

SAFETY DATA SHEET

Prepared to U.S. OSHA 29 CR 1910.1200 (2012), Canadian WHMIS 2015 (HPR-GHS), European Union CLP EC 1272/2008 & the 8th ATP 2016/918, Japanese JIS Z7250 and the Global Harmonization Standard

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

Product Identifier/Trade Name as Labeled: UVP BLAK-RAY® RI-20 Green Invisible Readmission Ink

SYNONYMS: None

CHEMICAL FAMILY NAME: Solvent-Based Ink

RELEVANT PRODUCT USE: Fluorescent Ink Used for Re-Admittance Marking on Skin and Fabric Fluorescing Markings

USES ADVISED AGAINST: Other than relevant product use.

COMPANY/UNDERTAKING IDENTIFICATION

U.S. Manufacturer/Distributor: ANALYTIK JENA US LLC
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Business Phone: Toll Free Phone in US/Canada: (800) 452-6788 (8 am to 5 pm PST) or (909) 946-3197
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Date of Preparation: April 2011

Date of Revision: December 6, 2020

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION: This product has been classified per GHS Standards under U.S, Canadian, Japanese and European regulations.

Classification: Flammable Liquid Category 3, Acute Oral Toxicity Category 4, Eye Damage Category 1, Skin Irritation Category 2, Skin Sensitization Category 1B, Specific Target Organ Toxicity (Inhalation-Respiratory Irritation/Narcotic Effects) Single Exposure Category 3

Signal Word: Danger

Hazard Statements: H226: Flammable liquid and vapour. H302: Harmful if swallowed. H315: Causes skin irritation. H317: May cause an allergic skin reaction. H335: May cause respiratory irritation. H336: May cause drowsiness or dizziness.

Supplemental Hazard Statements: EUH066: Repeated exposure may cause skin dryness or cracking.

Precautionary Statements:

Prevention: P210: Keep away from heat, sparks, open flames, hot surfaces. — No smoking. 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 all contaminated portions of the body after handling. P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in a well-ventilated area. P272: Contaminated work clothing should not be allowed out of the workplace. P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P370 + P378: In case of fire: Use materials appropriate for surrounding fire for extinction. P301 + P317: IF SWALLOWED: Get medical help. P330: Rinse mouth. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P333 + P317: If skin irritation or rash occurs, get medical attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. P317: Get medical help. P332 + P317: If skin irritation occurs, get medical attention. P304 + P340: If inhaled, remove victim to fresh air and keep at rest in a position comfortable for breathing. P319: Get medical help if you feel unwell. 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.

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

Hazard Symbol/Pictograms: GHS02, GHS05, GHS07



See Section 16 for Classification information for components.

PERCENTAGE OF UNKNOWN TOXICITY and PRODUCT ACUTE TOXICITY ESTIMATES (ATE): The percent of unknown toxicity by skin is 0.43%; the percent of unknown toxicity by inhalation is 0.14%. 100 % of toxicity by ingestion is known. The following calculated ATEs by route are: Oral: 2730 mg/kg; Skin: 4118 mg/kg; Inhalation: 721 mg/L.

EMERGENCY OVERVIEW: Product Description: This product is a clear, colorless liquid with an aromatic odor. Under exposure to UV light, this product fluoresces green. **Health Hazards:** This product is made to be put on skin as an ink; skin contact under normal circumstances is not expected to cause harm during routine use of the product. In the workplace, 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 if a large area of skin is involved and contact is prolonged such as may occur in a spill. Although not expected due to the use of the product, skin exposure that results in immersion of the skin may cause skin sensitization effects in susceptible individuals. Ingestion and inhalation may be harmful. May cause respiratory system and eye irritation; eye irritation may be severe. Ingestion and inhalation may cause adverse central nervous system effects. Accidental ingestion may result in aspiration into the lungs and chemical pneumonia.

