

SAFETY DATA SHEET



DynaPoxy™ Low Mod Epoxy Part B

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

1. PRODUCT IDENTIFICATION

IDENTIFICATION of the SUBSTANCE or PREPARATION

TRADE NAME (AS LABELED):	DynaPoxy™ Low Mod Epoxy Part B
PRODUCT DESCRIPTION:	Part B of Two-Part Epoxy Sealant
CHEMICAL NAME/CLASS:	Amine and Alcohol Blend
SYNONYMS:	None
RELEVANT USE:	Part B for Low Modulus, Low Viscosity Epoxy Bonding Agent
USES ADVISED AGAINST:	Other Than Relevant Use

COMPANY/UNDERTAKING IDENTIFICATION:

SUPPLIER/MANUFACTURER'S NAME:	Pecora Corporation
ADDRESS:	165 Wambold Road, Harleysville, PA 19438
EMERGENCY PHONE:	800-424-9300 (CHEMTREC, 24-hours)
BUSINESS PHONE:	215-723-6051 (Mon–Fri, 8 AM–5 PM ET)
PREPARATION DATE:	October 2009
REVISION DATE:	September 19, 2012

This product is sold for commercial use. This MSDS has been developed to address safety concerns of those individuals working with bulk quantities of this material, as well as those of potential users of this product in industrial/occupational settings. ALL United States Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards, and Canadian WHMIS [Controlled Products Regulations] and the Global Harmonization Standard required information is included in appropriate sections based on the U.S. ANSI Z400.1-2010 format. This product has been classified in accordance with the hazard criteria of the countries listed above.

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION LABELING AND CLASSIFICATION: This product has been classified per GHS Standards.

Classification: Combustible Liquid Cat. 4, Reproductive Toxicity Cat. 2, Acute Oral Toxicity Cat. 4, Acute Dermal Toxicity Cat. 4, Acute Inhalation Toxicity Cat. 4, Skin Corrosion Cat. 1B, Skin Sensitization Cat. 1, Aquatic Acute Toxicity Cat. 1, Aquatic Chronic Toxicity Cat. 1

Signal Word: Danger

Hazard Statement Codes: H227, H361fd, H302 + H312 + H332, H314, H317, H410

Precautionary Statement Codes: P201, P202, P210, P260, P264, P270, P271, P272, P273, P280, P370 + P378, P308 + P313, P301 + P330 + P331, P304 + P340 + P310, P305 + P351 + P338 + P310, P302 + P352, P333 + P313, P362 + P364, P321, P363, P391, P403 + P233 + P235, P501

Hazard Symbols/Pictograms: GHS05, GHS07, GHS08, GHS09



EMERGENCY OVERVIEW:

PHYSICAL DESCRIPTION: This product is an amber liquid with an odor characteristic of amines (ammonia-like).

HEALTH HAZARDS: Corrosive and can cause burns by all routes of exposure. Eye exposure may cause blindness. Harmful by inhalation, ingestion or skin contact. May be fatal if ingested. Symptoms of toxicity by all routes may be delayed. Ingestion may cause adverse central nervous system effects. May cause toxic systemic effects by skin absorption. Can cause skin sensitization and may cause respiratory sensitization and allergic reaction in individuals susceptible to amines. Limited evidence of reproductive toxicity for the 4-Nonylphenol Branched Mixed Isomers component.

FLAMMABILITY HAZARD: This product is combustible and may ignite if exposed to high temperature or direct flame.

REACTIVITY HAZARD: Closed containers may develop pressure and rupture on prolonged exposure to heat or if involved in a fire.

ENVIRONMENTAL HAZARD: This product is harmful to marine organisms. All release to the environment should be avoided.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS®)

Health	3*
Flammability	2
Physical Hazard	0

See Section 16 for definitions of ratings

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

HMIS® is a registered trademark of the National Paint and Coatings Association.

CANADIAN WHMIS CLASSIFICATION: Class B3, D1B, D2B and E. See Section 15 (Regulatory Information) for all classification details.

U.S. OSHA REGULATORY STATUS: This material has a classification under the Global Harmonization Standard, as applied under OSHA regulations, as given earlier in this Section.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Chemical Name	CAS #	W/W%	GHS Classification Hazard Statements
Amine Blend Consists of the following:		60.0-80.0	SELF-CLASSIFICATION <u>Classification:</u> Combustible Liquid, Cat. 4, Reproductive Toxicity Cat. 2, Acute Oral Toxicity Cat. 4, Acute Dermal Toxicity Cat. 4, Acute Inhalation Toxicity Cat. 4, Skin Corrosion Cat. 1B, Skin Sensitization Cat. 1, Aquatic Acute Toxicity Cat. 1, Aquatic Chronic Toxicity Cat. 1 <u>Hazard Statement Codes:</u> H227, H361fd, H302 + H312 + H332, H314, H317, H410
1-Aminoethylpiperazine	140-31-8	Proprietary	<u>Classification:</u> Acute Oral Toxicity Cat. 4, Acute Dermal Toxicity Cat. 4, Skin Corrosion Cat. 1B, Skin Sensitization Cat. 1, Aquatic Acute Toxicity Cat. 3 <u>Hazard Statement Codes:</u> H302 + H312, H314, H317, H412
Benzyl Alcohol	100-51-6	Proprietary	<u>Classification:</u> Acute Oral Toxicity Cat. 4, Acute Inhalation Toxicity Cat. 4 <u>Hazard Statement Codes:</u> H302 + H332
Bis(hexamethylene)triamine	143-23-7	Proprietary	SELF CLASSIFICATION <u>Classification:</u> Acute Oral Toxicity Cat. 4, Skin Corrosion Cat. 1B <u>Hazard Statement Codes:</u> H302, H314
1,2-Cyclohexanediamine	694-83-7	Proprietary	SELF CLASSIFICATION <u>Classification:</u> Acute Oral Toxicity Cat. 5, Skin Corrosion Cat. 1B <u>Hazard Statement Codes:</u> H303, H314
4-Nonylphenol Branched Mixed Isomers	84852-15-3	20.0-30.0	<u>Classification:</u> Reproductive Toxicity Cat. 2, Acute Oral Toxicity Cat. 4, Skin Corrosion Cat. 1B, Aquatic Acute Toxicity Cat. 1, Aquatic Chronic Toxicity Cat. 1 <u>Hazard Statement Codes:</u> H361fd, H302, H314, H400, H410
Tris-2,4,6-(dimethylaminomethyl) phenol	90-72-2	5.0-10.0	<u>Classification:</u> Acute Oral Toxicity Cat. 4, Eye Irritation Cat. 2A, Skin Irritation Cat. 2 <u>Hazard Statement Codes:</u> H302, H319, H315

See Section 16 for full text of Ingredient Hazard and Precautionary Statements

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

4. FIRST-AID MEASURES

PROTECTION OF FIRST AID RESPONDERS: Rescuers should not attempt to retrieve victims of exposure to this material without adequate personal protective equipment. Rescuers should be taken for medical attention, if necessary. Fire protective gear may be necessary.

DESCRIPTION OF FIRST AID MEASURES: Remove victim(s) to fresh air, as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Remove and isolate contaminated clothing and shoes. Seek immediate medical attention. Take copy of label and MSDS to physician or other health professional with victim(s).

INHALATION: If mists, sprays or fumes of this material are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions.

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

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.

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

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions and central nervous system conditions or skin problems may be aggravated by overexposure to this product.

