

MATERIAL SAFETY DATA SHEET

Illumina, Inc.

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, European Union Standards, Australian WorkSafe, and the Japanese Industrial Standard JIS Z 7250: 2000

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

<u>TRADE NAME (AS LABELED):</u>	Gene Expression Reagents
<u>CODE NUMBERS:</u>	
<u>U.N. NUMBER:</u>	Not applicable
<u>U.N. DANGEROUS GOODS CLASS/SUBSIDIARY RISK:</u>	Not applicable
<u>HAZCHEM CODE (AUSTRALIA):</u>	Not applicable
<u>POISONS SCHEDULE NUMBER (AUSTRALIA):</u>	Not applicable
<u>PRODUCT USE:</u>	Gene Expression
<u>SUPPLIER/MANUFACTURER'S NAME:</u>	ILLUMINA, Inc.
<u>ADDRESS:</u>	9885 Towne Centre Drive San Diego, CA 92121-1975
<u>EMERGENCY PHONE:</u>	+1-800-451-8346
<u>INFORMATION NUMBER:</u>	+1-800-809-ILMN (toll-free) +1-800-809-4566 (toll-free) +1-858-202-4566 (outside North America)
<u>SUPPLIER/IMPORTER'S NAME (AUSTRALIA):</u>	
<u>ADDRESS:</u>	
<u>EMERGENCY PHONE:</u>	
<u>BUSINESS PHONE:</u>	
<u>DATE OF PREPARATION:</u>	October 23, 2010

2. COMPOSITION AND INFORMATION ON INGREDIENTS

EU LABELING AND CLASSIFICATION: (See Section 15 for definition of risk phrases, safety phrases and symbols.) According to Article 1 of European Union Council Directive 92/32/EEC, medical products in the finished state for human use (as defined by European Union Council Directives 67/548/EEC and 87/21/EEC) are not subject to the regulations and administrative provisions of European Union Council Directive 92/32/EEC. The following classification is self-classification, based on possible contact of product in workplace.

CODE GX#-BE1 COMPONENT:

EU CLASSIFICATION and SYMBOL: Irritant [Xn]
EU RISK PHRASES: [R: 37]

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS:

EU CLASSIFICATION and SYMBOL: Toxic to Reproduction Development, Category 2 [T]
EU RISK PHRASES: [R: 61]

ALL OTHER COMPONENTS:

EU CLASSIFICATION and SYMBOLS: These components do not meet the definition of any hazard class as defined by the European Union Council Directive 67/548/EEC.
EU RISK PHRASES: Not applicable.

This Material Safety Data sheet describes the Gene Expression reagents. This product consists of eight solutions. This Material Safety Data Sheet provides complete information on all the components described in the following tables. Unless otherwise specified, the information in each of the following sections (Sections 3–16) of this document is pertinent to each solution. This product is a mixture (preparation) of the following chemical components:

CHEMICAL NAME	CAS #	EINECS#	ENCS#	% v/v	EU CLASSIFICATION FOR COMPONENTS
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COMPONENT 1: CODE GX#-HE1

Inorganic Phosphate Salt		Proprietary		5-10	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Alkyl Alcohol		Proprietary		7–13	HAZARD CLASSIFICATION: [F] Highly Flammable. RISK PHRASES: [R: 11]
Sodium Salt		Proprietary		7-13	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).				Balance	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard JIS Z 9250: 2000.

2. COMPOSITION AND INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	EINECS#	ENCS#	% v/v	EU CLASSIFICATION FOR COMPONENTS
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COMPONENT 2: CODE GX#-HC1

Inorganic Phosphate Salt	Proprietary			1-5	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Alkyl Alcohol	Proprietary			5-10	HAZARD CLASSIFICATION: [F] Highly Flammable. RISK PHRASES: [R: 11]
Sodium Salt	Proprietary			5-10	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable
Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).				Balance	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.

COMPONENT 3: CODE GX#-WE1

Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).				Balance	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
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COMPONENT 4: CODE GX#-WBC

Inorganic Phosphate Salt	Proprietary			1-5	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Alkyl Alcohol	Proprietary			5-10	HAZARD CLASSIFICATION: [F] Highly Flammable. RISK PHRASES: [R: 11]
Sodium Salt	Proprietary			5-10	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).				Balance	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.

COMPONENT 5: CODE GX#-BE1

Inorganic Sodium Compound	Proprietary			0.1-1.0	HAZARD CLASSIFICATION: [C] Corrosive. RISK PHRASES: [R: 35]
Phosphoric Acid Salt	Proprietary	Unlisted		1.0-5.0	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Protein	Proprietary	Unlisted	Proprietary		HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Heterocyclic Sulfur Compound	Proprietary		Proprietary		HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Magnesium Salt	Proprietary		Proprietary		HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Inorganic Nitric Acid Salt	Proprietary		Proprietary		HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Preservative	Proprietary		Proprietary		HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Sodium Salt	Proprietary		Proprietary		HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).				Balance	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard JIS Z 7250: 2000.

2. COMPOSITION AND INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	EINECS#	ENCS#	% v/v	EU CLASSIFICATION FOR COMPONENTS
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COMPONENT 6: CODE GX#-HTW

Alkyl Alcohol	Proprietary			1-5	HAZARD CLASSIFICATION: [F] Highly Flammable. RISK PHRASES: [R: 11]
Inorganic Phosphate Salt	Proprietary			1-5	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Sodium Salt	Proprietary			1-5	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).				Balance	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.

COMPONENT 7: CODE GX#-HYB

Inorganic Phosphate Salt	Proprietary			1-5	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Alkyl Alcohol	Proprietary			5-10	HAZARD CLASSIFICATION: Flammable. RISK PHRASES: [R: 11]
Sodium Salt	Proprietary			5-10	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Aliphatic Amide	Proprietary			30-40	HAZARD CLASSIFICATION: Repr. Cat. 2 [T] RISK PHRASES: [R: 61]
Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).				Balance	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.

COMPONENT 8: CODE GX#-HCB

Alkyl Alcohol	Proprietary			1-5	HAZARD CLASSIFICATION: Flammable. RISK PHRASES: [R: 11]
Inorganic Phosphate Salt	Proprietary			1-5	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Sodium Salt	Proprietary			1-5	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.
Aliphatic Amide	Proprietary			20-30	HAZARD CLASSIFICATION: Repr. Cat. 2 [T] RISK PHRASES: [R: 61]
Water and other constituents. Each of the other constituents is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).				Balance	HAZARD CLASSIFICATION: Not applicable. RISK PHRASES: Not applicable.

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

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard JIS Z 7250: 2000.

NOTE (2): Unless otherwise indicated, the hazard assessments in the following sections are pertinent to all component reagents.

3. HAZARD IDENTIFICATION

EU LABELING AND CLASSIFICATION: (See Section 15 for definition of risk phrases, safety phrases and symbols.)