2. HAZARD IDENTIFICATION (Continued)

EMERGENCY OVERVIEW (continued): 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). **Reactivity Hazards:** Due to the level of Proprietary Glycol Ester, contact with water may release small quantities of acetic acid and butanol. **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 #	Japanese ENC/MITI #	WT%	LABEL ELEMENTS GHS Classification per U.S., Canadian, Japanese & EU Standards Hazard Statements
n-Butanol	71-36-3	200-751-6	2-3049	65.0-85.0%	Harmonized GHS Classification per ECHA & U.S. OSHA HazCom 2012, Canadian WHMIS HPR-2015, Japanese JIS Z7250 & EU CLP 1272/2008: Classification: Flammable Liquid Cat. 3, Acute Oral Toxicity Cat. 4, Eye Damage Cat. 1, Skin Irritation Cat. 2, Specific Target Organ Toxicity (Inhalation-Respiratory Irritation/Narcotic Effects) Single Exposure Cat. 3 Hazard Statement Codes: H226, H302, H318, H315, H335, H336
Proprietary Glycol Ester			Listed	15.0-25.0%	Harmonized GHS Classification per ECHA & U.S. OSHA HazCom 2012, Canadian WHMIS HPR-2015, Japanese JIS Z7250 & EU CLP 1272/2008: Classification: Flammable Liquid Cat. 3, Specific Target Organ Toxicity (Inhalation-Narcotic Effects) Single Exposure Cat. 3 Hazard Statement Codes: H226, H336 Supplemental Hazard Codes: EUH066
2-Oxobicyclo (2,2,2) octane 1,3,3-trimethyl	470-82-6	207-43-5	5-684	0.1-0.5%	Notified GHS Classification per ECHA & U.S. OSHA HazCom 2012, Canadian WHMIS HPR-2015, Japanese JIS Z7250 & EU CLP 1272/2008: Classification: Flammable Liquid Cat. 3, Skin Sensitization Cat. 1B Hazard Statement Codes: H226, H317 Additional Self-Classification: Classification: Flammable Acute Oral Toxicity Cat. 4 Hazard Statement Codes: H302
Proprietary Yellow Pigment			Listed	0.1-0.5%	GHS Classification per ECHA & U.S. OSHA HazCom 2012, Canadian WHMIS HPR-2015, Japanese JIS Z7250 & EU CLP 1272/2008: Classification: Not Applicable U.S. OSHA Classification Only (U.S. OSHA HazCom 2012): Combustible Dust Hazard
Proprietary UV Pigment			Listed	0.1-0.5%	GHS Classification per ECHA & U.S. OSHA HazCom 2012, Canadian WHMIS HPR-2015, Japanese JIS Z7250 & EU CLP 1272/2008: Classification: Not Applicable U.S. OSHA Classification Only: Combustible Dust Hazard

See Section 16 for full classification information of components. The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

4. FIRST-AID MEASURES

PROTECTION OF FIRST AID RESPONDERS: Because spill or emergency scenes may be contaminated with other materials, rescuers should not attempt to retrieve or assist persons contaminated with this product who exhibit adverse symptoms without the use adequate personal protective equipment. Evaluation of the situation should include whether personal protective equipment should be used or if it is needed to assist contaminated individuals.

Rescuers should be taken for medical attention, if necessary. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

DESCRIPTION OF FIRST AID MEASURES: If adverse effect occurs after exposure, the following information is for first-aid measures to be taken for each route of exposure.

Inhalation Exposure: 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.

GHS Precautionary Statements for Inhalation Exposure: P304 + P340: If inhaled, remove victim to fresh air and keep at rest in a position comfortable for breathing. P319: Get medical help if you feel unwell.

Skin Exposure: If the material contaminates the skin and adverse effect occurs, 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.

GHS Precautionary Statements for Skin Exposure: P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P333 + P317: If skin irritation or rash occurs, get medical attention. P362 + P364: Take off contaminated clothing and wash it before reuse.

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.

GHS Precautionary Statements for Eye Exposure: P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. P317: Get medical help.

Ingestion Exposure: 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.

GHS Precautionary Statements for Ingestion Exposure: P301 + P317: IF SWALLOWED: Get medical help. P330: Rinse mouth.

4. FIRST-AID MEASURES (Continued)

IMPORTANT SYMPTOMS AND EFFECTS, WHETHER ACUTE OR DELAYED: See Sections 2 (Hazard Identification) and 11 (Toxicological Information) for more detailed information.

Acute:

Symptoms/Effects After Inhalation: Inhalation of vapors, sprays or fumes may cause irritation of the respiratory system and narcotic effects.

Symptoms/Effects After Skin Contact: Dermatitis, dry skin.

Symptoms/Effects After Eye Contact: Serious irritation of eye tissue, inflammation of the eyes, blurred vision, tearing and sensitivity to light.

Symptoms/Effects After Ingestion: Unknown; possible irritation of the digestive system, central nervous system effects and adverse system effects.

Delayed/Chronic:

Symptoms/Effects After Skin Contact: Dermatitis (dry, red skin, itching, cracking of the skin, skin rash/inflammation). Exposure may cause sensitization and allergic reaction. Repeated exposure to high concentration may result in adverse effects to hearing. Systemic effect as described in Section 11 (Toxicological Information) may occur.

Symptoms/Effects After Accidental Injection: None known.

Symptoms/Effects After Inhalation: None known.

Symptoms/Effects After Ingestion: Unknown; possible adverse system effects.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin or respiratory conditions may be aggravated by exposure 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): 28.9°C (84°F)

AUTOIGNITION TEMPERATURE: Not available.

