: Substance With Greatest Potential For Human Exposure Substance on Environment Canada/Health Canada Pilot Project List (CEPA 1999, Section 73). Meets categorization criteria: *may present, to individuals in Canada, the greatest potential for exposure; or *are persistent or bio-accumulative in accordance with the regulations, and inherently toxic to human beings or to non-human organisms, as determined by laboratory or other studies.

CANADIAN WHMIS CLASSIFICATION AND SYMBOLS: This product would be classified as a Controlled Product, Hazard Classes B2, D2A and D2B as per the Controlled Product Regulations.



ADDITIONAL EUROPEAN REGULATIONS:

SAFETY, HEALTH, AND ENVIRONMENTAL REGULATIONS/LEGISLATION SPECIFIC FOR THE PRODUCT:

Currently, there is no specific legislation pertaining to this product.

CHEMICAL SAFETY ASSESSMENT: No data available. The chemical safety assessment is required for some substances according to European Union Regulation (EC) 1907/2006, Article 14.

16. OTHER INFORMATION

GLOBAL HARMONIZATION AND EU CLP REGULATION (EC) 1272/2208 LABELING AND CLASSIFICATION: This product has been classified per GHS Standards, pending further testing. For information on EU classification under (67/548/EEC), see below.

Classification: Flammable Liquid Category 3, Acute Inhalation Toxicity Category 4, Acute Dermal Toxicity Category 4, Acute Oral Toxicity Category 4, Eye Irritant Category 2, Skin Irritant Category 2, Specific Target Organ (Central Nervous System, Blood System) Toxicity (via Inhalation, Ingestion) Single Exposure Category 3

Hazard Statement Codes: H225: Highly flammable liquid and vapour. H332: Harmful if inhaled. H312: Harmful in contact with skin. H302: Harmful if swallowed. H319: Causes serious eye irritation. H315: Causes skin irritation. H336: May cause drowsiness or dizziness.

Precautionary Codes:

Prevention: P210: Keep away from heat/sparks/open flames/hot surfaces. — No smoking. P233: Keep container tightly closed.

P240: Ground/bond container and receiving equipment. P241: Use explosion-proof electrical/ventilating/lighting/equipment.

P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P261: Avoid breathing

mists, sprays, fume. P264: Wash thoroughly after handling. P270: Do not eat, drink or smoke when using this product.

P271: Use only outdoors or in a well-ventilated area. P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P370 + P378: In case of fire: Use materials appropriate for surrounding fire for extinction. P304 + P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P301 + P312: If swallowed, Call a POISON CENTER or doctor/physician if you feel unwell. P330: Rinse mouth. P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337 + P313: If eye irritation persists: Get medical advice/attention. P332 + P313: If skin irritation occurs, get medical attention. P321: Specific treatment (remove from exposure and treat symptoms).

Storage: P403 + P233 + P235: Store in a well-ventilated place. Keep container tightly closed. Keep cool. P405: Store locked up.

Disposal: P501: Dispose of contents/containers in accordance with all local, regional, national and international regulations.

Signal Word: Warning

Hazard Symbol/Pictograms: GHS02, GHS07

16. OTHER INFORMATION (Continued)

EU LABELING AND CLASSIFICATION: This product has been classified as per European Union Council Directive 67/548/EEC or subsequent Directives.

Classification: Highly Flammable, Harmful, Irritant

Risk Phrases: R11: Highly Flammable. R20/21/22: Harmful by inhalation, in contact with skin and if swallowed. R36: Irritating to eyes. R66: Repeated exposure may cause skin dryness or cracking. R67: Vapours may cause drowsiness and dizziness.

Safety Phrases: S2: Keep locked up. S3/7/9: Keep container tightly closed in a cool, well-ventilated place. S16: Keep away from sources of ignition - No smoking. S23: Do not breathe gas/fumes/vapour/spray. S24/25: Avoid contact with skin and eyes. S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36/37/39: Wear suitable protective clothing, gloves and eye/face protection. S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible). S46: If swallowed, seek medical advice immediately and show this container or label.

Hazard Symbols: F, Xn/Xi

REFERENCES AND DATA SOURCES: Contact the supplier for information.