CODE GX#-BE1 COMPONENT:

EU CLASSIFICATION and SYMBOL: Irritant [Xn]

EU RISK PHRASES: [R: 37]

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS:

EU CLASSIFICATION and SYMBOL: Toxic to Reproduction Development, Category 2 [T]

EU RISK PHRASES: [R: 61]



ALL OTHER COMPONENTS:



EU CLASSIFICATION and SYMBOLS: These components do not meet the definition of any hazard class as defined by the European Union Council Directive 67/548/EEC.

EU RISK PHRASES: Not applicable.

3. HAZARD IDENTIFICATION (Continued)

EMERGENCY OVERVIEW: Product Description: The CODE GX#-HYB AND CODE GX#-HCB COMPONENTS are clear, colorless liquids with a slight sulfur odor. ALL OTHER COMPONENTS are clear, colorless, odorless liquids. **Health Hazards:** CODE GX#-HYB AND CODE GX#-HCB COMPONENTS contain Aliphatic Amide, a probable reproductive toxin. ALL OTHER COMPONENTS may slightly irritate contaminated tissue. **Flammability Hazards:** The components of this product present no significant fire or reactivity hazards; the chief hazard in event of overexposure is the potential for irritation of contaminated skin or eyes. In the event of a fire, this product will not contribute significant additional hazards. **Reactivity Hazards:** The components of this product are not reactive. **Environmental Hazards:** Negligible. **Emergency Recommendations:** Emergency responders must wear personal protective equipment suitable for the situation to which they are responding.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD		(BLUE)	2*
FLAMMABILITY HAZARD		(RED)	0
PHYSICAL HAZARD		(YELLOW)	0
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8
For Routine Use and Handling Applications			

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD		(BLUE)	1
FLAMMABILITY HAZARD		(RED)	0
PHYSICAL HAZARD		(YELLOW)	0
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8
For Routine Use and Handling Applications			

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

SYMPTOMS OF

OVEREXPOSURE BY ROUTE OF EXPOSURE: No adverse health effects should occur from routine, occupational use of this product's components in the manner specified by the manufacturer's instructions. The potential health effects of this product's components, via route of exposure, are described as follows:

INHALATION:

BLOCKER: Inhalation of vapors, mists, or sprays of this component can irritate and may damage the mouth, nose, throat, and other tissues of the respiratory system. Symptoms may include coughing, sneezing, and difficulty breathing.

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: Inhalation of vapors, mists, or sprays of these components will irritate the nose, throat, and lungs. Symptoms may include nausea, headache, and vomiting.

ALL OTHER COMPONENTS: Inhalation of vapors, mists, or sprays of these components may slightly irritate the nose, throat, and lungs. Symptoms are generally alleviated upon breathing fresh air.

CONTACT WITH SKIN or EYES: Contact with the skin or eyes may cause mild irritation, which is alleviated upon rinsing.

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: Depending on the duration and concentration of overexposure, skin and eye contact can irritate contaminated tissue. Symptoms of skin overexposure may include redness and discomfort. Symptoms of eye overexposure may include redness, tearing, and pain.

ALL OTHER COMPONENTS: Contact with the skin or eyes may cause mild irritation, which is alleviated upon rinsing.

3. HAZARD IDENTIFICATION (Continued)

SKIN ABSORPTION: No constituents of this product's components are known to be absorbed via intact skin.

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: The Aliphatic Amide constituent can be absorbed through the skin and may cause adverse reproductive effects.

ALL OTHER COMPONENTS: No constituents of these components are known to be absorbed via intact skin.

INGESTION: Ingestion is not anticipated to be a significant route of exposure for the product's solutions. If ingested, symptoms of such overexposure are described below.

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: If these components are swallowed, irritation of the mouth, throat, and other tissues of the digestive system may occur. Ingestion may cause adverse reproductive effects.

ALL OTHER COMPONENTS: If these components are swallowed they may cause gastric distress. Large doses may cause nausea, vomiting, and diarrhea.

INJECTION: Accidental injection of this product's components, via laceration or puncture by a contaminated object, may cause local reddening, tissue swelling, and discomfort in addition to the wound.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE:

CODE GX#-BE1 COMPONENT: Inhalation of vapors, mists, or sprays of this component may cause coughing, sneezing, and difficulty breathing.

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: Inhalation of vapors, mists, or sprays of these components may cause nausea, headache, and vomiting. Depending on the duration and concentration of overexposure, skin and eye contact can irritate contaminated tissue. The Aliphatic Amide constituent can be absorbed through the skin and may cause adverse reproductive effects. Ingestion may cause adverse reproductive effects.

ALL OTHER COMPONENTS: Beyond mild irritation of the skin or eyes, contact with this product's components does not usually cause acute health effects.

CHRONIC: The components of this product are not known to cause any significant chronic health effects.

TARGET ORGANS:

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS:

ACUTE: Eyes, skin, reproductive system.

CHRONIC: Skin.

ALL OTHER SOLUTIONS

ACUTE: Eyes, gastrointestinal tract.

CHRONIC: None known.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

Contaminated individuals must seek medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to physician or health professional with the contaminated individual.

SKIN EXPOSURE: If this product contaminates the skin, begin decontamination with copious amounts of running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Contaminated clothing must be removed and laundered before re-use. The contaminated individual must seek medical attention if any adverse effect develops after the area is flushed.

EYE EXPOSURE: If this product contaminates the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have the contaminated individual "roll" eyes. Minimum flushing is for 15 minutes. The contaminated individual must seek medical attention if adverse effects occur after flushing.

INHALATION: If vapors, mists or sprays from this product are inhaled, remove contaminated individual to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers. Seek medical attention if adverse effect continues after removal to fresh air.

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING unless directed by medical personnel. Have contaminated individual rinse mouth with water.

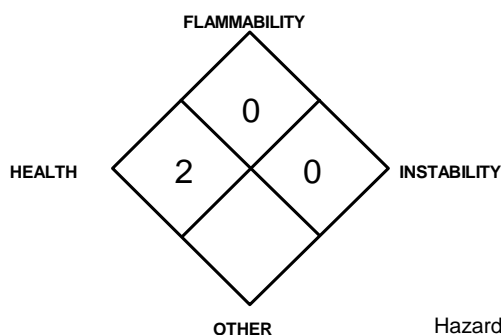
Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. If contaminated individual is convulsing, maintain an open airway and obtain immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis, other skin conditions, respiratory conditions, and liver disorders may be aggravated by overexposure to components of this product.

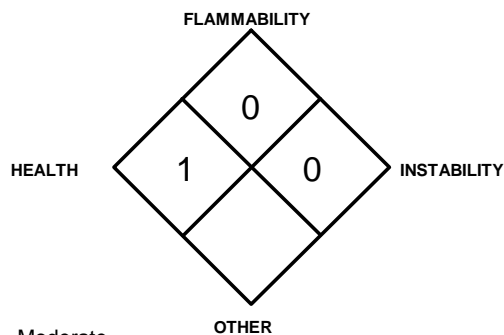
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

5. FIRE-FIGHTING MEASURES

For Code GX#-BE1, Code GX#-HYB, and
Code GX#-HCB Components
NFPA RATING



For All Other Components
NFPA RATING



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

FLASH POINT: Not flammable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

(LEL): Not applicable.

(UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: In the event of a fire, use suppression methods for surrounding materials.

Water Spray: YES Carbon Dioxide: YES Dry Chemical: YES

Halon: YES Other: Any "ABC" Class Foam: YES

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this product's components will decompose and produce irritating vapors and toxic gases (including carbon oxides, nitrogen oxides, sodium oxides, phosphorous oxides, potassium oxides, and hydrogen chloride).

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Move containers from fire area if it can be done without risk to personnel. Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: For small releases take basic hygiene precautions. Lightweight gloves, a lab coat, and eye protection should be worn. Absorb spilled liquid with paper towels. Wash contaminated area with soap and water, absorb with paper towels, and rinse with water. Trained personnel using pre-planned procedures should respond to large releases that are not immediately controlled. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. In the event of a non-incident release, minimum Personal Protective Equipment should be **Level D: lab-gloves, chemical resistant apron, boots, and splash goggles. Respiratory protection should not be necessary.** Absorb spilled liquid with polypads or other suitable absorbent materials. Decontaminate the area thoroughly. Place all spill residue in a suitable container and seal. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations, those of Canada, EU Member States and those of Japan (see Section 13, Disposal Considerations).

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product's components ON YOU or IN YOU. Wash thoroughly after handling this product's components. Avoid splashing or spraying this product's components. Do not eat or drink while handling this product's components.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing vapors or mists generated by this product's components. Ensure containers of this product's components are properly labeled. Open containers slowly on a stable surface. Store vials as directed in the product insert. Keep vials tightly closed when not in use. Store away from incompatible materials. Inspect vials containing this product's components for leaks or damage. Read instructions provided with the product prior to use.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/GUIDELINES (continued):

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR									
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELS		NIOSH	AIHA WEELs		OTHER
		TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	IDLH mg/m ³	TWA mg/m ³	STEL mg/m ³	mg/m ³

COMPONENT 7: CODE GX#-HYB

Alkyl Alcohol	Proprietary	1880	NE	1900	NE	1900	NE	6237	NE	NE	NE
Aliphatic Amide	Proprietary	18 (skin)	NE	30 (Vacated 1989 PEL)	45 (Vacated 1989 PEL)	15 (skin)	NE	NE	NE	NE	NE
Inorganic Phosphate Salt	Proprietary	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Sodium Salt	7647-14-5	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

COMPONENT 8: CODE GX#-HCB

Alkyl Alcohol	Proprietary	1880	NE	1900	NE	1900	NE	6237	NE	NE	NE
Aliphatic Amide	Proprietary	18 (skin)	NE	30 (Vacated 1989 PEL)	45 (Vacated 1989 PEL)	15 (skin)	NE	NE	NE	NE	NE
Inorganic Phosphate Salt	Proprietary	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Sodium Salt	Proprietary	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

RESPIRATORY PROTECTION: Respiratory protection is not generally needed when using this product. Maintain airborne contaminant concentrations below limits listed in Section 2 (Composition and Information on Ingredients). In instances where inhalable mists or sprays of product may be generated, and respiratory protection is necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, and EU member states, or the Australian Standard 1716-Respiratory Protective Devices, the Australian Standard 1715-Selection, Use, and Maintenance of Respiratory Protective Devices, as well as requirements of Japan. 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, SAR with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Depending on the use of this product, splash goggles or safety glasses may be worn. Use goggles or safety glasses for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, or the European Standard EN166, the Australian Standard 1337-Eye Protection for Industrial Applications and Australian Standard 1336-Recommended Practices for Eye Protection in the Industrial Environment, as well as requirements of Japan for further information.

HAND PROTECTION: Wear butyl rubber, neoprene, or nitrile rubber or latex gloves for routine use. If necessary, refer to U.S. OSHA 29 CFR 1910.138, the European Standard DIN EN 374, appropriate Standards of Canada, or the Australian Standard 2161-Industrial Safety Gloves and Mittens, and applicable Standards of Japan, for further information.

BODY PROTECTION: Use body protection appropriate for task, such as a lab coat. If necessary, use body protection appropriate for task (e.g., Tyvek suit, rubber apron). If necessary, refer appropriate Standards of Canada, the European Standard DIN EN 465, the Australian Standard 3765-Clothing for Protection Against Hazardous Chemicals, or Standards of Japan for further information. 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.

9. PHYSICAL and CHEMICAL PROPERTIES

FOR ALL COMPONENTS UNLESS OTHERWISE INDICATED:

RELATIVE VAPOR DENSITY (air = 1): Not established.

EVAPORATION RATE (nBuAc = 1): Similar to water.

SPECIFIC GRAVITY (water = 1): Not established.

FREEZING/MELTING POINT: Not established.

SOLUBILITY IN WATER: Completely soluble.

BOILING POINT: Not established.

FOR CODE GX#-HYB AND CODE GX#-HCB COMPONENTS:

VAPOR PRESSURE, mm Hg @ 20°C: Not established. **pH:** 7.2–8.2

ODOR THRESHOLD: Not applicable.

LOG WATER/OIL DISTRIBUTION COEFFICIENT: Not available.

APPEARANCE, ODOR AND COLOR: These components are clear, colorless liquids with a slight sulfur odor.

HOW TO DETECT THIS SUBSTANCE: The odor may act as a warning property associated with these components.

9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

FOR ALL OTHER COMPONENTS:

VAPOR PRESSURE, mm Hg @ 20°C: Not established. pH: 5.0–8.1

ODOR THRESHOLD: Not available.

LOG WATER/OIL DISTRIBUTION COEFFICIENT: Not available.

APPEARANCE AND COLOR: Clear, colorless liquids.

HOW TO DETECT THIS SUBSTANCE: There are no unusual warning properties associated with these components.

10. STABILITY AND REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition of this product's components may produce carbon oxides, nitrogen oxides, sodium oxides, phosphorous oxides, potassium oxides, and hydrogen chloride.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: Karl Fischer reagent (mixture of toluene, pyridine and sulfur trioxide), strong oxidizers, strong acids, some metals, substances that are incompatible with water.

ALL OTHER COMPONENTS: Strong oxidizers, strong acids, some metals, substances that are incompatible with water.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Any conditions that are incompatible with water, mixing this product with incompatible chemicals.

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

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following information is available for the constituents in components of this product listed in greater than 1 percent concentration in Section 2 (Composition and Information on Ingredients).