FLAMMABLE LIMITS (in air by volume, %): LEL = 1.6% UEL: 7.6%

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

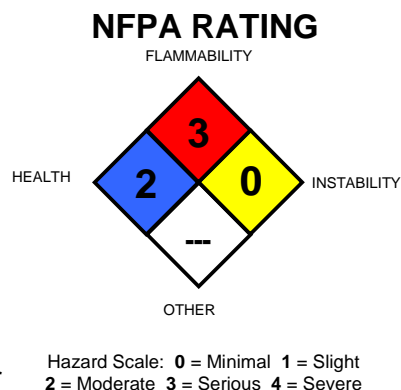
UNSUITABLE FIRE EXTINGUISHING MEDIA: Streams or jets of water may spread fire.

SPECIFIC HAZARDS ARISING FROM THE PRODUCT: 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, nitrogen and sulfur oxides, acetic acid). Contact with water may produce acetic acid and butanol. Vapors can travel to distant locations and flashback to source of fire. Liquid can float on water and may travel to distant locations and/or spread fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

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

SPECIAL PROTECTIVE ACTIONS FOR 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.



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.

6. ACCIDENTAL RELEASE MEASURES (Continued)

METHODS FOR CLEAN-UP AND CONTAINMENT (continued):

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. Minimize inhalation exposure 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.

GHS Statements for Safe Handling: P210: Keep away from heat, sparks, open flames, hot surfaces. — No smoking. 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 all contaminated portions of the body after handling. P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in a well-ventilated area. P272: Contaminated work clothing should not be allowed out of the workplace. P280: Wear protective gloves/protective clothing/eye protection/face protection.

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. 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.

GHS Statements for Safe Storage: P403 + P233 + P235: Store in a well-ventilated place. Keep container tightly closed. Keep cool.

SPECIFIC END USE(S): This product is a fluorescent ink used for re-admittance marking on skin and fabric fluorescing markings. 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. 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: References are only to those components with published exposure limits.

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							OTHER
		ACGIH-TLVS		OSHA-PELs		NIOSH-RELs		NIOSH IDLH ppm	
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm		
n-Butanol	71-36-3	20	NE	100	Vacated 1989 PEL: 50 (ceiling)	Skin	50 (ceiling) Skin	1400 (10% of LEL)	DFG MAKs: TWA: 100 PEAK: 1●MAK, excursion factor 2, 15 min. average value, 4 per shift, 1-hr interval DFG MAK Pregnancy Risk Classification: C Carcinogen: EPA-D

NE = Not Established.

See Section 16 for Definition of Terms Used

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS (continued):

Occupational Exposure Limits (continued):

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							OTHER ppm
		ACGIH-TLVS		OSHA-PELs		NIOSH-RELs		NIOSH	
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	
Proprietary Glycol Ester	123-86-4	NE	NE	150	Vacated 1989 PEL: 200	150	200	1700 (10% LEL)	DFG MAKs: TWA: 100 PEAK: 2•MAK, excursion factor 2, 15 min. average value, 4 per shift, 1-hr interval DFG MAK Pregnancy Risk Classification: C

NE = Not Established.

See Section 16 for Definition of Terms Used

ACGIH Biological Exposure Indices (BEIs): Currently, there are no Biological Exposure Indices determined for the components of this product.

International Exposure Limits: Currently, the following international limits established for components of these products. New exposure limits can come into effect or existing limits may change. These limits may not be the most current; appropriate government agencies in each jurisdiction should be consulted to determine which regulations apply.

n-BUTANOL

	<u>Limit Value - Eight Hours</u>	<u>Limit Value - Short Term</u>
Austria	50 ppm, 150 mg/m ³	200 ppm, 600 mg/m ³
Belgium	20 ppm, 62 mg/m ³	
Canada-Ontario	20 ppm	
Canada-Québec		50 ppm (1)(2), 152 mg/m ³ (1)(2)
Denmark	50 ppm(1), 150 mg/m ³ (1)	50 ppm(1)(2), 150 mg/m ³ (1)(2)
Finland	50 ppm, 150 mg/m ³	75 ppm (1), 230 mg/m ³ (1)
France		50 ppm, 150 mg/m ³
Germany(AGS)	100 ppm, 310 mg/m ³	100 ppm (1), 310 mg/m ³ (1)
Germany (DFG)	100 ppm, 310 mg/m ³	100 ppm, 310 mg/m ³
Hungary	45 mg/m ³	90 mg/m ³
Ireland	20 ppm	
Japan	25 ppm	
Japan-JSOH	50 ppm (1), 150 mg/m ³ (1)	
Latvia	10 mg/m ³	
Poland	50 mg/m ³	150 mg/m ³
Romania	33 ppm; 100 mg/m ³	66 ppm (1); 200 mg/m ³ (1)
Spain	20 ppm, 61 mg/m ³	50 ppm, 154 mg/m ³
Sweden	15 ppm; 45 mg/m ³	30 ppm (1); 90 mg/m ³ (1)
Switzerland	100 ppm, 310 mg/m ³	100 ppm (1), 310 mg/m ³ (1)
United Kingdom		50 ppm, 154 mg/m ³