METHODS OF EVALUATING INFORMATION FOR THE PURPOSE OF CLASSIFICATION: Bridging principles were used to classify this product.

REVISION DETAILS: May 2011: Review and up-date entire MSDS. Revise format to include current ANSI 16 Part format, Canadian, European and Global Harmonization compliance.

MIXTURES: When two or more chemicals are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for this product before you use the product. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember all chemicals have properties that can cause serious injury or death.

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.

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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 UVP'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.

DEFINITION 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 that uniquely identifies each constituent.

15-minute TWA exposure (unless otherwise specified) that shall not be exceeded at any time during a workday.

EXPOSURE LIMITS IN AIR:

NIOSH RELs: NIOSH's Recommended Exposure Limits.

CEILING LEVEL: The concentration that shall not be exceeded during any part of the working exposure.

DFG MAK Germ Cell Mutagen Categories: **1:** Germ cell mutagens that have been shown to increase the mutant frequency in the progeny of exposed humans. **2:** Germ cell mutagens that have been shown to increase the mutant frequency in the progeny of exposed mammals. **3A:** Substances that have been shown to induce genetic damage in germ cells of human or animals, or which produce mutagenic effects in somatic cells of mammals *in vivo* and have been shown to reach the germ cells in an active form. **3B:** Substances that are suspected of being germ cell mutagens because of their genotoxic effects in mammalian somatic cell *in vivo*; in exceptional cases, substances for which there are no *in vivo* data, but that are clearly mutagenic *in vitro* and structurally related to known *in vivo* mutagens. **4:** Not applicable (Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic. Therefore, a Category 4 for germ cell mutagens cannot apply. At some time in the future, it is conceivable that a Category 4 could be established for genotoxic substances with primary targets other than DNA [e.g. purely aneugenic substances] if research results make this seem sensible.) **5:** Germ cell mutagens, the potency of which is considered to be so low that, provided the MAK value is observed, their contribution to genetic risk for humans is expected not to be significant.

DFG MAK Pregnancy Risk Group Classification: Group A: A risk of damage to the developing embryo or fetus has been unequivocally demonstrated. Exposure of pregnant women can lead to damage of the developing organism, even when MAK and BAT (Biological Tolerance Value for Working Materials) values are observed.

DFG MAK Pregnancy Risk Group Classification (continued): Group B: Currently available information indicates a risk of damage to the developing embryo or fetus must be considered to be probable. Damage to the developing organism cannot be excluded when pregnant women are exposed, even when MAK and BAT values are observed.

Group C: There is no reason to fear a risk of damage to the developing embryo or fetus when MAK and BAT values are observed. **Group D:** Classification in one of the groups A-C is not yet possible because, although the data available may indicate a trend, they are not sufficient for final evaluation.

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.

LOQ: Limit of Quantitation.

MAK: Federal Republic of Germany Maximum Concentration Values in the workplace.

NE: Not Established. When no exposure guidelines are established, an entry of NE is made for reference.

NIC: Notice of Intended Change.

NIOSH CEILING: The exposure that shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, the ceiling shall be assumed as a

EXPOSURE LIMITS IN AIR (continued):

PEL: OSHA's Permissible Exposure Limits. 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 that was vacated by Court Order.

SKIN: Used when there is a danger of cutaneous absorption.

STEL: Short Term Exposure Limit, usually a 15-minute time-weighted average (TWA) exposure that should not be exceeded at any time during a workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA.

TLV: Threshold Limit Value. An airborne concentration of a substance that 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.

TWA: Time Weighted Average exposure concentration for a conventional 8-hr (TLV, PEL) or up to a 10-hr (REL) workday and a 40-hr workweek.

WEEL: Workplace Environmental Exposure Limits from the AIHA.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD

RATINGS: This rating system was developed by the National Paint and Coating Association and has been adopted by industry to identify the degree of chemical hazards.