ALKYL ALCOHOL:

LDLo (oral, child) = 2 g/kg

LDLo (oral, human) = 1400 mg/kg

LDLo (subcutaneous, human) = 19440 mg/kg;

Behavioral: convulsions or effect on seizure threshold, coma; body temperature decrease

TDLo (oral, child) = 14400 mg/kg/30 minutes/intermittent; coma, dyspnea, nausea or vomiting

TDLo (oral, man) = 3371 µL/kg; altered sleep time, excitement, coma

TDLo (oral, man) = 700 mg/kg

TDLo (oral, man) = 50 mg/kg; Gastrointestinal: alteration in gastric secretion, other changes

TDLo (oral, man) = 1430 µg/kg; Behavioral: changes in motor, ataxia, antipsychotic

TDLo (oral, woman) = 256 g/kg/12 weeks; Behavioral: hallucinations, distorted perceptions; Endocrine: effect on menstrual cycle

TDLo (oral, woman) = 41 g/kg/female 41 weeks after conception; Effects on Newborn: Apgar score (human only), other neonatal measures or effects, drug dependence

TDLo (oral, woman) = 250 mg/kg/female 37 weeks after conception; Effects on Embryo or Fetus: other effects to embryo

TDLo (intravenous, woman) = 8 g/kg/female 32 weeks after conception; Effects on Newborn: Apgar score (human only), other neonatal measures or effects

DNA Inhibition (lymphocyte, human) = 220 mmol/L
Cytogenetic Analysis (lymphocyte, human) = 1160 gm/L

Cytogenetic Analysis (fibroblast, human) = 12000 ppm
Cytogenetic Analysis (leukocyte, human) = 1 pph/72 hours/continuous

Sister Chromatid Exchange (lymphocyte, human) = 500 ppm/72 hours/continuous

LD₅₀ (oral, rat) = 7060 mg/kg

LC₅₀ (inhalation, rat) = 20000 ppm/10 hours

LD₅₀ (intraperitoneal, rat) = 3600 µg/kg

LD₅₀ (intravenous, rat) = 1440 mg/kg

LD₅₀ (intraarterial, rat) = 11 mg/kg

LD₅₀ (oral, mouse) = 3450 mg/kg

ALKYL ALCOHOL (continued):

LC₅₀ (inhalation, mouse) = 39 gm/m³/4 hours

LD₅₀ (intraperitoneal, mouse) = 528 mg/kg

LD₅₀ (subcutaneous, mouse) = 8285 mg/kg

LD₅₀ (intravenous, mouse) = 1973 mg/kg

LDLo (oral, dog) = 5500 mg/kg

LDLo (intraperitoneal, dog) = 3 g/kg

LDLo (subcutaneous, dog) = 6 g/kg

LDLo (intravenous, dog) = 1600 mg/kg

LDLo (oral, cat) = 6 g/kg

LDLo (intravenous, cat) = 3945 mg/kg

LD₅₀ (oral, rabbit) = 6300 mg/kg

LD₅₀ (intraperitoneal, rabbit) = 963 mg/kg

LDLo (subcutaneous, rabbit) = 20 g/kg

LD₅₀ (oral, guinea pig) = 5560 mg/kg

LD₅₀ (intraperitoneal, guinea pig) = 3414 mg/kg

LCLo (inhalation, guinea pig) = 21900 ppm

LD₅₀ (intraperitoneal, hamster) = 5068 mg/kg

LDLo (subcutaneous, pigeon) = 5 g/kg

LDLo (subcutaneous, chicken) = 5 g/kg

LDLo (intravenous, chicken) = 8216 mg/kg; Vascular: other changes

LDLo (subcutaneous, frog) = 7100 mg/kg

LDLo (parenteral, frog) = 36 g/kg

TDLo (oral, rat) = 1825 gm/kg/1 years/continuous;

Liver: fatty liver degeneration, changes in liver weight, weight loss or decreased weight gain

TDLo (oral, mouse) = 320 mg/kg/50

weeks/intermittent; tumorigenic: equivocal tumorigenic agent

TDLo (rectal, mouse) = 120 gm/kg/18

weeks/intermittent; tumorigenic: equivocal tumorigenic agent

Skin Irritancy (rabbit) = 400 mg; mild

Skin Irritancy (rabbit) = 20 mg/24 hours; moderate

Eye Irritancy (rabbit) = 500 mg; severe

Eye Irritancy (rabbit) = 500 mg/24 hours; mild

Eye Irritancy (rabbit) = 100 mg/4 seconds; moderate

Mutation in Microorganisms (*Salmonella typhimurium*) = 11 pph

Mutation in Microorganisms (*Escherichia coli*) = 140 gm/L

ALKYL ALCOHOL (continued):

Mutation in Microorganisms (*Saccharomyces cerevisiae*) = 24 pph

Mutation in Microorganisms (*Aspergillus nidulans*) = 20 pph

DNA Repair (*Escherichia coli*) = 5 mg/well

DNA Damage (*Saccharomyces cerevisiae*) = 850 mmol/L

DNA Damage (oral, rat) = 4 gm/kg

Cytogenetic Analysis (parenteral, grasshopper) = 500 mmol/L

Sex Chromosome Loss and Nondisjunction (oral, *Drosophila melanogaster*) = 10 pph

Gene Conversion and Mitotic Recombination (*Aspergillus nidulans*) = 5 pph

Mutation Test Systems (intraperitoneal, rat) = 250 gm/kg/16 days/continuous

ALIPHATIC AMIDE:

LD (skin, rat) > 13500 mg/kg

LD₅₀ (oral, rat) = 5577 mg/kg; Autonomic Nervous System: other (direct) parasympathomimetic;

Behavioral: ataxia Incontinence

LD₅₀ (intraperitoneal, rat) = 5700 mg/kg

LD₅₀ (subcutaneous, rat) > 4 g/kg

LD₅₀ (oral, mouse) > 3150 mg/kg

LD₅₀ (intraperitoneal, mouse) = 2450 mg/kg

LDLo (skin, rabbit) = 6 g/kg

LDLo (intravenous, dog) = 1500 mg/kg

LD₅₀ (intraperitoneal, guinea pig) = 1250 mg/kg; Autonomic Nervous System: other (direct)

parasympathomimetic; Behavioral: somnolence (general depressed activity); Behavioral: convulsions

or effect on seizure threshold

LDLo (subcutaneous, frog) = 30 mg/kg

LD₅₀ (oral, mammal) = 3150 mg/kg

TDLo (oral, rat) = 910 mg/kg/26 weeks/intermittent; Brain and Coverings: recordings from specific areas

of CNS; Liver: liver function tests impaired Kidney, Ureter, Bladder: proteinuria

TDLo (oral, rat) = 7980 mg/kg/female 7–12 days after conception; Reproductive: Specific Developmental

Abnormalities: craniofacial (including nose and tongue); musculoskeletal system

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

ALIPHATIC AMIDE (continued):

TDLo (oral, rat) = 2 g/kg/female 7 days after conception; Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

TDLo (inhalation, rat) = 1500 ppm/6 hours/2 weeks/intermittent; Blood: changes in leukocyte (WBC) count; Blood: changes in platelet count; Nutritional and Gross Metabolic: weight loss or decreased weight gain

TDLo (skin, rat) = 1200 mg/kg/female 10–11 days after conception; Reproductive: Effects on Embryo or Fetus: fetal death

TDLo (skin, rabbit) = 910 mg/kg/female 6–18 days after conception; Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus); Specific Developmental Abnormalities: musculoskeletal system

Mutation Test Systems (Non-Mammalian Species Cells) = 500 mmol/L

Cytogenetic Analysis (Non-Mammalian Species Cells) = 500 mmol/L

Standard Draize Test (eye, rabbit) = 100 mg; severe

INORGANIC PHOSPHATE SALT:

Currently, there are no toxicological data available for this component.