Remarks

Belgium	Additional indication 'D' means that the absorption of the agent through the skin, mucous membranes or eyes is an important part of the total exposure. It can be the result of both direct contact and its presence in the air.
Canada-Québec	(1) Skin (2) Ceiling limit value
Denmark	(1) Skin (2) Ceiling limit value
Finland	(1) 15 minutes average value
Germany(AGS)	(1) 15 minutes average value
Germany (DFG)	(1) 15 minutes average value
Japan-JSOH	(1) Occupational exposure limit ceiling: Reference value to the maximal exposure concentration of the substance during a working day
Romania	(1) 15 minutes average value
Sweden	(1) 15 minutes average value
Switzerland	(1) 15 minutes average value

Proprietary Glycol Ester

	<u>Limit Value - Eight Hours</u>	<u>Limit Value - Short Term</u>
Denmark	150 ppm, 710 mg/m ³	300 ppm, 1420 mg/m ³
European Union	50 ppm, 241 mg/m³	150 ppm (1), 723 mg/m³ (1)
Finland	150 ppm, 720 mg/m ³	200 ppm (1), 960 mg/m ³ (1)
France	150 ppm, 710 mg/m ³	200 ppm, 940 mg/m ³
Germany(AGS)	62 ppm, 300 mg/m ³	124 ppm (1), 600 mg/m ³ (1)
Germany (DFG)	100 ppm, 480 mg/m ³	200 ppm (1), 960 mg/m ³ (1)
Hungary	950 mg/m ³	950 mg/m ³
Ireland	150 ppm, 720 mg/m ³	200 ppm (1), 950 mg/m ³ (1)
Italy	20 ppm, 98 mg/m ³	50 ppm, 246 mg/m ³
Latvia	200 mg/m ³	
Poland	240 mg/m ³	720 mg/m ³ (1)
Romania	150 ppm, 715 mg/m ³	200 ppm (1); 950 mg/m ³ (1)
Spain	150 ppm, 724 mg/m ³	200 ppm, 965 mg/m ³
Sweden	100 ppm; 500 mg/m ³	150 ppm (1); 700 mg/m ³ (1)
Switzerland	100 ppm, 480 mg/m ³	200 ppm, 960 mg/m ³
United Kingdom	150 ppm, 724 mg/m ³	200 ppm, 986 mg/m ³

Remarks

Belgium	(1) Butylacetates, all isomers (2) 15 minutes average value.
European Union	(1) 15 minutes average value. Bold-type: Indicative Occupational Exposure Limit Values and Limit Values for Occupational Exposure Binding Occupational Exposure Limit Value; BOELV ~
Finland	(1) 15 minutes average value.
Germany(AGS)	(1) 15 minutes average value.
Germany (DFG)	(1) 15 minutes average value.
Ireland	(1) 15 minutes reference period
Poland	(1) 15 minutes average value
Romania	(1) 15 minutes average value
Sweden	(1) 15 minutes average value

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS (continued):

International Exposure Limits (continued):

UK Minimum Exposure Limits:

CHEMICAL NAME	CAS #	WORKPLACE EXPOSURE LIMIT				Comments
		Long-Term Exposure Limit (8-Hrs TWA Reference Period)		Short-Term Exposure Limit (15-minute Reference Period)		
		ppm	mg.m ⁻³	ppm	mg.m ⁻³	
n-Butyl Alcohol	71-36-3	NE	NE	50	154	The Carcin, Sen and Skin notations are not exhaustive. Notations have been applied to substances identified in IOELV Directives
Proprietary Glycol Ester	123-86-4	150	724	200	956	

NE = Not Established.

PERSONAL PROTECTIVE EQUIPMENT: The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132, including U.S. Federal OSHA Respiratory Protection (29 CFR 1910.134), OSHA Eye Protection 29 CFR 1910.133, OSHA Hard Protection 29 CFR 1910.138, OSHA Foot Protection 29 CFR 1910.136 and OSHA Body Protection 29 CFR 1910.132), equivalent standards of Canada (including CSA Respiratory Standard Z94.4-02, Z94.3-M1982, *Industrial Eye and Face Protectors* and CSA Standard Z195-02, *Protective Footwear*), standards of EU member states (including EN 529:2005 for respiratory PPE, CEN/TR 15419:2006 for hand/body protection, and CR 13464:1999 for face/eye protection). Please reference applicable regulations and standards for relevant details.