0 Minimal Hazard: No significant health risk, irritation of skin or eyes not anticipated. *Skin Irritation:* Essentially non-irritating. Mechanical irritation may occur. PII or Draize = 0. *Eye Irritation:* Essentially non-irritating, minimal effects clearing in < 24 hours. Mechanical

irritation may occur. Draize = 0. *Oral Toxicity LD₅₀ Rat:* > 5000 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* > 2000 mg/kg. *Inhalation Toxicity 4-hrs LC₅₀ Rat:* > 20 mg/L. **1 Slight Hazard:** Minor reversible injury may occur; may irritate the stomach if swallowed; may defat the skin and exacerbate existing dermatitis. *Skin Irritation:* Slightly or mildly irritating. PII or Draize > 0 < 5. *Eye Irritation:* Slightly to mildly irritating, but reversible within 7 days. Draize > 25. *Oral Toxicity LD₅₀ Rat:* > 500–5000 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* > 1000–2000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 2–20 mg/L. **2 Moderate Hazard:** Temporary or transitory injury may occur; prolonged exposure may affect the CNS. *Skin Irritation:* Moderately irritating; primary irritant; sensitizer. PII or Draize 5, with no destruction of dermal tissue. *Eye Irritation:* Moderately to severely irritating; reversible corneal opacity; corneal involvement or irritation clearing in 8–21 days. Draize = 26–100, with reversible effects. *Oral Toxicity LD₅₀ Rat:* > 50–500 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* > 200–1000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 0.5–2 mg/L. **3 Serious Hazard:** Major injury likely unless prompt action is taken and medical treatment is given; high level of toxicity; corrosive. *Skin Irritation:* Severely irritating and/or corrosive; may cause destruction of dermal tissue, skin burns, and dermal necrosis. PII or Draize > 5–8, with destruction of tissue. *Eye Irritation:* Corrosive, irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days. Draize > 80 with effects irreversible in 21 days. *Oral Toxicity LD₅₀ Rat:* > 1–50 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* > 20–200 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 0.05–0.5 mg/L.

DEFINITION OF TERMS (Continued)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

HEALTH HAZARD (continued): 4 Severe Hazard: Life-threatening; major or permanent damage may result from single or repeated exposures; extremely toxic; irreversible injury may result from brief contact. *Skin Irritation:* Not appropriate. Do not rate as a 4, based on skin irritation alone. *Eye Irritation:* Not appropriate. Do not rate as a 4, based on eye irritation alone. *Oral Toxicity LD₅₀ Rat:* ≤ 1 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* ≤ 20 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* ≤ 0.05 mg/L.

FLAMMABILITY HAZARD: 0 Minimal Hazard: Materials that will not burn in air when exposed to a temperature of 815.5°C (1500°F) for a period of 5 minutes. **1 Slight Hazard:** Materials that must be pre-heated before ignition can occur. Material requires considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur. This usually includes the following: Materials that will burn in air when exposed to a temperature of 815.5°C (1500°F) for a period of 5 minutes or less; Liquids, solids and semisolids having a flash point at or above 93.3°C (200°F) (i.e. OSHA Class IIIB); and Most ordinary combustible materials (e.g. wood, paper, etc.). **2 Moderate Hazard:** Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not, under normal conditions, form hazardous atmospheres in air, but under high ambient temperatures or moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres with air. This usually includes the following: Liquids having a flash-point at or above 37.8°C (100°F); Solid materials in the form of course dusts that may burn rapidly but that generally do not form explosive atmospheres; Solid materials in a fibrous or shredded form that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp); and Solids and semisolids (e.g. viscous and slow flowing as asphalt) that readily give off flammable vapors. **3 Serious Hazard:** Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures, or, unaffected by ambient temperature, are readily ignited under almost all conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures, or, unaffected by ambient temperature, are readily ignited under almost all conditions. This usually includes the following: Liquids having a flash point below 22.8°C (73°F) and having a boiling point at or above 38°C (100°F) and those liquids having a flash point at or above 22.8°C (73°F) and below 37.8°C (100°F) (i.e. OSHA Class IB and IC); Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air (e.g., dusts of combustible solids, mists or droplets of flammable liquids); and Materials that burn extremely rapidly, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). **4 Severe Hazard:** Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air, and that will burn readily. This usually includes the following: Flammable gases; Flammable cryogenic materials; Any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8°C (73°F) and a boiling point below 37.8°C (100°F) (i.e. OSHA Class IA); and Materials that ignite spontaneously when exposed to air at a temperature of 54.4°C (130°F) or below (pyrophoric).