SODIUM SALT:

DNA Inhibition (fibroblast, human) = 125 mmol/L

TDLo (intraplacental, woman) = 27 mg/kg/15 weeks pregnant; Reproductive effects

SODIUM SALT (continued):

TDLo (oral, human) = 12,357 mg/kg/23 days/continuous; Cardiovascular effects

LD₅₀ (oral, rat) = 3000 mg/kg

LC₅₀ (inhalation, rat) > 42 g/m³/1 hour

LD₅₀ (oral, mouse) = 4000 mg/kg

LD₅₀ (intraperitoneal, mouse) = 6614 mg/kg

LD₅₀ (subcutaneous, mouse) = 3 g/kg

LD₅₀ (intravenous, mouse) = 645 mg/kg

LD₅₀ (intracervical, mouse) = 131 mg/kg

LDLo (intraperitoneal, dog) = 364 mg/kg

LDLo (intravenous, dog) = 2 g/kg

LDLo (oral, rabbit) = 8 g/kg

LD₅₀ (skin, rabbit) > 10 g/kg

TDLo (oral, rat) = 56400 mg/kg/female 5 days pre-mating/21 days post-birth; Reproductive: Maternal Effects: postpartum, Effects on Newborn: biochemical and metabolic

TDLo (oral, rat) = 16800 mg/kg/28 days/continuous; Endocrine: changes in adrenal weight

TDLo (oral, rat) = 145 g/kg/female 7 days pre-mating/female 1–22 days after conception; Reproductive: Effects on Newborn: delayed effects

TDLo (intrauterine, rat) = 500 mg/kg/female 4 days after conception; Reproductive: Fertility: pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea)

TDLo (intraperitoneal, rat) = 1710 mg/kg/female 13days post; Teratogenic effects

TDLo (subcutaneous, mouse) = 1900 mg/kg/female 10–11 days after conception; Reproductive: Effects on Embryo or Fetus: fetal death, Specific Developmental Abnormalities: musculoskeletal system

SODIUM SALT (continued):

TDLo (parenteral, rat) = 10 mg/kg/female 1 day pre-mating; Reproductive: Maternal Effects: ovaries, fallopian tubes

TDLo (subcutaneous, mouse) = 2500 mg/kg/female 10 days after conception; Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

LDLo (subcutaneous, rat) = 3500 mg/kg

LDLo (intravenous, rabbit) = 1100 mg/kg

LDLo (intraarterial, guinea pig) = 300 mg/kg

LDLo (subcutaneous, guinea pig) = 2160 mg/kg

LDLo (intravenous, guinea pig) = 2910 mg/kg

LDLo (parenteral, guinea pig) = 300 mg/kg

Skin Irritancy (rabbit) = 50 mg/24 hours; mild

Skin Irritancy (rabbit) = 500 mg/24 hours; mild

Eye Irritancy (rabbit) = 100 mg; mild

Eye Irritancy (rabbit) = 100 mg/24 hours; moderate

Eye Irritancy (rabbit) = 10 mg; moderate

Mutation in Microorganisms (yeast, *Saccharomyces cerevisiae*) = 2 mol/L

Unscheduled DNA Synthesis (oral, rat) = 16800 mg/kg/4 weeks/continuous

Cytogenetic Analysis (intraperitoneal, rat) = 2338 mg/kg

DNA Damage (lymphocyte, mouse) = 101 mmol/L

Mutation in Mammalian Somatic Cells (lymphocyte, mouse) = 57200 μmol/L

Micronucleus Test (lung, hamster) = 4 g/L

DNA Damage (ovary, hamster) = 275 mmol/L

Cytogenetic Analysis (ovary, hamster) = 160 mmol/L

Cytogenetic Analysis (lung, hamster) = 7500 mg/L

PHOSPHORIC ACID SALT

Currently, there are no toxicological data available for this component.

SUSPECTED CANCER AGENT: The constituents in the components of this product are not found on the following lists: NTP, IARC, FEDERAL OSHA Z-List, and CAL-OSHA and therefore are neither considered to be nor suspected to be cancer causing agents by these agencies.

IRRITANCY OF PRODUCT: Inhalation of vapors, mists, or sprays of this product may cause coughing, sneezing, and difficulty breathing. Contact with the skin or eyes may cause mild irritation, which is alleviated upon rinsing.

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: Depending on the duration and concentration of overexposure, skin and eye contact can irritate contaminated tissue.

ALL OTHER COMPONENTS: Contact with the skin or eyes may cause mild irritation, which is alleviated upon rinsing.

SENSITIZATION TO THE PRODUCT: This product's components are not known to cause skin or respiratory sensitization.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: Human mutation data are available for the Alkyl Alcohol, Magnesium, and Sodium Salt constituents in this product's components; these data were obtained during clinical studies on specific human tissues exposed to high doses of these compounds. Animal mutation data are available for the Heterocyclic Sulfur Compound, Aliphatic Amide, and Inorganic Sodium Compound constituents in this product's components; these data were obtained during clinical studies on specific animal tissues exposed to high doses of these compounds.

Embryotoxicity: The constituents of this product are not reported to cause human embryotoxic effects.

Teratogenicity: The constituents of this product are not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of the Alkyl Alcohol, Aliphatic Amide, and Sodium Salt constituents in this product's components, indicate teratogenic effects.

Reproductive Toxicity: The constituents of this product are not reported to cause adverse reproductive effects in humans. Clinical studies on human tissue exposed to relatively high doses of the Alkyl Alcohol constituent in this product's components indicate adverse reproductive effects. Clinical studies on test animals exposed to relatively high doses of the Aliphatic Amide and Sodium Salt constituent in this product's components indicate adverse reproductive effects.

A *mutagen* is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An *embryotoxin* is a chemical that 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 that causes damage to a developing fetus, but the damage does not propagate across generational lines. A *reproductive toxin* is any substance that interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES: Currently, there are no Biological Exposure Indices (BEIs) determined for the constituents in this product's components.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this product will degrade in the environment into smaller organic and inorganic constituents. Additional environmental data for components are available as follows:

ALIPHATIC AMIDE:

Water solubility = Miscible

Log Kow = -1.51

Terrestrial Fate: Several biodegradation screening studies have observed significant biodegradation of this compound; although these screening studies are not specific to soil media, they suggest that biodegradation in soil may be important. An estimated Koc value of 3.6 indicates that this compound has very high mobility in soil and significant leaching may occur. Based on an estimated vapor pressure of 0.023 mmHg at 25°C, this compound may evaporate from dry soil surfaces; however, volatilization from moist soils is not expected to be important.