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

5. FIRE-FIGHTING MEASURES

FLASH POINT (COC): > 60°C (> 140°F) **AUTOIGNITION:** Not known.

FLAMMABLE LIMITS IN AIR: Not known.

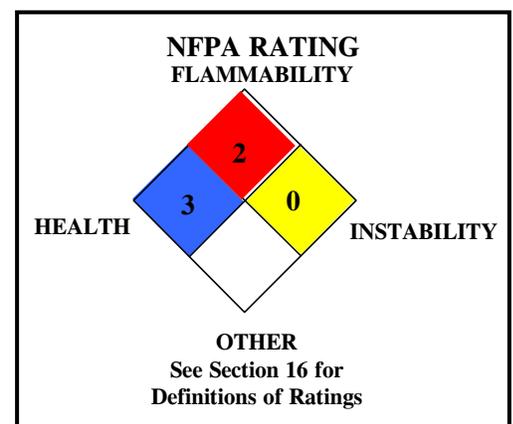
EXTINGUISHING MEDIA:

SUITABLE EXTINGUISHING MEDIA: Use materials appropriate for surrounding materials.

UNSUITABLE EXTINGUISHING MEDIA: Do not use water jet; water used directly on burning product may cause frothing and spread fire. May be incompatible with halons.

PROTECTION OF FIREFIGHTERS:

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE: This product is combustible and can be ignited when exposed to high temperature for prolonged period or direct flame. The product is corrosive and presents a severe contact hazard to fire-fighters. Not sensitive to mechanical impact under normal conditions. Vapors may form explosive mixtures in air. Vapors are heavier than air and can accumulate in confined spaces creating a toxicity and explosion hazard. Vapors can travel long distances and flashback to ignition source. Closed containers may develop pressure and rupture in event of fire.



5. FIRE-FIGHTING MEASURES (Continued)

PROTECTION OF FIREFIGHTERS (continued):

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

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES: An accidental release can result in a fire in the presence of ignition source. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. Use only non-sparking tools and equipment during the response. The atmosphere must at least 19.5 percent Oxygen before non-emergency personnel can be allowed in the area without Self-Contained Breathing Apparatus and fire protection. Avoid contact with water.

PERSONAL PROTECTIVE EQUIPMENT: Responders should wear the level of protection appropriate to the type of chemical released, the amount of the material spilled, and the location where the incident has occurred.

Small Spills: For releases of 1 drum or less, Level D Protective Equipment (gloves, chemical resistant apron, boots, and eye protection) should be worn.

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: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit, fire-retardant clothing and boots, hard hat, and Self-Contained Breathing Apparatus.**

METHODS FOR CLEAN-UP AND CONTAINMENT:

All Spills: Access to the spill area should be restricted. Spread should be limited by gently covering the spill with polypads. Absorb spilled liquid with clay, sand, polypads, or other suitable inert absorbent materials. Neutralize spill and spill area with material appropriate for basic amine compounds. All contaminated absorbents and other materials should be placed in an appropriate container and seal. Do not mix with wastes from other materials. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations). Dispose of recovered material and report spill per regulatory requirements. Remove all residue before decontamination of spill area. Clean spill area with soap and copious amounts of water. Monitor area for combustible vapor levels and confirm levels are below exposure limits given in Section 8 (Exposure Controls-Personal Protection), if applicable, and that levels are below applicable LELs (see Section 5 – Fire Fighting Measures) before non-response personnel are allowed into the spill area. Purge equipment with inert gas prior to reuse.

ENVIRONMENTAL PRECAUTIONS: Minimize use of water to prevent environmental contamination. Prevent spill or rinsate from contaminating storm drains, sewers, soil or groundwater. Place all spill residues in a suitable container and seal. Do not discharge effluent containing this product into streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA.

OTHER INFORMATION: U.S. regulations may require reporting of spills of this material that reach surface waters if a sheen is formed. If necessary, the toll-free phone number for the US Coast Guard National Response Center is 1-800-424-8802.

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

PART III

How can I prevent hazardous situations from occurring?

7. HANDLING and STORAGE

PRECAUTIONS FOR SAFE HANDLING: Danger! Corrosive; avoid all contact with this product. As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Avoid contact with eyes, skin, and clothing. Avoid breathing fumes, dusts, vapors or mist. Do not taste or swallow. Use only with adequate ventilation. Contaminated clothing needs to be laundered prior to reuse. Keep away from heat and flame. In the event of a spill, follow practices indicated in Section 6: ACCIDENTAL RELEASE MEASURES. Empty containers may contain residual product; therefore, empty containers should be handled with care. Keeping work areas clean is essential. Use work surfaces that can be easily decontaminated. Maintain good personal hygiene.

CONDITIONS FOR SAFE STORAGE: 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. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. 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. **Local Fire Departments should be notified of the storage of this product on site. Storage and processing areas of this product should be identified with a NFPA 704 placard (diamond) large enough to be seen from a distance.** Post warning and “NO SMOKING” signs in storage and use areas, as appropriate. Refer to NFPA 30, *Flammable and Combustible Liquids Code*, for additional information on storage. Have appropriate extinguishing equipment in the storage area (such as sprinkler systems or portable fire extinguishers). Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged.

PRODUCT USE: This product is a Part B in a three-part sealant product. Follow all industry standards for use of this product.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/CONTROL PARAMETERS:

VENTILATION AND ENGINEERING CONTROLS: Use with adequate, explosion proof ventilation to ensure exposure levels are maintained below the limits provided in this section.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS (continued):

OCCUPATIONAL/WORKPLACE EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS #	Guideline	Value
1-Aminoethylpiperazine	140-31-8	NE	NE
Benzyl Alcohol	100-51-6	AIHA WEEL TWA	10 ppm
Bis(hexamethylene)triamine	143-23-7	NE	NE
1,2-Cyclohexanediamine	694-83-7	NE	NE
4-Nonylphenol Branched Mixed Isomers	84852-15-3	NE	NE
Tris-2,4,6-(dimethylaminomethyl) phenol	90-72-2	NE	NE

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

PERSONAL PROTECTIVE EQUIPMENT (PPE): *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 the Respiratory Protection Standard (29 CFR 1910.134), Eye Protection Standard 29 CFR 1910.13, the Hand Protection Standard 29 CFR 1910.138, and the Foot Protection Standard 29 CFR 1910.136), equivalent standards of Canada (including the Canadian CSA Respiratory Standard Z94.4-93-02, the CSA Eye Protection Standard Z94.3-M1982, Industrial Eye and Face Protectors and the Canadian CSA Foot Protection Standard Z195-M1984, Protective Footwear). Please reference applicable regulations and standards for relevant details.*

EYE/FACE PROTECTION: Use approved safety goggles or safety glasses with side-shield. When handling more than 1 quart a full-faceshield should be used. If necessary, refer to appropriate regulations.

SKIN PROTECTION: Wear chemical impervious gloves (e.g., Nitrile or Neoprene). Gloves should have a gauntlet to cover the arms. Use triple gloves for spill response. If necessary, refer to appropriate regulations.

BODY PROTECTION: Use body protection appropriate for task (e.g., lab coat, coveralls, Tyvek suit). If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment) or appropriate Standards of Canada. Full body protective suit is appropriate for spill response. 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 appropriate regulations.

RESPIRATORY PROTECTION: If mists or sprays from this product are created during use, use appropriate respiratory protection. If necessary, use only respiratory protection authorized in appropriate regulations. 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 appropriate regulations.