PHYSICAL HAZARD: 0 Water Reactivity: Materials that do not react with water. *Organic Peroxides:* Materials that are normally stable, even under fire conditions and will not react with water. *Explosives:* Substances that are Non-Explosive. *Compressed Gases:* No Rating. *Pyrophorics:* No Rating. *Oxidizers:* No 0 rating. *Unstable Reactives:* Substances that will not polymerize, decompose, condense, or self-react. **1 Water Reactivity:** Materials that change or decompose upon exposure to moisture. *Organic Peroxides:* Materials that are normally stable, but can become unstable at high temperatures and pressures. These materials may react with water, but will not release energy violently. *Explosives:* Division 1.5 & 1.6 explosives. Substances that are very insensitive explosives or that do not have a mass explosion hazard. *Compressed Gases:* Pressure below OSHA definition. *Pyrophorics:* No Rating. *Oxidizers:* Packaging Group III oxidizers; Solids: any material that in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65%)/cellulose mixture and the criteria for Packing Group I and II are not met. *Unstable Reactives:* Substances that may decompose, condense, or self-react, but only under conditions of high temperature and/or pressure and have little or no potential to cause significant heat generation or explosion hazard. Substances that readily undergo hazardous polymerization in the absence of inhibitors. Substances that readily undergo hazardous polymerization in the absence of inhibitors. **2 Water Reactivity:** Materials that may react violently with water. *Organic Peroxides:* Materials that, in themselves, are normally unstable and will readily undergo violent chemical change, but will not detonate. These materials may also react violently with water. *Explosives:* Division 1.4 explosives. Explosive substances where the explosive effects are largely confined to the package and no projection of fragments of appreciable size or range are expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package. *Compressed Gases:* Pressurized and meet OSHA definition but < 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics:* No Rating. *Oxidizers:* Packaging Group II oxidizers. Solids: any material that, either in concentration tested, exhibits a mean burning time of less than or equal to the mean burning time of a 2:3 potassium bromate/cellulose mixture and the criteria for Packing Group I are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 aqueous sodium chlorate solution (40%)/cellulose mixture and the criteria for Packing Group I are not met. *Reactives:* Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure, but have a low potential (or low risk) for significant heat generation or explosion. Substances that readily form peroxides upon exposure to air or oxygen at room temperature. **3 Water Reactivity:** Materials that may form explosive reactions with water. *Organic Peroxides:* Materials that are capable of detonation or explosive reaction, but require a strong initiating source or must be heated under confinement before initiation; or materials that react explosively with water. *Explosives:* Division 1.3 explosives. Explosive substances that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but do not have a mass explosion hazard. *Compressed Gases:* Pressure ≥ 514.7 psi absolute at 21.1°C (70°F) [500 psig].

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued): 3 (continued): Pyrophorics: No Rating. *Oxidizers:* Packing Group I oxidizers. Solids: any material that, in either concentration tested, exhibits a mean burning time less than the mean burning time of a 3:2 potassium bromate/cellulose mixture. Liquids: any material that spontaneously ignites when mixed with cellulose in a 1:1 ratio, or which exhibits a mean pressure rise time less than the pressure rise time of a 1:1 perchloric acid (50%)/cellulose mixture. *Unstable Reactives:* Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a moderate potential (or moderate risk) to cause significant heat generation or explosion. **4 Water Reactivity:** Materials that react explosively with water without requiring heat or confinement. *Organic Peroxides:* Materials that are readily capable of detonation or explosive decomposition at normal temperature and pressures. *Explosives:* Division 1.1 & 1.2 explosives. Explosive substances that have a mass explosion hazard or have a projection hazard. A mass explosion is one that affects almost the entire load instantaneously. *Compressed Gases:* No Rating. *Pyrophorics:* Add to the definition of Flammability 4. *Oxidizers:* No 4 rating. *Unstable Reactives:* Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a high potential (or high risk) to cause significant heat generation or explosion.