Respiratory Protection: Respiratory protection is not needed during use of this product during normal use and handling. Maintain airborne contaminant concentrations below exposure limits listed in this section, if applicable. If respiratory protection is needed refer to applicable standards above. 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). In the workplace, when handling large quantities the following NIOSH respiratory guidelines may be helpful in event of the presence of aerosols.

n-BUTANOL

CONCENTRATION

RESPIRATORY PROTECTION

Up to 1250 ppm: Any Supplied-Air Respirator (SAR) operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with organic vapor cartridge(s).

Up to 1400 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.

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 self-contained breathing apparatus 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.

Proprietary Glycol Ester

CONCENTRATION

RESPIRATORY PROTECTION

Up to 1500 ppm: Any Chemical Cartridge Respirator with organic vapor cartridge(s), or any Supplied-Air Respirator (SAR).

Up to 1700 ppm: Any SAR operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with organic vapor cartridge(s), 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 Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR.

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 needed for handling of small quantities or during normal use. If handling more than several ounces, wear splash goggles or safety glasses. If necessary, refer to applicable standards given at the beginning of this section.

Hand Protection: Not needed under normal use and handling. Wear rubber or other appropriate glove to avoid skin contact when handling large quantity. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this SDS. If necessary, refer to applicable standards given at the beginning of this section.

Body Protection: Not normally needed for handling of small quantities. Coveralls or apron when handling large quantity. If necessary, refer to applicable standards given at the beginning of this section.

9. PHYSICAL and CHEMICAL PROPERTIES

FORM: Liquid.

ODOR: Aromatic.

ODOR THRESHOLD: For n-Butanol: Geometric Mean - 1.2 ppm (detection); Geometric Mean - 5.8 ppm (recognition)

VAPOR DENSITY (air = 1): 2.6

BOILING POINT: 93.33°C (200°F)

SPECIFIC GRAVITY (water = 1): 0.81

FLASH POINT (TOC): 28.9°C (84°F)

COLOR: Clear; fluoresces green in UV light.

EVAPORATION RATE (nBuAc): 1

VAPOR PRESSURE @ 20°C: 12

FREEZING POINT: Not available.

pH: Not available.

AUTOIGNITION TEMPERATURE: Not determined.

9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

FLAMMABLE LIMITS (in air by volume, %): LEL = 1.6% UEL: 7.6%

FLAMMABILITY: Flammable.

FLAMMABILITY LIMITS IN AIR: Not available.

CORROSIVITY: Not corrosive.

OXIDIZING PROPERTIES: Not an oxidizer.

SOLUBILITY IN WATER: Immiscible

OTHER SOLUBILITIES: Not available.

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.

10. STABILITY and REACTIVITY

CHEMICAL STABILITY: This product is stable under normal conditions.

DECOMPOSITION PRODUCTS: Combustion: Carbon, sulfur and nitrogen oxides, acetic acid. **Hydrolysis:** Acetic acid and butanol.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product is incompatible with strong oxidizing agents, strong acids, potassium tert-butoxide, bases, aluminum, alkali metals (e.g., sodium or potassium), halogens (e.g., bromine or chlorine), perchloric acid or metal perchlorates, acids, acid anhydrides, or acid chlorides, lithium aluminum hydride, isocyanates.

POSSIBILITY OF HAZARDOUS POLYMERIZATION/REACTIONS: Will not occur.

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

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF EXPOSURE BY ROUTE OF EXPOSURE: Adverse effects are not expected to occur with normal use of this product, due to the small quantity of product used for skin application. In the workplace, the most significant routes of occupational exposure are anticipated to be by inhalation, skin and eye contact. The following symptoms of exposure to this product are anticipated to be as follows:

Inhalation: Under normal product use, no adverse effect is expected by inhalation due to the small quantity used. In the workplace, inhalation of vapors, mists or sprays from this product may irritate the tissues of the nose, mouth, throat, and upper respiratory system. Symptoms are expected to dissipate after removal to fresh air. Inhalation of high concentration may lead to adverse central nervous system effects, such as headache, dizziness, drowsiness, incoordination, nausea and vomiting.

Contact with Skin: This product is designed for skin contact and is not expected to cause adverse effect. Chronic or repeated skin exposure to the liquid may cause dermatitis (dry, red, itchy skin. The trace 2-Oxobicyclo (2,2,2) octane 1,3,3-trimethyl component is a suspected skin sensitizer; persons susceptible to this compound may experience skin sensitization upon repeated skin exposure. Symptoms may include redness, itching and welts.

Contact with Eyes: Symptoms may include redness, itching and welts. Eye contact can cause severe irritation, inflammation of the eyes, blurred vision, tearing and sensitivity to light.

Skin Absorption: Components of this product can be absorbed via intact skin; however, this is not expected to be a significant hazard unless skin contact is frequent and chronic and a 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 exposure for this product. If this product is swallowed, irritation of the gastrointestinal system may occur. Ingestion of large quantity may cause adverse central nervous system effects described under 'Inhalation'. Aspiration into the lungs after ingestion can cause potentially fatal chemical pneumonia and edema.