Aquatic Fate: Based on an estimated Henry's Law constant of 1.39×10^{-9} atm-cubic meters/mole at 25°C and a complete water solubility, this compound is not expected to volatilize significantly from aquatic systems. An estimated Koc of 3.6 and BCF of 0.0417 indicate that adsorption to sediment and bioconcentration in aquatic organisms are not significant fate processes in water. The chemical structure of this compound suggests that it may be susceptible to environmental hydrolysis; although, no rate data are available that indicate hydrolysis is an important fate process in aquatic systems. Biodegradation is an important fate process in water based on its biodegradability in aqueous screening tests.

Atmospheric Fate: Based on an estimated vapor pressure of 0.023 at 25°C, this compound is expected to exist almost entirely in the vapor phase in the ambient atmosphere. Vapor-phase this compound is degraded relatively rapidly in the ambient atmosphere by reaction with photochemically formed hydroxyl radicals; the half-life for this reaction in typical air can be estimated to be about 2.1 hours.

Biodegradation: Theoretical BODs were measured for this compound of 1.6, 4.7, and 11.8% over 6-, 12-, and 24-hour inoculation periods, respectively. Theoretical BODs greater than 30% over a 2 week incubation period, and 22.6 and 57.7% over a 2 week incubation period were noted using the Japanese MITI standard BOD test.

Bioconcentration: Based on a measured log Kow of -1.51, the bioconcentration factor (BCF) for this compound can be estimated to be 0.042 from a recommended regression-derived equation. This BCF value is not indicative of significant bioconcentration in aquatic organisms.

SODIUM SALT:

Water solubility = 37 g/ 100 mL @ 0°C; 39.12 g/100 ml of water @ 100°C

Log Kow = -3.0

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Release of large quantities of this product's components into the environment may have adverse effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Release of large quantities of this product's components into an aquatic environment may have adverse effects on aquatic plants or animals. Additional aquatic toxicity data are available as follows:

ALKYL ALCOHOL:

LC₅₀ (*Palaemonetes pugio*, grass shrimp) 96 hours = 250 µg/L

LC₅₀ (*Salmo gairdnerii*, rainbow trout) 96 hours = 13000 mg/L

LC₅₀ (*Pimephales promelas*, fathead minnow) 96 hours = 15.3 mg/L

LC₅₀ (*Pimephales promelas*, fathead minnow) 96 hours = 14.2 mg/L

LC₅₀ (*Artemia salina*) 24 hours = 24,000 mg/L

LC₅₀ (*Streptocephalus proboscideus*) 24 hours = 19,000 mg/L

LC₅₀ (*Daphnia magna*) 24 hours = 11,000 mg/L

LC₅₀ (*Brachionus calyciflorus*) 24 hours = 30,000 mg/L

LC₅₀ (fingerling trout) 24 hours = 11,200 mg/L

LC₅₀ (*Semotilus atromaculatus*, creek chub) 24 hours = > 7,000 mg/L

LC₅₀ (*Poecilia reticulata*, guppy) 7 days = 11,050 ppm

LC₅₀ (*Alburnus alburnus*, bleak) 96 hours = 11,000 mg/L

ALKYL ALCOHOL (continued):

LC₅₀ (*Nitocra spinipes*) 96 hours = 7,750 mg/L

EC₀ (*Pseudomonas putida*, bacteria) 16 hours = 6,500 mg/L

EC₀ (*Microcystis aeruginosa*, algae) 8 days = 1,450 mg/L

EC₀ (*Scenedesmus quadricauda*, green algae) 7 days = 5,000 mg/L

EC₀ (*Entosiphon sulcatum*, protozoa) 72 hours = 65 mg/L

EC₀ (*Uronema parduczi* Chatton-Lwoff, protozoa) = 6,120 mg/L

EC₅₀ (*Pimephales promelas*, fathead minnow) 96 hours = 12.9 mg/L

IC₁₀ (*Scenedesmus subspicatus*, algae) = 18,400 mg/L; inhibition of fluorescence

IC₁₀ (*Scenedesmus subspicatus*, algae) = 400 mg/L; growth inhibition

EC₅₀ (*Photobacterium*) 5 minutes = 32,000 mg/L

IC₁₀ (Ribulose-P2-carboxylase in protoplasts) = 11,500 mg/L; inhibition of enzyme activity

ALKYL ALCOHOL (continued):

LD₀ (creek chub) 24 hours = 7,000 mg/L

LD₁₀₀ (creek chub) 24 hours = 9,000 mg/L

ALIPHATIC AMIDE:

LC₅₀ (minnow) > 500 mg/L 48 hours

SODIUM SALT:

LC₅₀ (*Carassius auratus* goldfish) 240 hours = 11,764.3 mg/L (@ 23.5°C, tap water, static bioassay)

LC₅₀ (*Tinca tinca* tench) 12 hours = 112 mg/L @ 25°C, freshwater, static bioassay

LC₅₀ (*Tinca tinca* tench) 12 hours = 1142 mg/L @ 20°C, freshwater, static bioassay

LC₅₀ (*Tinca tinca* tench) 24 hours = 119 mg/L @ 25°C, freshwater, static bioassay

LC₅₀ (*Tinca tinca* tench) 24 hours = 104 mg/L @ 20°C, freshwater, static bioassay

EC₅₀ (*Daphnia magna* water flea) 48 hours = 340.7-469.2 mg/L s.c. (11.5-14.5°C, well water, static bioassay)

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Do NOT dispose of any component of this product by pouring down the drain. 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.

EPA WASTE NUMBER: Not applicable.

14. TRANSPORTATION INFORMATION

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Not Regulated

HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable

UN IDENTIFICATION NUMBER: Not Applicable

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: Not Applicable

EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable

MARINE POLLUTANT: Not applicable (49 CFR 172.101, Appendix B).

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is not classified as dangerous goods, per regulations of Transport Canada.

14. TRANSPORTATION INFORMATION (Continued)

INTERNATIONAL AIR TRANSPORT ASSOCIATION DESIGNATION: This product is not classified as dangerous goods, per rules of IATA.

INTERNATIONAL MARITIME ORGANIZATION (IMO): This product is not classified as dangerous goods, per rules of the IMO. **Marine Pollutant**: No component of this product is designated by the IMO to be a Marine Pollutant.

JAPAN SHIP SAFETY LAW, PORT REGULATION LAW): This product is not regulated according to Japan Ship Safety Law.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The constituents in components of this product are not subject to Sections 302, 304, and 313 reporting requirements under the Superfund Amendment and Reauthorization Act.