9. PHYSICAL and CHEMICAL PROPERTIES

FORM: Liquid.

MOLECULAR WEIGHT: Mixture.

ODOR: Characteristic of amines/like ammonia.

VAPOR DENSITY: (air = 1) > 1

FREEZING/MELTING POINT: Not available.

SPECIFIC GRAVITY (water = 1) @ 21°C: 0.97

SOLUBILITY IN WATER: Slightly soluble.

VAPOR PRESSURE: Not available.

COEFFICIENT WATER/OIL DISTRIBUTION: Not available

VOC (less water and exempt): <50 g/L

HOW TO DETECT THIS SUBSTANCE (IDENTIFICATION/WARNING PROPERTIES): The odor and appearance may be good warning property in the event of an accidental release.

COLOR: Amber.

MOLECULAR FORMULA: Mixture.

ODOR THRESHOLD: Not determined.

BOILING POINT: Not available.

EXPANSION RATIO: Not applicable.

pH: 12.0

EVAPORATION RATE (nBuAc = 1): > 1

SPECIFIC VOLUME (ft³/lb): Not available.

VISCOSITY @ 25°C: Not available.

10. STABILITY and REACTIVITY

CHEMICAL STABILITY: Stable under normal circumstances of use and handling.

CONDITIONS TO AVOID: Avoid contact with incompatible chemicals and exposure to extreme temperatures.

INCOMPATIBLE MATERIALS: Based upon component incompatibility, this product may be incompatible with halogenated materials, acids and oxidizers. This product may attack some types of plastic and coatings due to the Benzyl Alcohol component.

HAZARDOUS DECOMPOSITION PRODUCTS: *Combustion:* Thermal decomposition of this product can generate carbon and nitrogen oxides, formaldehyde. *Hydrolysis:* None known.

POSSIBILITY OF HAZARDOUS REACTIONS/POLYMERIZATION: Polymerization will not occur.

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

11. TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS: The most significant routes of occupational overexposure are inhalation and contact with skin and eyes. The symptoms of overexposure to this product are as follows:

CONTACT WITH SKIN or EYES: This product is corrosive; direct skin or eye contact can cause severe irritation or burns, depending on concentration and duration of exposure. Burns may not be immediately visible or painful. Direct eye contact may cause blindness. Eye contact with vapors is irritating and can cause a disturbance of vision known as 'halo eyes'. This is a visual disturbance of a blue halo or ring seen when looking into light. This disturbance normally disappears after several hours when exposure has ended.

SKIN ABSORPTION: Prolonged skin contact may cause adverse systemic toxicity by skin absorption as described under ingestion or inhalation.

INGESTION: Corrosive by ingestion. May be harmful or fatal swallowed. If the product is swallowed, it severe irritation of the mouth, throat, and other tissues of the gastro-intestinal system and may cause nausea, vomiting, and diarrhea as well as adverse effects on the central nervous system. Less significant adverse effects may be delayed for a week and can include skin problems (rash, thickening and flaking), abdominal pain, gastrointestinal ulcers and bleeding, loss of appetite and muscle pain.

11. TOXICOLOGICAL INFORMATION (Continued)

POTENTIAL HEALTH EFFECTS (continued):

INHALATION: Corrosive by inhalation and may cause severe irritation or burns to the respiratory system, depending on concentration and duration of exposure. Symptoms of inhalation exposure include a burning sensation, cough, labored breathing, sore throat and unconsciousness. Symptoms of injury from inhalation may be delayed and can include, coughing, wheezing and severe shortness of breath. Severe inhalation exposure may be fatal due to development of pulmonary edema, and accumulation of fluid in the lungs. Chronic inhalation of low vapor concentration may cause permanent damage to the lungs and reduced lung function. Inhalation of vapors or fumes from this product may result in sensitization and allergic reaction in sensitive individuals. Refer to 'Sensitization to the Product' for additional information on possible sensitization effects by inhalation.

INJECTION: Accidental injection of this product (e.g. puncture with a contaminated object) may cause burning, redness, and swelling in addition to the wound.

TARGET ORGANS: Acute: Skin, eyes, respiratory system. Chronic: Skin, respiratory system.

TOXICITY DATA: This product has not been tested for toxicity. The following data are for components.

1-AMINOETHYLPIPERAZINE:

Open Irritation Test (Skin-Rabbit) 100 µg/24 hours
Standard Draize Test (Skin-Rabbit) 5 mg/24 hours: Severe
Standard Draize Test (Eye-Rabbit) 20 mg/24 hours: Moderate
LD₅₀ (Oral-Rat) 2140 µL/kg
LD₅₀ (Oral-Chicken) 1500 mg/kg
LD₅₀ (Skin-Rabbit) 880 µL/kg
LD₅₀ (Intraperitoneal-Mouse) 250 mg/kg
TDLo (Oral-Rat) 1680 mg/kg: male 28 day(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count)
Morphological Transformation (Mouse Lymphocyte) 1 µL/L
Sister Chromatid Exchange (Hamster Ovary) 125 µg/L
Mutation in Mammalian Somatic Cells (Hamster Ovary) 500 µg/L

BENZYL ALCOHOL:

TCLo (Inhalation-Human) 10 pph/45 days-intermittent: Behavioral: somnolence (general depressed activity), headache; Gastrointestinal: nausea or vomiting
Standard Draize Test (Skin-Man) 16 mg/48 hours: Mild
Standard Draize Test (Skin-Rabbit) 100 mg/24 hours: Moderate
Standard Draize Test (Skin-Pig) 100%: Moderate
LD₅₀ (Oral-Rat) 1.5 mL/kg
LD₅₀ (Oral-Rat) 1660 mg/kg: Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: respiratory depression
LD₅₀ (Oral-Rat) 1230 mg/kg: Behavioral: somnolence (general depressed activity), excitement, coma
LD₅₀ (Oral-Mouse) 1360 mg/kg
LD₅₀ (Oral-Mouse) 1360 mg/kg: Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: respiratory depression
LD₅₀ (Oral-Rabbit) 1040 mg/kg: Behavioral: somnolence (general depressed activity)
LD₅₀ (Oral-Rabbit) 1040 mg/kg: Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: respiratory depression
LD₅₀ (Oral-Guinea Pig) 2500 mg/kg
LD₅₀ (Oral-Guinea Pig) 2500 mg/kg: Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: respiratory depression
LD₅₀ (Oral-Wild Bird Species) 100 mg/kg
LD₅₀ (Skin-Rabbit) 2000 mg/kg
LD₅₀ (Intraperitoneal-Rat) 400 mg/kg
LD₅₀ (Intraarterial-Rat) 441 mg/kg: Lungs, Thorax, or Respiration: chronic pulmonary edema; Lungs, Thorax, or Respiration: dyspnea
LD₅₀ (Intravenous-Mouse) 324 mg/kg
LD₅₀ (Subcutaneous-Rat) 1700 mg/kg: Sense Organs and Special Senses (Eye): miosis (pupillary constriction); Behavioral: coma; Kidney/Ureter/Bladder: other changes
LC₅₀ (Inhalation-Rat) > 500 mg/m³: Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: respiratory depression
LC₅₀ (Inhalation-Rat) > 500 mg/m³: Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: respiratory depression
LC₅₀ (Inhalation-Mouse) > 500 mg/m³: Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: respiratory depression
LDLo (Intravenous-Rat) 53 mg/kg: Lungs, Thorax, or Respiration: dyspnea
LDLo (Intravenous-Cat) 625 mg/kg
LDLo (Intravenous-Dog) 50 mg/kg: Behavioral: ataxia; Lungs, Thorax, or Respiration: dyspnea; Gastrointestinal: hypermotility, diarrhea
LDLo (Parenteral-Dog) 9 mg/kg: Behavioral: tremor; Lungs, Thorax, or Respiration: other changes
LDLo (Skin-Cat) 10 gm/kg: Behavioral: tremor, muscle weakness; Gastrointestinal: changes in structure or function of salivary glands
LDLo (Intraperitoneal-Rat) 650 mg/kg: Behavioral: somnolence (general depressed activity), ataxia; Lungs, Thorax, or Respiration: respiratory depression
LCLo (Inhalation-Rat) 1000 ppm/8 hours
TCLo (Inhalation-Rat) 46 mg/m³: Brain and Coverings: other degenerative changes; Behavioral: alteration of classical conditioning
TCLo (Inhalation-Mammal-Species Unspecified) 42 mg/m³/122 days-intermittent: Cardiac: other changes; Liver: other changes; Kidney/Ureter/Bladder: other changes
TDLo (Oral-Rat) 2100 mg/kg/21 days-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Related to Chronic Data: death
TDLo (Oral-Rat) 13 gm/kg/13 weeks-intermittent: Brain and Coverings: other degenerative changes; Related to Chronic Data: death
TDLo (Oral-Rat) 24 mL/kg/12 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases
TDLo (Oral-Rat) 103,000 mg/kg/103 weeks-continuous: Endocrine: tumors; Tumorigenic: active as anti-cancer agent
TDLo (Oral-Rat) 25,200 mg/kg/6 weeks-intermittent: Nutritional and Gross Metabolic: metabolic acidosis
TDLo (Oral-Rat) 52,000 mg/kg/13 weeks-intermittent: Brain and Coverings: other degenerative changes; Kidney/Ureter/Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Related to Chronic Data: death
TDLo (Oral-Rat) 206,000 mg/kg/103 weeks-intermittent: Related to Chronic Data: death