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

Other Health Effects: Limited evidence suggests that occupational exposure to n-Butanol and products that contain high levels of n-Butanol, in conjunction with noise exposure, may cause hearing impairment. Exposure to 80 ppm n-Butanol, in combination with unprotected noise exposure, caused dizziness and hearing impairment in a small number of employees.

DELAYED AND IMMEDIATE EFFECTS AND CHRONIC EFFECTS FROM SHORT AND LONG-TERM EXPOSURE:

Exposure to this product may cause the following health effects:

Short-Term/Acute: Under normal circumstances of use, no acute effects are expected. In the workplace, when handling larger quantities in the workplace, contact via inhalation and skin or eye contact may cause irritation. Ingestion may be harmful or lead to aspiration into the lungs.

Long-Term/Chronic: Chronic skin contact may cause dermatitis or skin sensitization effects in susceptible persons. Possible hearing impairment from concurrent exposure to loud noises.

TARGET ORGANS:

Acute: Skin, eyes, respiratory system, central nervous system.

Chronic: Skin.



HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD 2*

FLAMMABILITY HAZARD 3

PHYSICAL HAZARD 0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Industrial Use and Handling Applications

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

11. TOXICOLOGICAL INFORMATION (Continued)

PRODUCT TOXICITY DATA: This product has not been tested for toxicity by any route. The following are calculated toxicity values for each route of exposure.

Oral: 2730 mg/kg; Skin: 4118 mg/kg; Inhalation: 721 mg/L.

TOXICITY DATA: The following toxicity data are available for the components in 1% concentration or more. Due to the large amount of data of available for these components, only skin and eye irritation, human data, LD50 oral-rat and mouse, LD50 skin-rabbit and rat, LC50 inhalation-rat and mouse data.

n-BUTYL ALCOHOL:

Standard Draize Test (Eye-Human) 50 ppm
Standard Draize Test (Eye-Human) 990 ppm/1 hour
Standard Draize Test (Skin-Human) 20 µL/20 minutes
TCLo (Inhalation-Human) 25 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
TDLo (Eye-Human) 72.5 mg/m³: Sense Organs and Special Senses (Eye): conjunctive irritation
LDLo (Oral-Human) 428 mg/kg
Standard Draize Test (Skin-Rabbit) 20 mg/24 hours: Moderate
Standard Draize Test (Eye-Rabbit) 2 mg/24 hours: Severe
Standard Draize Test (Eye-Rabbit) 1.62 mg: Severe
Standard Draize Test (Eye-Rabbit) 0.005 mL: Severe
LD₅₀ (Oral-Rat) 790 mg/kg: Liver: fatty liver degeneration; Kidney/Ureter/Bladder: other changes; Blood: other changes
LD₅₀ (Oral-Rat) 4.36 gm/kg: Gastrointestinal: gastritis; Liver: other changes; Blood: hemorrhage
LD₅₀ (Oral-Rat) 0.79 gm/kg
LD₅₀ (Oral-Mouse) 100 mg/kg

n-BUTYL ALCOHOL (continued):

LD₅₀ (Skin-Rabbit) 3400 mg/kg
LC₅₀ (Inhalation-Rat) 24,000 mg/m³/4 hours
LC₅₀ (Inhalation-Rat) > 8000 ppm/4 hours
Proprietary Glycol 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 (Skin-Rabbit) > 17,600 mg/kg

CARCINOGENIC POTENTIAL: The n-Butyl Alcohol component is listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

n-BUTYL ALCOHOL: EPA-D (Not Classifiable as to Human Carcinogenicity)

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 cancer causing agents by these agencies.

IRRITANCY OF PRODUCT: Not expected to cause skin or respiratory irritation under normal circumstances of use. In the workplace this product may be irritating to contaminated tissue. Eye irritation may be severe.

SENSITIZATION TO THE PRODUCT: The trace 2-Oxobicyclo (2,2,2) octane 1,3,3-trimethyl component is a suspected skin sensitizer; persons susceptible to this compound may experience skin sensitization upon repeated skin exposure.

Symptoms may include redness, itching and welts. No component is known to be a human respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: The components of this product are not reported to produce 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.

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 components.

n-BUTYL ALCOHOL: The Koc of n-Butyl Alcohol is estimated as 72, using a log Kow of 0.88 and a regression-derived equation. According to a classification scheme, this estimated Koc value suggests that n-Butyl Alcohol is expected to have high mobility in soil.

Proprietary Glycol Ester: The Koc of this compound is estimated as approximately 200, using a measured log Kow of 1.78 and a regression-derived equation. According to a recommended classification scheme, this estimated Koc value suggests that this material is expected to have moderate mobility in soil.