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

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

U.S. TSCA INVENTORY STATUS: This product is regulated by the Food and Drug Administration; it is exempt from the requirements of TSCA.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 lists.

ANSI LABELING (Z129.1; Provided to Summarize Occupational Hazard Information):

CODE GX#-BE1 COMPONENT: WARNING! CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE SKIN AND EYE IRRITATION. MAY CAUSE DISCOMFORT IF SWALLOWED. Do not taste or swallow. Avoid skin or eye contact. Avoid prolonged or repeated skin contact. Avoid breathing mists or sprays. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves and goggles. **FIRST-AID**: In case of contact, immediately flush skin or eyes with plenty of water. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention if necessary. **IN CASE OF FIRE**: Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL**: Absorb spill with polypads and place in suitable container. Consult Material Safety Data Sheet for additional information.

CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: WARNING! POSSIBLE BIRTH DEFECT HAZARD. CONTAINS MATERIAL THAT MAY CAUSE BIRTH DEFECTS BASED ON ANIMAL DATA. MAY CAUSE SKIN AND EYE IRRITATION. MAY CAUSE DISCOMFORT IF SWALLOWED OR INHALED. Do not taste or swallow. Avoid skin or eye contact. Avoid prolonged or repeated skin contact. Avoid breathing mists or sprays. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves and goggles. **FIRST-AID**: In case of contact, immediately flush skin or eyes with plenty of water. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention if necessary. **IN CASE OF FIRE**: Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL**: Absorb spill with polypads and place in suitable container. Consult Material Safety Data Sheet for additional information.

ALL OTHER SOLUTIONS: CAUTION! MAY CAUSE SKIN AND EYE IRRITATION. MAY CAUSE DISCOMFORT IF SWALLOWED OR INHALED. Do not taste or swallow. Avoid skin or eye contact. Avoid prolonged or repeated skin contact. Avoid breathing mists or sprays. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves and goggles. **FIRST-AID**: In case of contact, immediately flush skin or eyes with plenty of water. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention if necessary. **IN CASE OF FIRE**: Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL**: Absorb spill with polypads and place in suitable container. Consult Material Safety Data Sheet for additional information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL STATUS: The constituents in this product's components are listed on the DSL Inventory or are exempt.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITY SUBSTANCES LISTS: The components of this product are not on the CEPA Priority Substances Lists.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL CANADIAN REGULATIONS (continued):

CANADIAN WHMIS CLASSIFICATION AND SYMBOLS:

CODE GX#-BE1 COMPONENT: Contains an antimicrobial agent classified as a D2A material causing other toxic effects (Very Toxic).



CODE GX#-HYB AND CODE GX#-HCB COMPONENTS: Contains Aliphatic Amide classified as a D2A material causing other toxic effects (Very Toxic)



ALL OTHER COMPONENTS: Not applicable.

EUROPEAN UNION INFORMATION:

EU LABELING AND CLASSIFICATION:

CODE GX#-BE1 COMPONENT:

EU CLASSIFICATION and SYMBOL: Irritant [Xn]

EU RISK PHRASES: Irritating to respiratory system [R: 37]

EU SAFETY PHRASES: Keep out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) Use only in well-ventilated areas. [S: 2–51]

EUROPEAN UNION ANNEX II HAZARD SYMBOL:



CODE GX#-HYB AND CODE GX#-HCB COMPONENTS:

EU CLASSIFICATION: Toxic to Reproduction Development, Category 2 [T]

EU RISK PHRASES: May cause harm to the unborn child. [R: 61]

EU SAFETY PHRASES: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). [S: 45] Avoid exposure-obtain special instructions before use. [S: 53]

EUROPEAN UNION ANNEX II HAZARD SYMBOL:



ALL OTHER COMPONENTS:

EU CLASSIFICATION: These components do not meet the definition of any hazard class as defined by the European Union Council Directive 67/548/EEC.

EU RISK PHRASES: Not applicable.

EU SAFETY PHRASES: Not applicable.

EUROPEAN UNION ANNEX II HAZARD SYMBOL: Not applicable.

FOR CONSTITUENTS:

Protein:

An official classification for this substance has not been published in Commission Directives 93/72EEC, 94/69/EC, 96/56/EC, or 98/98/EC.

Heterocyclic Sulfur Compound:

An official classification for this substance has not been published in Commission Directives 93/72EEC, 94/69/EC, 96/56/EC, or 98/98/EC.

Alkyl Alcohol:

EU CLASSIFICATION: Highly Flammable. [F]

EU RISK PHRASES: Highly flammable. [R: 11]

EU SAFETY PHRASES: Keep out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) Keep container tightly closed. Keep away from sources of ignition — No smoking. [S: 2–7–16]

Aliphatic Amide:

EU CLASSIFICATION: Toxic to Reproduction Development, Category 2 [T]

EU RISK PHRASES: May cause harm to the unborn child. [R: 61]

EU SAFETY PHRASES: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). [S: 45] Avoid exposure—obtain special instructions before use. [S: 53]

15. REGULATORY INFORMATION (Continued)

EUROPEAN UNION INFORMATION (continued):

FOR CONSTITUENTS (continued):

Magnesium Salt:

An official classification for this substance has not been published in Commission Directives 93/72EEC, 94/69/EC, 96/56/EC, or 98/98/EC.

Inorganic Nitric Acid Salt:

An official classification for this substance has not been published in Commission Directives 93/72EEC, 94/69/EC, 96/56/EC, or 98/98/EC.

Preservative:

An official classification for this substance has not been published in Commission Directives 93/72EEC, 94/69/EC, 96/56/EC, or 98/98/EC.

Inorganic Phosphate Salt:

An official classification for this substance has not been published in Commission Directives 93/72EEC, 94/69/EC, 96/56/EC, or 98/98/EC.

Sodium Salt:

An official classification for this substance has not been published in Commission Directives 93/72EEC, 94/69/EC, 96/56/EC, or 98/98/EC.

Inorganic Sodium Compound:

EU CLASSIFICATION: Corrosive. [C]

EU RISK PHRASES: Causes severe burns. [R: 35]

EU SAFETY PHRASES: Keep locked up and out of reach of children. [S: 1/2] In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 26] Wear suitable gloves and eye/face protection. [S: 37/39] In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). [S: 45]

Phosphoric Acid Salt:

An official classification for this substance has not been published in Commission Directives 93/72EEC, 94/69/EC, 96/56/EC, or 98/98/EC.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: The components of this product are listed on the AICS or are exempt.

LIST OF DESIGNATED SUBSTANCES: Not applicable.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

LABELING AND CLASSIFICATION: This product does not meet the definition of any hazard class.