BENZYL ALCOHOL (continued):

TDLo (Oral-Rat) 10,000 mg/kg/16 days-intermittent: Related to Chronic Data: death
TDLo (Oral-Mouse) 12 gm/kg/16 days-intermittent: Related to Chronic Data: death
TDLo (Oral-Mouse) 10,000 mg/kg/16 days-intermittent: Behavioral: somnolence (general depressed activity); Related to Chronic Data: death
TDLo (Oral-Mouse) 52,000 mg/kg/13 weeks-intermittent: Behavioral: changes in motor activity (specific assay)
TDLo (Oral-Mouse) 6000 mg/kg/8 days-intermittent: Behavioral: ataxia; Lungs, Thorax, or Respiration: dyspnea; Related to Chronic Data: death
TDLo (Oral-Mouse) 6 gm/kg: female 6-13 day(s) after conception: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain)
TDLo (Intraperitoneal-Rat) 514 mg/kg: Behavioral: ataxia
DNA Repair (Bacteria-*Bacillus subtilis*) 21 mg/disc
DNA Damage (Rat-Liver) 10 mmol/L
Mutation in Microorganisms (Mouse-Lymphocyte) 250 mg/L
Cytogenetic Analysis (Hamster-Ovary) 4 µg/L
Mutation Test Systems-Not Otherwise Specified (Oral-Drosophila melanogaster) 50 mmol/L
DNA Damage (Human-Liver) 0.1 mmol/L/48 hours
BIS(HEXAMETHYLENE)TRIAMINE:
LD₅₀ (Oral-Rat) 450 mg/kg: Behavioral: food intake (animal); Lungs, Thorax, or Respiration: pulmonary emboli; Gastrointestinal: other changes
LDLo (Skin-Rabbit) 200 mg/kg: Behavioral: food intake (animal); Lungs, Thorax, or Respiration: pulmonary emboli; Liver: other changes
1,2-CYCLOHEXANEDIAMINE:
Standard Draize Test (Skin-Rabbit) 500 mg/24 hours: Moderate
Standard Draize Test (Skin-Rabbit) 0.5 mL: Severe
LD₅₀ (Oral-Rat) 4556 mg/kg: Behavioral: somnolence (general depressed activity), tremor
LDLo (Oral-Rat) 2300 mg/kg: Behavioral: somnolence (general depressed activity); Gastrointestinal: changes in structure or function of salivary glands
LCLo (Inhalation-Rat) 3200 mg/m³/4 hours
TCLo (Inhalation-Rat) 50 mg/m³/2 weeks-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Lungs, Thorax, or Respiration: other changes
4-NONYLPHENOL BRANCHED MIXED ISOMERS:
Standard Draize Test (Skin-Rabbit) 500 mg/24 hours: Severe
Standard Draize Test (Eye-Rabbit) 100 mg: Severe
LD₅₀ (Oral-Rat) 1300 mg/kg: Liver: other changes; Blood: hemorrhage Nutritional and Gross Metabolic: weight loss or decreased weight gain
LD₅₀ (Oral-Rat) 1882 mg/kg
LDLo (Skin Rabbit) 3160 mg/kg: Gastrointestinal: other changes; Liver: other changes; Nutritional and Gross Metabolic: weight loss or decreased weight gain
TDLo (Oral-Rat) 10 mg/kg: Liver: other changes; Kidney/Ureter/Bladder: other changes in urine composition
TDLo (Oral-Rat) 4592 mg/kg/28 days-continuous: Behavioral: wakefulness; Nutritional and Gross Metabolic: weight loss or decreased weight gain
TDLo (Oral-Rat) 6250 mg/kg/50 days-intermittent: Liver: changes in liver weight; Endocrine: changes in luteinizing hormone, changes in gonadotropins
TDLo (Oral-Rat) 12,500 mg/kg/50 days-intermittent: Kidney/Ureter/Bladder: changes in kidney weight; Reproductive: Paternal Effects: testes, epididymis, sperm duct; Related to Chronic Data: changes in testicular weight
TDLo (Oral-Rat) 12,500 mg/kg/50 days-intermittent: Endocrine: androgenic; Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count)
TDLo (Oral-Rat) 7200 mg/kg/72 days-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain
TDLo (Oral-Rat) 90 mg/kg/72 days-intermittent: Immunological Including Allergic: decrease in cellular immune response
TDLo (Oral-Rat) 11,340 mg/kg/56 days-continuous: Nutritional and Gross Metabolic: weight loss or decreased weight gain
TDLo (Oral-Rat) 2520 mg/kg/42 days-continuous: Nutritional and Gross Metabolic: weight loss or decreased weight gain
TDLo (Oral-Rat) 21,262.5 mg/kg/15 weeks-continuous: Kidney/Ureter/Bladder: other changes; Nutritional and Gross Metabolic: weight loss or decreased weight gain
TDLo (Oral-Rat) 6300 mg/kg/15 weeks-continuous: Kidney/Ureter/Bladder: other changes, changes in kidney weight
TDLo (Oral-Rat) 7560 mg/kg/18 weeks-continuous: Related to Chronic Data: changes in ovarian weight
TDLo (Oral-Rat) 525 mg/kg/45 days-intermittent: Brain and Coverings: other degenerative changes
TDLo (Oral-Rat) 11,200 mg/kg/28 days-intermittent: Liver: changes in liver weight; Kidney/Ureter/Bladder: changes in kidney weight; Related to Chronic Data: changes in testicular weight
TDLo (Oral-Rat) 13,500 mg/kg/90 days-intermittent: Behavioral: food intake (animal); Kidney/Ureter/Bladder: changes in kidney weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain
TDLo (Oral-Rat) 550 mg/kg/50 days-intermittent: Liver: hepatitis (hepatocellular necrosis), zonal; Blood: changes in leukocyte (WBC) count; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: transaminases