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

n-BUTYL ALCOHOL: If released to air, a vapor pressure of 7 mm Hg at 25° C indicates n-Butyl Alcohol will exist solely as a vapor in the ambient atmosphere. Vapor-phase n-Butyl Alcohol 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 46 hours. If released to soil, n-Butyl Alcohol is expected to have high mobility based upon an estimated Koc of 72. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of 8.8X10⁻⁶ atm-cu m/mole. n-Butyl Alcohol may volatilize from dry soil surfaces based upon its vapor pressure. The biodegradation half-life of n-Butyl Alcohol in a sub-surface soil was approximately 7 days. If released into water, n-Butyl Alcohol is not expected to adsorb to suspended solids and sediment in water based upon the estimated Koc. Volatilization from water surfaces is expected to be an important environmental fate process based upon this compound's Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 2 and 29 days, respectively. In a river die-away test, n-Butyl Alcohol achieved 33% of its theoretical BOD in 5 days, suggesting biodegradation will be an important fate process in water. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions.

Proprietary Glycol Ester: Based on a vapor pressure of 11.5 mm Hg at 25°C, this compound 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 with an atmospheric half-life of about 4 days. This compound is expected to have moderate mobility in soils based upon an estimated Koc value of 200. Volatilization from dry soil surfaces is expected based upon the vapor pressure of this compound. Volatilization from moist soil surfaces is also expected based upon a Henry's Law constant of 2.8X10⁻⁴ atm-cu m/mol. This compound is expected to biodegrade in both soils and aquatic environments based on standard BOD studies. In water, this material is not expected to adsorb to sediment or particulate matter given its estimated Koc value. This compound is expected to volatilize from water surfaces given its experimental Henry's Law constant. Estimated half-lives for a model river and model lake are 7 and 127 hours respectively. Hydrolysis may be an important environmental fate for this compound based upon experimentally determined hydrolysis half-lives of 114 and 11 days at pH 8 and 9 respectively.

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

n-BUTYL ALCOHOL: An estimated BCF of 3 was calculated for this material, using a log Kow of 0.88 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low. Octanol/Water Partition Coefficient: Log Kow = 0.88

Proprietary Glycol Ester: An estimated BCF value of 10 was calculated for this material, using a log Kow of 1.78 and a recommended regression-derived equation. According to a classification scheme, this BCF value suggests that bioconcentration in aquatic organisms is low.

ECOTOXICITY: This product has not been tested for aquatic or animal toxicity. No component meets the criteria of acutely or chronically toxic to marine organisms. However, all release to the environment should be avoided.

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

12. ECOLOGICAL INFORMATION (Continued)

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.

GHS Statements for Environmental Exposure Control: Not applicable.

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.

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

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: Wastes of this product should be tested to see if they meet criteria for D001, Waste Characteristic Flammability.

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. (n-Butanol)
Hazard Class Number and Description: 3 (Flammable)
Packing Group: III
DOT Label(s) Required: Class 3 (Flammable)

North American Emergency Response Guidebook Number, 2020: 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. (n-Butanol)
Hazard Class Number and Description: 3 (Flammable)
Packing Group: III
Special Provisions: 16, 150
Excepted Quantities: E1
Explosive Limit and Limited Quantity Index: 5
ERAP Index: None
Passenger Carrying Ship Index: None
Passenger Carrying Road or Rail Vehicle Index: 60 L

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. (n-Butanol)
Hazard Class Number and Description: 3 (Flammable)
Hazard Label(s) Required: Class 3 (Flammable)
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

14. TRANSPORTATION INFORMATION (Continued)

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (continued):

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. (n-Butanol)
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 and Handling Category: Category A.
Segregation: None.

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 not classified by the Economic Commission for Europe to be dangerous goods.

UN No.: 1993
Name and Description: Flammable liquid, n.o.s. (n-Butanol)
Class: 3
Classification Code: F1
Packing Group: III
Labels: 3
Special Provisions: 274, 601
Limited Quantities: 5 L
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

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.

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
n-Butyl Alcohol	No	No	Yes

U.S. SARA Threshold Planning Quantity (TPQ): The components of this product have no specific Threshold Planning Quantity. The default Federal SDS 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): n-Butyl Alcohol = 5000 lb (2270 kg)

U.S. SARA Hazard Categories (Section 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: No; 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:

Proprietary Glycol Ester: CLEAN WATER ACT REQUIREMENTS: Proprietary Glycol Ester 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.

15. REGULATORY INFORMATION (Continued)

CANADIAN REGULATIONS:

Canadian DSL/NDSL Inventory Status: The components of this product are on the DSL Inventory.

Canadian Environmental Protection Act (CEPA) Priorities Substances Lists: Not applicable.

Canadian Environmental Protection Act (CEPA) Reporting Requirements: The n-Butyl Alcohol component is a 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 bioaccumulative 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 HPR 2015 Classification and Symbols: See the following section for classification and symbols under WHMIS.