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

HEALTH HAZARD: 0 Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials. Gases and vapors with an LC₅₀ for acute inhalation toxicity greater than 10,000 ppm. Dusts and mists with an LC₅₀ for acute inhalation toxicity greater than 200 mg/L. Materials with an LD₅₀ for acute dermal toxicity greater than 2000 mg/kg. Materials with an LD₅₀ for acute oral toxicity greater than 2000 mg/kg. Materials essentially non-irritating to the respiratory tract, eyes, and skin. **1** Materials that, under emergency conditions, can cause significant irritation. Gases and vapors with an LC₅₀ for acute inhalation toxicity greater than 5,000 ppm but less than or equal to 10,000 ppm. Dusts and mists with an LC₅₀ for acute inhalation toxicity greater than 10 mg/L but less than or equal to 200 mg/L. Materials with an LD₅₀ for acute dermal toxicity greater than 1000 mg/kg but less than or equal to 2000 mg/kg. Materials that slightly to moderately irritate the respiratory tract, eyes and skin. Materials with an LD₅₀ for acute oral toxicity greater than 500 mg/kg but less than or equal to 2000 mg/kg. **2** Materials that, under emergency conditions, can cause temporary incapacitation or residual injury. Gases with an LC₅₀ for acute inhalation toxicity greater than 3,000 ppm but less than or equal to 5,000 ppm. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 5000 ppm and that does not meet the criteria for either degree of hazard 3 or degree of hazard 4. Dusts and mists with an LC₅₀ for acute inhalation toxicity greater than 2 mg/L but less than or equal to 10 mg/L. Materials with an LD₅₀ for acute dermal toxicity greater than 200 mg/kg but less than or equal to 1000 mg/kg. Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-66.5°F) that cause severe tissue damage, depending on duration of exposure. Materials that are respiratory irritants. Materials that cause severe, but reversible irritation to the eyes or are lachrymators. Materials that are primary skin irritants or sensitizers. Materials whose LD₅₀ for acute oral toxicity is greater than 50 mg/kg but less than or equal to 500 mg/kg. **3** Materials that, under emergency conditions, can cause serious or permanent injury. Gases with an LC₅₀ for acute inhalation toxicity greater than 1,000 ppm but less than or equal to 3,000 ppm. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 3000 ppm and that does not meet the criteria for degree of hazard 4. Dusts and mists with an LC₅₀ for acute inhalation toxicity greater than 0.5 mg/L but less than or equal to 2 mg/L. Materials with an LD₅₀ for acute dermal toxicity greater than 40 mg/kg but less than or equal to 200 mg/kg. Materials that are corrosive to the respiratory tract. Materials that are corrosive to the eyes or cause irreversible corneal opacity. Materials corrosive to the skin. Cryogenic gases that cause frostbite and irreversible tissue damage. Compressed liquefied gases with boiling points below -55°C (-66.5°F) that cause frostbite and irreversible tissue damage. Materials with an LD₅₀ for acute oral toxicity greater than 5 mg/kg but less than or equal to 50 mg/kg. **4** Materials that, under emergency conditions, can be lethal. Gases with an LC₅₀ for acute inhalation toxicity less than or equal to 1,000 ppm. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than ten times its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 1000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is less than or equal to 0.5 mg/L. Materials whose LD₅₀ for acute dermal toxicity is less than or equal to 40 mg/kg. Materials whose LD₅₀ for acute oral toxicity is less than or equal to 5 mg/kg.

FLAMMABILITY HAZARD: 0 Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand. Materials that will not burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in accordance with Annex D of NFPA 704. **1** Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur. Materials that will burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in accordance with Annex D of NFPA 704. Liquids, solids, and semisolids having a flash point at or above 93.4°C (200°F) (i.e. Class IIIB liquids). Liquids with a flash point greater than 35°C (95°F) that do not sustain combustion when tested using the *Method of Testing for Sustained Combustibility*, per 49 CFR 173, Appendix H or the *UN Recommendations on the Transport of Dangerous Goods, Model Regulations* (current edition) and the related *Manual of Tests and Criteria* (current edition). Liquids with a flash point greater than 35°C (95°F) in a water-miscible solution or dispersion with a water non-combustible liquid/solid content of more than 85% by weight. Liquids that have no fire point when tested by ASTM D 92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup*, up to the boiling point of the liquid or up to a temperature at which the sample being tested shows an obvious physical change. Combustible pellets with a representative diameter of greater than 2 mm (10 mesh). Most ordinary combustible materials. Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

DEFINITION OF TERMS (Continued)

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

HEALTH HAZARD (continued):