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

4-NONYLPHENOL BRANCHED MIXED ISOMERS (continued):

TDLo (Oral-Rat) 4400 mg/kg: Multi-generations: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain), physical

TDLo (Oral-Rat) 6500 mg/kg: Multi-generations: Reproductive: Maternal Effects: other effects; Specific Developmental Abnormalities: immune and reticuloendothelial system; Effects on Newborn: delayed effects

TDLo (Oral-Rat) 100 mg/kg: Multi-generations: Reproductive: Specific Developmental Abnormalities: blood and lymphatic systems (including spleen and marrow); Effects on Newborn: growth statistics (e.g.%, reduced weight gain)

TDLo (Oral-Rat) 1.25 mg/kg: Multi-generations: Reproductive: Specific Developmental Abnormalities: blood and lymphatic systems (including spleen and marrow), endocrine system, immune and reticuloendothelial system

TDLo (Oral-Rat) 5363 mg/kg: Multi-generations: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain), biochemical and metabolic, other postnatal measures or effects

TDLo (Oral-Rat) 4.4 gm/kg: female 7-22 day(s) after conception lactating female 14 day(s) post-birth: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain), other postnatal measures or effects

TDLo (Oral-Rat) 3.9 gm/kg: female 7-22 day(s) after conception lactating female 14 day(s) post-birth: Reproductive: Effects on Newborn: biochemical and metabolic

TDLo (Oral-Rat) 100 mg/kg: Multi-generations: Reproductive: Effects on Newborn: germ cell effects (in offspring), other postnatal measures or effects

TDLo (Oral-Rat) 42.5 gm/kg: male 84 day(s) pre-mating female 84 day(s) pre-mating: 3 week(s) post-birth: Reproductive: Maternal Effects: ovaries, fallopian tubes; Effects on Newborn: growth statistics (e.g.%, reduced weight gain)

TDLo (Oral-Rat) 17.5 mg/kg: Multi-generations: Reproductive: Effects on Newborn: physical

4-NONYLPHENOL BRANCHED MIXED ISOMERS (continued):

TDLo (Oral-Rat) 12.6 mg/kg: male 84 day(s) pre-mating female 84 day(s) pre-mating: 3 week(s) post-birth: Reproductive: Maternal Effects: ovaries, fallopian tubes

TDLo (Oral-Rat) 202.5 mg/kg: Multi-generations: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), Paternal Effects: testes, epididymis, sperm duct; growth statistics (e.g.%, reduced weight gain)

TDLo (Oral-Rat) 60 mg/kg: Multi-generations: Reproductive: Maternal Effects: other effects; Fertility: male fertility index (e.g. # males impregnating females per # males exposed to fertile non-pregnant females); Effects on Newborn: live birth index (measured after birth)

TDLo (Oral-Rat) 60 mg/kg: Multi-generations: Reproductive: Effects on Newborn: other neonatal measures or effects

TDLo (Subcutaneous-Rat) 1500 mg/kg/3 days-intermittent: Related to Chronic Data: changes in uterine weight; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: other oxidoreductases

TDLo (Intraperitoneal-Frog) 300 mg/kg/14 days-intermittent: Related to Chronic Data: death

TRIS-2,4,6-(DIMETHYLAMINOMETHYL) PHENOL:

Standard Draize Test (Skin-Rabbit) 2 mg/24 hours: Severe

Standard Draize Test (Skin-Rabbit) 500 µL/24H hours: Severe

Standard Draize Test (Skin-Rat) 0.025 mL: Mild

Standard Draize Test (Skin-Rat) 0.25 mL: Severe

Standard Draize Test (Skin-Eye) 50 µg/24 hours: Severe

LD₅₀ (Oral-Rat) 1200 mg/kg: Peripheral Nerve and Sensation: flaccid paralysis without anesthesia (usually neuromuscular blockage); Lungs, Thorax, or Respiration: dyspnea

LD₅₀ (Oral-Rat) 1673 mg/kg: Behavioral: tremor; Gastrointestinal: ulceration or bleeding from stomach; Liver: other changes

LD₅₀ (Skin-Rat) 1280 mg/kg

CARCINOGENIC POTENTIAL: The following table summarizes the carcinogenicity listing for the components of this product. "NO" indicates that the substance is not considered to be or suspected to be a carcinogen by the listed agency, see section 16 for definitions of other ratings.

CHEMICAL	IARC	EPA	NTP	NIOSH	ACGIH	OSHA	PROP 65
All Components	No	No	No	No	No	No	No

IRRITANCY OF PRODUCT: This product is corrosive and severely irritating by all routes of exposure.

SENSITIZATION TO THE PRODUCT: This product may cause skin sensitivity and allergic reaction in susceptible individuals.

Symptoms can include itching, redness, swelling, welts and rash. Respiratory sensitization is also possible.

Skin Sensitization: Repeated or prolonged skin contact with can cause allergic skin sensitization. A sensitized person who contacts even a small amount of material can develop severe dermatitis with symptoms such as skin redness, itching, rashes and swelling. This can spread from the exposed skin areas to other parts of the body not directly exposed to the material. Exposure to hot vapors can cause reddening of the face, swelling of the area around the eyes and itching.

Respiratory Sensitization: Amine compounds are possible respiratory sensitizers in persons who are susceptible to amines. There are a small number of case reports of occupational asthma that may be related to Triethylenetetramine exposure. Sensitized people can react to low levels of airborne occupational sensitizers that have no effect on non-sensitized people. Symptoms can resemble a cold, flu, mild hay fever or asthma. Effects commonly include difficulty in breathing, chest tightness, wheezing, coughing, sneezing, and runny or blocked nose. Other symptoms such as headache, watery eyes and general feelings of bodily discomfort may also appear.

TOXICOLOGICAL SYNERGISTIC PRODUCTS: Alcohols such as the Benzyl Alcohol component may interact synergistically with chlorinated solvents (e.g. carbon tetrachloride), aromatic hydrocarbons (e.g. xylene) or dithiocarbamates (e.g. disulfiram).

REPRODUCTIVE TOXICITY INFORMATION: This product has not been tested for reproductive toxicity. Animal data indicate possible embryotoxic or teratogenic effects from compounds related to the 4-Nonylphenol Branched Mixed Isomers component, as well as data indicating possible endocrine system effects. No data are specific to this compound.

BIOLOGICAL EXPOSURES INDICES (BEIs): There are no BEI's established for any component of this product at this time.

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 have some mobility. The following information is available for some components.

1-AMINOETHYLPIPERAZINE: Using a structure estimation method based on molecular connectivity indices, the Koc can be estimated to be 43. According to a classification scheme, this estimated Koc value suggests that this compound is expected to have very high mobility in soil. However, the material will exist primarily as a cation in the environment, and cations are expected to adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts, suggesting that mobility may be much lower in some soils.

BENZYL ALCOHOL: Experimental Koc values for Benzyl Alcohol are < 5 for three different soils; Apison (0.11% organic carbon), Fullerton (0.06% organic carbon), and Dormont (1.2% organic carbon). An experimental Koc of 15 was determined for Benzyl Alcohol on a red-brown Australian soil (1.09% organic carbon). According to a classification scheme, these Koc values suggest that Benzyl Alcohol is expected to have very high mobility in soil.