JAPANESE REGULATIONS:

Japanese ENCS/METI: Components are on the ENCS/METI Inventory, as indicated in Section 3 (Composition and Information on Ingredients).

Japanese Ministry of Economy, Trade, and Industry (METI) Status: No component is listed as a Specified Chemical Substance.

Poisonous and Deleterious Substances Control Law: No component is listed as a Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

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) 1272/2008 LABELING AND CLASSIFICATION FOR COMPONENTS:

n-Butyl Alcohol:

Harmonized GHS Classification per ECHA & U.S. OSHA HazCom 2012, Canadian WHMIS HPR-2015, Japanese JIS Z7250 & EU CLP 1272/2008:

Classification: Flammable Liquid Category 3, Acute Oral Toxicity Category 4, Eye Damage Category 1, Skin Irritation Category 2, Specific Target Organ Toxicity (Inhalation-Irritation/Narcotic Effect) Single Exposure Category 3

Hazard Statements: H226: Flammable liquid and vapour. H302: Harmful if swallowed. H318: Causes serious eye damage. H315: Causes skin irritation. H335: May cause respiratory irritation. H336: May cause drowsiness or dizziness.

2-Oxobicyclo (2,2,2) octane 1,3,3-trimethyl:

Notified GHS Classification per ECHA & U.S. OSHA HazCom 2012, Canadian WHMIS HPR-2015, Japanese JIS Z7250 & EU CLP 1272/2008:

Classification: Flammable Liquid Category 3, Skin Sensitization Category 1

Hazard Statements: H226: Flammable liquid and vapour. H317: May cause an allergic skin reaction.

Additional Self-Classification:

Classification: Acute Oral Toxicity Category 4

Hazard Statements: H302: Harmful if swallowed.

Proprietary Glycol Ester:

Harmonized GHS Classification per ECHA & U.S. OSHA HazCom 2012, Canadian WHMIS HPR-2015, Japanese JIS Z7250 & EU CLP 1272/2008:

Classification: Flammable Liquid Category 3, Specific Target Organ Toxicity (Inhalation-Narcotic Effect) Single Exposure Category 3

Hazard Statements: H226: Flammable liquid and vapour. H336: May cause drowsiness or dizziness.

Supplemental Hazard Statements: EUH066: Repeated exposure may cause skin dryness or cracking.

Proprietary UV Pigment:

Classification: U.S. OSHA Classification Only: Combustible Dust Hazard

Proprietary Yellow Pigment:

Classification: U.S. OSHA Classification Only: Combustible Dust Hazard

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:

April 2011: Review and up-date entire SDS. Revise format to include current ANSI 16 Part format, Canadian, European and Global Harmonization compliance.

June 2018: Review and up-date of entire SDS and up-date as necessary. Change of company name.

December 2020: Review and up-date entire SDS for currency and up-date to current requirements under U.S. OSHA, Canadian WHMIS and EU GHS regulations.

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.

PO Box 1961, Hilo, HI 96721 • (800) 441-3365 • (808) 969-4846

This Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200 and the Global Harmonization Standard. Other government regulations must be reviewed for applicability to this product. To the best of Analytik-Jena'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.

16. OTHER INFORMATION (Continued)

DEFINITION OF TERMS

A large number of abbreviations and acronyms appear on an SDS. Some of these, which are commonly used, include the following:

CAS #: This is the Chemical Abstract Service Number that uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

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 of 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. **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.

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

NIOSH RELs: NIOSH's Recommended Exposure Limits.

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.

HEALTH HAZARD: 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 > 0 ≤ 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. **4 Severe Hazard:** Life-threatening; major or permanent damage may result from single or repeated exposure; 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 exposure 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) (e.g., 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.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

FLAMMABILITY HAZARD (continued): 2 (continued): 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) (e.g. 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) (e.g., 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:** Packing 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:** Packing 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 of a 1:1 aqueous sodium chlorate solution (40%)/cellulose mixture and the criteria for Packing Group I are not met. **Reactivities:** 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]. **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.

16. OTHER INFORMATION (Continued)

DEFINITION OF TERMS (Continued)

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

HEALTH HAZARD (continued): 0 (continued): 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 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) (e.g., Class IIB 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.

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. Liquids, solids, and semisolids having a flash point at or above 93.4°C (200°F) (e.g., Class IIB 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. 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) (e.g., 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.

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

FLAMMABILITY HAZARD (continued): 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) (e.g., 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) (e.g., 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. **TLQ:** Lowest dose to cause a symptom. **TCLO:** Lowest concentration to cause a symptom. **TD₀₁, LD₀₁, and LD₀, or TC, TC₀, LCLO, and LC₀:** 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.

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. **IC:** 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. **TC:** Transport Canada. **DSL/NDSL:** Canadian Domestic/Non-Domestic Substances List.