CODE GX#-BE1 COMPONENT:

EU CLASSIFICATION and SYMBOL: Irritant [Xn]

EU RISK PHRASES: Irritating to respiratory system [R: 37]

EU SAFETY PHRASES: Keep out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) Use only in well-ventilated areas. [S: 2-51]

EUROPEAN UNION ANNEX II HAZARD SYMBOL:

**CODE GX#-HYB AND CODE GX#-HCB COMPONENTS:**

CLASSIFICATION: Toxic to Reproduction Development, Category 2 [T]

RISK PHRASES: May cause harm to the unborn child. [R: 61]

SAFETY PHRASES: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). [S: 45]

Avoid exposure—obtain special instructions before use. [S: 53]

ADDITIONAL LABELING INFORMATION: Not applicable.

HAZARD SYMBOL:

**ALL OTHER COMPONENTS:**

CLASSIFICATION: Not applicable.

RISK PHRASES: Not applicable.

SAFETY PHRASES: Not applicable.

HAZARD SYMBOL: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE ENCS: The components of this product are on the ENCS Inventory as indicated in composition tables in Section 2 (Composition and Information on Ingredients).

POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW: No component of this product is a listed Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

16. OTHER INFORMATION

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
800/441-3365

DEFINITIONS OF TERMS

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

CAS #: This is the Chemical Abstract Service Number 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 which have been shown to increase the mutant frequency in the progeny of exposed humans. **2:** Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed mammals. **3A:** Substances which 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 which 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 which 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.

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 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-Permissible Exposure Limit: OSHA's Permissible Exposure Limit. This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule ([Federal Register](#): 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL that was vacated by Court Order.

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

STEL-Short Term Exposure Limit: 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.

EXPOSURE LIMITS IN AIR (continued):

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: 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.

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. PII or Draize = "0". *Eye Irritation:* Essentially non-irritating, or minimal effects which clear in < 24 hours [e.g. mechanical irritation]. 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; slightly or mildly irritating. *Skin Irritation:* Slightly or mildly irritating. *Eye Irritation:* Slightly or mildly irritating. *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. *Skin Irritation:* Moderately irritating; primary irritant; sensitizer. PII or Draize > 0, < 5. *Eye Irritation:* Moderately to severely irritating and/or corrosive; reversible corneal opacity; corneal involvement or irritation clearing in 8-21 days. Draize > 0, ≤ 25. *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 destroy dermal tissue, cause skin burns, 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. *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 require considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur, Including: 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, or; 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 in air, Including: 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; Solids and semisolids 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, including:

DEFINITIONS OF TERMS (Continued)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM
HAZARD RATINGS (continued):**FLAMMABILITY HAZARD (continued):**

3 (continued) Liquids having a flash point below 22.8°C [73°F] and having a boiling point at or above 38°C [100°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]; 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 which will burn readily, including: 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; Material that ignite spontaneously when exposed to air at a temperature of 54.4°C [130°F] or below [e.g. 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. *Unstable Compressed Gases*: No Rating. *Pyrophorics*: No Rating. *Oxidizers*: No "0" rating allowed. *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. Division 1.5 & 1.6 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; *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 explosive hazard. 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 – Explosive substances where the explosive effect 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 *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. *Unstable Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure, but have a low potential 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 1.2 – 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 *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 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-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 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 whose LC₅₀ for acute inhalation toxicity is greater than 10,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 200 mg/L. Materials whose LD₅₀ for acute dermal toxicity is greater than 2000 mg/kg. Materials whose LD₅₀ for acute oral toxicity is greater than 2000 mg/kg. Materials that are essentially non-irritating to the respiratory tract, eyes and skin. **1** (materials that, under emergency conditions, can cause significant irritation): Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 5,000 ppm but less than or equal to 10,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 10 mg/L but less than or equal to 200 mg/L. Materials whose LD₅₀ for acute dermal toxicity is greater than 1000 mg/kg but less than or equal to 2000 mg/kg. Materials whose LD₅₀ for acute oral toxicity is greater than 500 mg/kg but less than or equal to 2000 mg/kg. Materials that cause slight to moderate irritation to the respiratory tract, eyes and skin. **2** (materials that, under emergency conditions, can cause temporary incapacitation or residual injury): Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 3,000 ppm but less than or equal to 5,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 2 mg/L but less than or equal to 10 mg/L. Materials whose LD₅₀ for acute dermal toxicity is greater than 200 mg/kg but less than or equal to 1000 mg/kg. Materials whose LD₅₀ for acute oral toxicity is greater than 50 mg/kg but less than or equal to 500 mg/kg. 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. 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. **3** (materials that, under emergency conditions, can cause serious or permanent injury): Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 1,000 ppm but less than or equal to 3,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 0.5 mg/L but less than or equal to 2 mg/L. Materials whose LD₅₀ for acute dermal toxicity is greater than 40 mg/kg but less than or equal to 200 mg/kg. Materials whose LD₅₀ for acute oral toxicity is greater than 5 mg/kg but less than or equal to 50 mg/kg. 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 3000 ppm and that does not meet the criteria for degree of hazard 4. Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-66.5°F) that cause frostbite and irreversible tissue damage. Materials that are respiratory irritants. Cryogenic gases that cause frostbite and irreversible tissue damage. Materials that are corrosive to the respiratory tract. Materials that are corrosive to the eyes or cause irreversible corneal opacity. Materials that are corrosive to the skin.

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. **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. 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 *Recommendation 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 percent 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 a 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). Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed up flash point of the solvent. Most ordinary combustible materials. **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 in air, including: 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; Solids and semisolids that readily give off flammable vapors.);

DEFINITIONS OF TERMS (Continued)

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

FLAMMABILITY HAZARD (continued): 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, including: Liquids having a flash point below 22.8°C [73°F] and having a boiling point at or above 38°C [100°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]; 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 which will burn readily, including: 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; Material that ignite spontaneously when exposed to air at a temperature of 54.4°C [130°F] or below [e.g. pyrophoric]).

INSTABILITY HAZARD: 0 Materials that in themselves are normally stable, even under fire conditions: Materials that have an estimated 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 estimated 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 estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 10 W/mL and below 1000 W/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 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. Materials that are sensitive to localized thermal or mechanical shock at normal temperatures and pressures.

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (NFPA). **Flash Point** - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. **Autoignition Temperature**: The minimum temperature required to initiate combustion in air with no other source of ignition. **LEL** - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. **UEL** - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

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. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other 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 is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. **TL_m** = median threshold limit; Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

U.S. and CANADA:

This section explains the impact of various laws and regulations on the material. **ACGIH:** American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **EPA** is the U.S. Environmental Protection Agency. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label. **OSHA** - U.S. Occupational Safety and Health Administration.

EUROPEAN: **EU** is the European Union (formerly known as the **EEC**, European Economic Community). **EINECS:** This the European Inventory of Now-Existing Chemical Substances. The **ARD** is the European Agreement Concerning the International Carriage of Dangerous Goods by Road and the **RID** are the International Regulations Concerning the Carriage of Dangerous Goods by Rail. **AUSTRALIAN:** **AICS** is the Australian Inventory of Chemical Substances. **NOHSC:** National Occupational Health & Safety CODE. **MITI** is the Japanese Minister of International Trade and Industry.