4-NONYLPHENOL BRANCHED MIXED ISOMERS: The Koc of this compound is estimated as 31,000, using a log Kow of 5.71 (1) and a regression-derived equation. According to a classification scheme, this estimated Koc value suggests that this material is expected to be immobile in soil. This compound has been found to strongly adsorb to sewage sludge and stream and pond sediment.

PERSISTENCE AND BIODEGRADABILITY: This product has not been tested for persistence or biodegradability. The following information is available for some components.

1-AMINOETHYLPIPERAZINE: If released to air, an estimated vapor pressure of 6.6X10⁻² mm Hg at 25°C indicates this compound will exist solely as a vapor in the atmosphere. Vapor-phase material will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 1.8 hrs. This compound does not contain chromophores that absorb at wavelengths >290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight. If released to soil, this material is expected to have very high mobility based upon an estimated Koc of 43. However, this compound will exist primarily as a cation in the environment, and cations are expected to adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts, suggesting that mobility may be much lower in some soils. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 6.6X10⁻¹³ atm-cu m/mole. Utilizing the Japanese MITI test, 0-1% of the theoretical BOD was reached in four weeks indicating that biodegradation is not an important environmental fate process. If released into water, this compound is not expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process based upon this compound's estimated Henry's Law constant. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions.

BENZYL ALCOHOL: If released to air, a vapor pressure of 0.094 mm Hg at 25°C indicates Benzyl Alcohol will exist solely as a vapor in the ambient atmosphere. Vapor-phase Benzyl 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 17 hours. If released to soil, Benzyl Alcohol is expected to have very high mobility based upon Koc values of less than 5 to 15 measured in various soils. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 3.1X10⁻⁷ atm-cu m/mole. Benzyl Alcohol is not expected to volatilize rapidly from dry soil surfaces based on its vapor pressure. Benzyl Alcohol is expected to undergo biodegradation under both aerobic and anaerobic conditions based upon results in a number of aqueous biodegradation tests. If released into water, Benzyl Alcohol is not expected to adsorb to suspended solids and sediment based upon the Koc data. Volatilization from water surfaces is not expected to be an important fate process based upon this compound's estimated Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 75 days and 2.2 years, respectively. Hydrolysis is not expected to be an important environmental fate process since Benzyl Alcohol lacks hydrolyzable functional groups.

12. ECOLOGICAL INFORMATION (Continued)

PERSISTENCE AND BIODEGRADABILITY (continued):

4-NONYLPHENOL BRANCHED MIXED ISOMERS: If released to air, a vapor pressure of 2.36X10⁻⁵ mm Hg at 25°C indicates this compound will exist in both the vapor and particulate phases in the ambient atmosphere. Vapor-phase material will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 7.5 hours. Particulate-phase material will be removed from the atmosphere by wet and dry deposition. If released to soil, this compound is expected to be immobile based upon an estimated Koc of 31,000. Volatilization is expected to be important from moist soil surfaces given an estimated Henry's Law constant of 1.1X10⁻⁶ atm-cu m/mole, derived from its vapor pressure and water solubility of 6.35 mg/l. However, adsorption to soil is expected to attenuate volatilization. If released to water, this compound is expected to adsorb strongly to suspended solids and sediment. Volatilization from water surfaces is expected to be an important fate process based upon this compound's Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 1.1 and 17 days, respectively. However, volatilization from water surfaces is expected to be attenuated by adsorption to suspended solids and sediment in the water column. Limited data from sludge-amended soil studies indicate that this material may undergo aerobic biodegradation. After a 5-day lag period, 100 mg/kg of this material applied to a sewage sludge-amended soil decreased to approximately 10% of its original concentration during a 40-day incubation. In the upper layers of surface water, this compound may undergo sensitized photolysis.

BIO-ACCUMULATION POTENTIAL: This product has not been tested for bio-accumulation potential. The 4-Nonylphenol Branched Mixed Isomers component has BCFs ranging from approx 2 to 350 suggest the potential for bioconcentration in aquatic organisms ranges from low to high; however, under most conditions, depuration in fish will be rapid and indicating that Nonylphenol uptake is readily reversible which suggest that long-term bioconcentration will be low if exposure to the material ceases. Available information for the other components does not indicate a hazard of bioconcentration.

ECOTOXICITY: This product is harmful to aquatic organisms and may cause both acute and long-lasting adverse effects. All release to terrestrial, atmospheric and aquatic environments should be avoided. This product has not been tested for aquatic toxicity; however, the 4-Nonylphenol Branched Mixed Isomers component is toxic to aquatic organisms. The following aquatic toxicity data are available this material and the Benzyl Alcohol component (only select data for the Benzyl Alcohol component are presented).

BENZYL ALCOHOL:

LC₅₀ (*Pimephales promelas* fathead minnows) 96 hours = 460 mg/L (static bioassay in Lake Superior water at 18-22°C)

LC₅₀ (*Medina beryllina* tidewater silverside fish) 96 hours = 15 ppm (static bioassay in synthetic seawater at 23°C, mild aeration after 24 hours)

LC₅₀ (*Daphnia*) 24 hours = 55; 400 mg/L

EC₅₀ (*Photobacterium phosphoreum*) 30 minutes = 71 mg/L

EC₅₀ (*Scenedesmus quadricauda*) 3 hours = 79 mg/L

NONYLPHENOL MIXED ISOMERS:

LC₅₀ (Bay Mussel) 96 hours = 3.0 mg/L/Conditions of bioassay not specified

LC₅₀ (*Salmo gairdneri* Rainbow trout) 96 hours = 0.56-0.92 mg/L/Conditions of bioassay not specified

LC₅₀ (*Leuciscus idus* Golden Orfe) 48 hours = 0.95 mg/L/Conditions of bioassay not specified

NONYLPHENOL MIXED ISOMERS (continued):

LC₅₀ (*Pimephales promelas* fathead minnow) 48 hours = 0.164 (0.145-0.186) mg/L, wt 220 mg, flow-through bioassay, dissolved oxygen 7.4 (4.6-8.8) mg/L, water hardness 44.9 (42.4-46.6) mg/L as calcium carbonate, pH 6.9-7.7, alkalinity 42.9 (39.6-61.4) mg/L calcium carbonate, temp: 26.4 + or - 1.4 deg C, Purity 91% 4-nonylphenol, 4% 2-nonylphenol, 2% nonylphenol

LC₅₀ (*Pimephales promelas* fathead minnow) 72 hours = 0.137 (0.34-0.140) mg/L, wt 220 mg, flow-through bioassay, dissolved oxygen 7.4 (4.6-8.8) mg/L, water hardness 44.9 (42.4-46.6) mg/L as calcium carbonate, pH 6.9-7.7, alkalinity 42.9 (39.6-61.4) mg/L calcium carbonate, temp: 26.4 + or - 1.4 deg C, Purity 91% 4-nonylphenol, 4% 2-nonylphenol, 2% Nonylphenol

LC₅₀ (*Pimephales promelas* fathead minnow) 96 hours = 0.135 (0.098-0.187) mg/L; size 220 mg, flow-through bioassay, dissolved oxygen 7.4 (4.6-8.8) mg/L, water hardness 44.9 (42.4-46.6) mg/L as calcium carbonate, pH 6.9-7.7, alkalinity 42.9 (39.6-61.4) mg/L calcium carbonate, temp: 26.4 + or - 1.4 deg C, Purity 91% 4-nonylphenol, 4% 2-nonylphenol, 2% nonylphenol

OTHER ADVERSE EFFECTS: This material is not expected to have any ozone depletion potential.