FLAMMABILITY HAZARD: 2 Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air. Liquids having a flash point at or above 37.8°C (100°F) and below 93.4°C (200°F) (i.e. Class II and Class IIIA liquids.) Solid materials in the form of powders or coarse dusts of representative diameter between 420 microns (40 mesh) and 2 mm (10 mesh) that burn rapidly but that generally do not form explosive mixtures with air. Solid materials in fibrous or shredded form that burn rapidly and create flash fire hazards, such as cotton, sisal, and hemp. Solids and semisolids that readily give off flammable vapors. Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **3** Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions. Liquids having a flash point below 22.8°C (73°F) and having a boiling point at or above 37.8°C (100°F) and those liquids having a flash point at or above 22.8°C (73°F) and below 37.8°C (100°F) (i.e. Class IB and IC liquids). Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air. Flammable or combustible dusts with representative diameter less than 420 microns (40 mesh). Materials that burn with extreme rapidity, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **4** Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily. Flammable gases. Flammable cryogenic materials. Any liquid or gaseous materials that is liquid while under pressure and has a flash point below 22.8°C (73°F) and a boiling point below 37.8°C (100°F) (i.e. Class IA liquids). Materials that ignite when exposed to air, Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

INSTABILITY HAZARD: 0 Materials that in themselves are normally stable, even under fire conditions. Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) below 0.01 W/mL. Materials that do not exhibit an exotherm at temperatures less than or equal to 500°C (932°F) when tested by differential scanning calorimetry. **1** Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures. Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 0.01 W/mL and below 10 W/mL. **2** Materials that readily undergo violent chemical change at elevated temperatures and pressures. Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 10 W/mL and below 100W/mL. **3** Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but that require a strong initiating source or that must be heated under confinement before initiation. Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 100 W/mL and below 1000 W/mL. Materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures. **4** Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures. Materials that are sensitive to localized thermal or mechanical shock at normal temperatures and pressures. Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) of 1000 W/mL or greater.

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 vapor to form an ignitable mixture with air near the surface of the liquid or within the test vessel used. **Autoignition Temperature:** Minimum temperature of a solid, liquid, or gas required to initiate or cause self-sustained combustion in air with no other source of ignition. **LEL:** Lowest concentration of a flammable vapor or gas/air mixture that will ignite and burn with a flame. **UEL:** Highest concentration of a flammable vapor or gas/air mixture that will ignite and burn with a flame.

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. **LD₅₀:** Lethal Dose (solids & liquids) that kills 50% of the exposed animals. **LC₅₀:** Lethal Concentration (gases) that 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. **TDLo:** Lowest dose to cause a symptom. **TCLo:** Lowest concentration to cause a symptom. **TD₀, LDLo,** and **LD₀**, or **TC, TCo, LCLo,** and **LCo:** Lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** **IARC:** International Agency for Research on Cancer. **NTP:** National Toxicology Program. **RTECS:** Registry of Toxic Effects of Chemical Substances. 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 Information:** **BEI:** ACGIH 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.

REPRODUCTIVE TOXICITY INFORMATION:

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.

ECOLOGICAL INFORMATION:

EC: Effect concentration in water. **BCE:** Bioconcentration Factor, which is used to determine if a substance will concentrate in life forms that consume contaminated plant or animal matter. **TLm:** Median threshold limit. **log K_{OW}** or **log K_{OC}:** Coefficient of Oil/Water Distribution is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

U.S.:

EPA: U.S. Environmental Protection Agency. **ACGIH:** American Conference of Governmental Industrial Hygienists, a professional association that establishes exposure limits. **OSHA:** U.S. Occupational Safety and Health Administration. **NIOSH:** National Institute of Occupational Safety and Health, which is the research arm of OSHA. **DOT:** U.S. Department of Transportation. **TC:** Transport Canada. **SARA:** Superfund Amendments and Reauthorization Act. **TSCA:** U.S. Toxic Substance Control Act. **CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act. Marine Pollutant status according to the DOT; CERCLA or Superfund; and various state regulations. This section also includes information on the precautionary warnings that appear on the material's package label.

CANADA:

WHMIS: Canadian Workplace Hazardous Materials Information System. **IC:** Transport Canada. **DSL/NDSL:** Canadian Domestic/Non-Domestic Substances List.