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

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: As supplied, this product would not be a hazardous waste as defined by U.S. federal regulation (40 CFR 261) if discarded or disposed. State and local regulations may differ from federal regulations. The generator of the waste is responsible for proper waste determination and management.

U.S. EPA WASTE NUMBER: Wastes of this product should be test to see if they meet the criteria of D002 (Corrosivity Characteristic) and D001 (Ignitability characteristic).

14. TRANSPORTATION INFORMATION

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

UN IDENTIFICATION NUMBER:

UN 2735

PROPER SHIPPING NAME:

Polyamines, liquid, corrosive, n.o.s. (1-Aminoethylpiperazine, Bis(hexamethylene)triamine)

HAZARD CLASS NUMBER and DESCRIPTION:

8 (Corrosive)

PACKING GROUP:

PG III

DOT LABEL(S) REQUIRED:

Class 8 (Corrosive)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2012): 153

MARINE POLLUTANT: The 4-Nonylphenol Branched Mixed Isomers component meets the criteria of a Marine Pollutant (as defined by 49 CFR 172.101).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is classified as Dangerous Goods, per regulations of Transport Canada.

UN IDENTIFICATION NUMBER:

UN 2735

PROPER SHIPPING NAME:

Polyamines, liquid, corrosive, n.o.s. (1-Aminoethylpiperazine, Bis(hexamethylene)triamine)

HAZARD CLASS NUMBER and DESCRIPTION:

8 (Corrosive)

PACKING GROUP:

PG III

HAZARD SHIPPING LABEL(S) REQUIRED:

Class 8 (Corrosive)

SPECIAL PROVISIONS:

16

EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX:

5

ERAP INDEX:

None

PASSENGER CARRYING SHIP INDEX:

None

PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: 5

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

UN IDENTIFICATION NUMBER:

UN 2735

PROPER SHIPPING NAME:

Polyamines, liquid, corrosive, n.o.s. (1-Aminoethylpiperazine, Bis(hexamethylene)triamine)

HAZARD CLASS or DIVISION:

8 (Corrosive)

HAZARD LABEL(S) REQUIRED:

Class 8 (Corrosive)

PACKING GROUP:

III

14. TRANSPORTATION INFORMATION (Continued)

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

EXCEPTED QUANTITIES: E1
PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION: 852
PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG: 5 L
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION: Y841
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PER PKG: 1 L
CARGO AIRCRAFT ONLY PACKING INSTRUCTION: 856
CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY PER PKG: 60 L
SPECIAL PROVISIONS: A3, A803
ERG CODE: 8L

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

UN No.: 2735
PROPER SHIPPING NAME: Polyamines, liquid, corrosive, n.o.s. (1-Aminoethylpiperazine, Bis(hexamethylene)triamine)
HAZARD CLASS NUMBER: 8 (Corrosive)
LABELS: Class 8 (Corrosive)
PACKING GROUP: III
SPECIAL PROVISIONS: 223, 274
LIMITED QUANTITIES: 5 L
EXCEPTED QUANTITIES: E1
PACKING: Instructions: P001; Provisions: LP01
IBCs: Instructions: IBC03; Provisions: None
TANKS: Instructions: T7; Provisions: TP1, TP28
EmS: F-A, S-B
STOWAGE CATEGORY: Category A. 'Separated from acids.'
MARINE POLLUTANT: The 4-Nonylphenol Branched Mixed Isomers meets the criteria of a marine pollutant.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

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

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

U.S. TSCA INVENTORY STATUS: All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): The default RQ for corrosive liquids of 100 lb (45.4 kg) for unlisted hazardous wastes of characteristic of corrosivity (D002) is applicable.

U.S. CLEAN AIR ACT (CA 112r) THRESHOLD QUANTITY (TQ): Not applicable.

U.S. CLEAN WATER ACT REQUIREMENTS: Not applicable.

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

ADDITIONAL CANADIAN REGULATIONS:

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

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: Not applicable

CANADIAN WHMIS REGULATIONS: This product is classified as a Controlled Product, Hazard Classes B3 (Combustible Liquid), D1B (Poisonous and Infectious Material, Toxic); and D2B (Poisonous and Infectious Material, Other effects/Toxic: Eye Irritation, Skin Irritation, Respiratory Tract and Skin Sensitization, Limited Evidence of Reproductive Effects), E (Corrosive) as per the Controlled Product Regulations.



ADDITIONAL MEXICAN REGULATIONS:

MEXICAN WORKPLACE REGULATIONS (NOM-018-STPS-2000): This product is classified as hazardous.

16. OTHER INFORMATION

U.S. ANSI STANDARD LABELING (Precautionary Statements): DANGER! CORROSIVE BY ALL ROUTES OF EXPOSURE; CAN CAUSE SEVERE IRRITATION OR BURNS DEPENDING ON CONCENTRATION AND DURATION OF CONTACT. BURNS MAY NOT BE IMMEDIATELY VISIBLE OR PAINFUL. EYE CONTACT MAY CAUSE BLINDNESS. MAY BE FATAL IF INGESTED OR BY SEVERE INHALATION EXPOSURE. MAY CAUSE TOXIC EFFECT BY INHALATION, INGESTION OR SKIN CONTACT. TOXIC EFFECTS MAY BE DELAYED. CAN CAUSE SKIN SENSITIZATION AND MAY CAUSE RESPIRATORY SENSITIZATION. CONTAINS COMPOUND WITH LIMITED EVIDENCE OF REPRODUCTIVE TOXICITY IN ANIMALS. COMBUSTIBLE LIQUID; CAN IGNITE IF EXPOSED TO DIRECT FLAME OR IF EXPOSED TO HIGH TEMPERATURE. CONTAINS COMPOUND WITH ACUTE AND CHRONIC TOXICITY TO AQUATIC ORGANISMS; HARMFUL IF RELEASED TO THE ENVIRONMENT. Avoid contact with eyes, skin, and clothing. Avoid breathing mist, vapors or fume. Do not taste or swallow. Wash thoroughly after handling. Keep container tightly closed. Use only with adequate ventilation. Keep away from heat and flame. Wear gloves, eye protection, respiratory protection, and appropriate body protection.

16. OTHER INFORMATION (Continued)

U.S. ANSI STANDARD LABELING (continued): FIRST-AID: In case of contact, immediately flush skin and eyes with plenty of water. Remove contaminated clothing and shoes. Get medical attention if irritation develops or persists. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, foam, dry chemical, or CO₂. Do not use halogenated media. **IN CASE OF SPILL:** Absorb spilled product with polypads or other suitable absorbing material. Place all spill residue in an appropriate container and seal. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations and those of Canada.

GLOBAL HARMONIZATION SYSTEM CLASSIFICATION:

Classification: Combustible Liquid Category 4, Reproductive Toxicity Category 2, Acute Oral Toxicity Category 4, Acute Dermal Toxicity Category 4, Acute Inhalation Toxicity Category 4, Skin Corrosion Category 1B, Skin Sensitization Category 1, Aquatic Acute Toxicity Category 1, Aquatic Chronic Toxicity Category 1

Signal Word: Danger

Hazard Statements: H227: Combustible liquid. H361fd: Suspected of damaging fertility. Suspected of damaging the unborn child. H302 + H312 + H332: Harmful if swallowed, in contact with skin or if inhaled. H314: Causes severe skin burns and eye damage. H317: May cause an allergic skin reaction. H410: Very toxic to aquatic life with long-lasting effects.

Precautionary Statements:

Prevention: P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. — No smoking. P260: Do not breathe mist/vapors/spray. P264: Wash thoroughly after handling. P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in a well-ventilated area. P272: Contaminated work clothing should not be allowed out of the workplace. P273: Avoid release to the environment. 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. Do not use halons. P308 + P313: IF exposed or concerned: Get medical advice/attention. P301 + P330 + P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P304 + P340 + P310: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor. P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P333 + P313: If skin irritation or rash occurs: Get medical advice/attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P363: Wash contaminated clothing before reuse. P321: Specific treatment (remove from exposure and treat symptoms). Refer to other portions of precautionary text on this label, SDS or other product information sheets, as appropriate. P391: Collect spillage.

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

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

Hazard Symbols/Pictograms: GHS05, GHS07, GHS08, GHS09

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

The information presented in this Material Safety Data Sheet is presented in good faith based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. In no case shall the descriptions, information, data or designs provided be considered a part of our terms and conditions of sale.

All materials may present hazards and should be used with caution. Because many factors may affect processing or application/use, we recommend that you make tests to determine the suitability of a product for your particular purpose prior to use. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices or applicable federal, state, or local laws or regulations. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

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: September 2012: Up-date and revise entire MSDS to include current GHS requirements; change in formulation.

DATE OF PRINTING

March 27, 2013

DEFINITIONS OF TERMS

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

KEY ACRONYMS:

CHEMTREC: Chemical Transportation Emergency Center, a 24-hour emergency information and/or emergency assistance to emergency responders.

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

DFG MAKs: Federal Republic of Germany Maximum Concentration Values in the workplace. Exposure limits are given as TWA (Time-Weighted Average) or PEAK (short-term exposure) values.

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

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

KEY ACRONYMS (continued):

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.

DFG MAK Pregnancy Risk Group Classification (continued): Group D: Classification in one of the groups A–C is not yet possible because, although the data available may indicate a trend, they are not sufficient for final evaluation.

IDLH: Immediately Dangerous to Life and Health. This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

LOQ: Limit of Quantitation.

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 a there is a danger of cutaneous absorption.

DEFINITIONS OF TERMS (Continued)

KEY ACRONYMS (continued):

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 exposures; extremely toxic; irreversible injury may result from brief contact. *Skin Irritation:* Not appropriate. Do not rate as a 4, based on skin irritation alone. *Eye Irritation:* Not appropriate. Do not rate as a 4, based on eye irritation alone. *Oral Toxicity LD₅₀ Rat:* ≤ 1 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* ≤ 20 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* ≤ 0.05 mg/L.

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

PHYSICAL HAZARD: 0 Water Reactivity: Materials that do not react with water. *Organic Peroxides:* Materials that are normally stable, even under fire conditions and will not react with water. *Explosives:* Substances that are Non-Explosive. *Compressed Gases:* No Rating. *Pyrophorics:* No Rating. *Oxidizers:* No 0 rating. *Unstable Reactives:* Substances that will not polymerize, decompose, condense, or self-react. **1 Water Reactivity:** Materials that change or decompose upon exposure to moisture. *Organic Peroxides:* Materials that are normally stable, but can become unstable at high temperatures and pressures. These materials may react with water, but will not release energy violently. *Explosives:* Division 1.5 & 1.6 explosives. Substances that are very insensitive explosives or that do not have a mass explosion hazard. *Compressed Gases:* Pressure below OSHA definition. *Pyrophorics:* No Rating. *Oxidizers:* Packaging Group III oxidizers; Solids: any material that in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65%) cellulose mixture and the criteria for Packing Group I and II are not met. *Unstable Reactives:* Substances that may decompose, condense, or self-react, but only under conditions of high temperature and/or pressure and have little or no potential to cause significant heat generation or explosion hazard. Substances that readily undergo hazardous polymerization in the absence of inhibitors. **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.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued): 2 (continued): 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. *Reactives:* Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure, but have a low potential (or low risk) for significant heat generation or explosion. Substances that readily form peroxides upon exposure to air or oxygen at room temperature. **3 Water Reactivity:** Materials that may form explosive reactions with water. *Organic Peroxides:* Materials that are capable of detonation or explosive reaction, but require a strong initiating source or must be heated under confinement before initiation; or materials that react explosively with water. *Explosives:* Division 1.3 explosives. Explosive substances that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but do not have a mass explosion hazard. *Compressed Gases:* Pressure ≥ 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *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. *Pyrophorics:* Add to the definition of Flammability 4. *Oxidizers:* No 4 rating. *Unstable Reactives:* Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a high potential (or high risk) to cause significant heat generation or explosion.

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

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

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

DEFINITIONS OF TERMS (Continued)

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

FLAMMABILITY HAZARD (continued): 1 (continued): 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) (i.e. Class II and Class IIIA liquids.) Solid materials in the form of powders or coarse dusts of representative diameter between 420 microns (40 mesh) and 2 mm (10 mesh) that burn rapidly but that generally do not form explosive mixtures with air. Solid materials in fibrous or shredded form that burn rapidly and create flash fire hazards, such as cotton, sisal, and hemp. Solids and semisolids that readily give off flammable vapors. Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **3** Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions. Liquids having a flash point below 22.8°C (73°F) and having a boiling point at or above 37.8°C (100°F) and those liquids having a flash point at or above 22.8°C (73°F) and below 37.8°C (100°F) (i.e. Class IB and IC liquids). Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air. Flammable or combustible dusts with representative diameter less than 420 microns (40 mesh). Materials that burn with extreme rapidity, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **4** Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily. Flammable gases. Flammable cryogenic materials. Any liquid or gaseous materials that is liquid while under pressure and has a flash point below 22.8°C (73°F) and a boiling point below 37.8°C (100°F) (i.e. Class IA liquids). Materials that ignite when exposed to air, Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

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

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (NFPA). **Flash Point:** Minimum temperature at which a liquid gives off sufficient vapor to form an ignitable mixture with air near the surface of the liquid or within the test vessel used. **Autoignition Temperature:** Minimum temperature of a solid, liquid, or gas required to initiate or cause self-sustained combustion in air with no other source of ignition. **LEL:** Lowest concentration of a flammable vapor or gas/air mixture that will ignite and burn with a flame. **UEL:** Highest concentration of a flammable vapor or gas/air mixture that will ignite and burn with a flame.

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. **LD₅₀:** Lethal Dose (solids & liquids) that kills 50% of the exposed animals. **LC₅₀:** Lethal Concentration (gases) that kills 50% of the exposed animals. **ppm:** Concentration expressed in parts of material per million parts of air or water. **mg/m³:** Concentration expressed in weight of substance per volume of air. **mg/kg:** Quantity of material, by weight, administered to a test subject, based on their body weight in kg. **TDLo:** Lowest dose to cause a symptom. **TCLo:** Lowest concentration to cause a symptom. **TD₀, LDLo, and LD₀, or TC, 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.

REPRODUCTIVE INFORMATION: A **mutagen** is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational 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.

ECOLOGICAL INFORMATION:

EC: Effect concentration in water. **BCF:** 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: This section explains the impact of various laws and regulations on the material.

U.S.:

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

CANADA:

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