Section 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, EC Directives, and the Japanese Industrial Standard JIS Z 9250: 2000

NAME USED ON LABEL: **APICAL FILM: AV, AH**
PRODUCT USE: **INDUSTRIAL**
SUPPLIER/MANUFACTURER'S NAME: KANEKA TEXAS CORPORATION – APICAL® DIVISION
ADDRESS: 6161 Underwood Road
Pasadena, Texas 77507
EMERGENCY PHONE: **(800) 424-9300 or (703) 527-3887 (CHEMTREC)**
PRODUCT INFORMATION PHONE: (800) 222-8128
CHEMICAL NAME: Polyimide Film
CHEMICAL FAMILY NAME: Polyimide Film

NOTE: These products are defined as an "Article" under the U.S. Federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the Canadian Workplace Hazardous Materials Standard. These products are also not considered dangerous substances or dangerous preparations under the standards of the European Community. Refer to Section 15 (Regulatory Information) for specific regulatory citations. As an article, these products present negligible health and physical hazards under reasonably anticipated circumstances of use. Subsequently, a Material Safety Data Sheet is not required for these products under Standards cited above. This document is prepared to provide persons using these products with additional safety information.

Section 2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: These products are amber, transparent films. **Health Hazards:** These products present no significant health hazard under normal circumstances of handling. If subjected to very high temperatures, thermal degradation may release toxic compounds, including carbon oxides and nitrogen oxides. **Flammability Hazard:** These products can char, but should not burn if involved in a fire, or subjected to temperature above 400°C (752°F) and in normal oxygen content atmospheres. **Reactivity Hazard:** This product is not reactive. **Environmental Hazard:** There are no significant environmental hazards posed by these products; however waste products should be disposed of properly in permitted landfill. **Emergency Considerations:** Emergency responders must wear proper personal protective equipment for the incident to which they are responding.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: These products pose no significant hazards by all routes of exposure:

INHALATION: Due to the form of these products, inhalation is not a route of exposure. If products are heated to decomposition, inhalation of decomposition products (carbon and nitrogen oxides), can be irritating to the nose, throat and respiratory system.

CONTACT WITH SKIN or EYES: Skin and eye contact with these products should pose no significant hazard, beyond the possibility of cuts from handling the films similar to "paper cuts". If heated to decomposition, irritation of skin and eyes may occur from decomposition fumes.

SKIN ABSORPTION: Although the Dimethyl Acetamide and Dimethyl Formamide components of these products are known to be absorbed via intact skin, the form of these products make this route of exposure to these compounds unlikely.

INGESTION: Ingestion is not anticipated to be a likely route of exposure to this product.

INJECTION: Accidental injection of this product, via laceration or puncture by a contaminated object, may cause pain and irritation in addition to the wound.

ADDITIONAL INFORMATION: Caution: Do not use in medical applications involving implantation in the human body or in contact with fluids or tissues.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	0
FLAMMABILITY HAZARD (RED)	1
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT

SEE SECTION 8

For Routine Industrial Use and Handling Applications

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Overexposure to these products may cause the following health effects**:**

ACUTE: These products pose no significant hazards by all routes of exposure under normal circumstances of use and handling. If heated to decomposition, irritation of respiratory system, skin and eyes may occur from decomposition fumes.

CHRONIC: There are no known chronic effects from these products.

TARGET ORGANS: ACUTE: Decomposition Fumes Only: Respiratory system, skin, eyes. CHRONIC: None known.

Section 3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	EINECS #	ENCS #	w/w %	EXPOSURE LIMITS IN AIR					
					ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
					TWA	STEL	TWA	STEL	IDLH	
					ppm	ppm	ppm	ppm	ppm	ppm
Polyimide polymer	Trade Secret	Unlisted	Unlisted	100	NE	NE	NE	NE	NE	NE

NE = Not Established. NIC = Noticed of Intended Change. 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, EC Directives and the Japanese Industrial Standard *JIS Z 9250: 2000.*

Section 4. FIRST-AID MEASURES

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to health professional with victim.

SKIN EXPOSURE: Under normal circumstances, this product is not expected to cause adverse effect by skin contact. While not expected, if adverse effect occurs after skin contact, begin decontamination with running water. Minimum flushing is for 15 minutes. Do not interrupt flushing. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek medical attention if adverse effect occurs.

INHALATION: Due to the form of the products, inhalation is not a potential route of exposure to these products. If decomposition fumes from heated product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

EYE or SKIN EXPOSURE: If tissue damage occurs after eye or skin contact, place a sterile bandage over the affected area and contact physician or other medical health professional.

INGESTION: If this product 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 side (head-down position, if possible) to maintain an open airway and prevent aspiration.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Non known.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

Section 5. FIRE-FIGHTING MEASURES

FLASH POINT: Not determined.

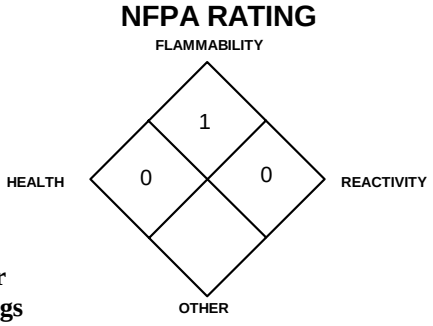
AUTOIGNITION TEMPERATURE:
Not determined.

FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL)**:** Not determined.
Upper (UEL)**:** Not determined.

FIRE EXTINGUISHING MATERIALS:

Water Spray**:** YES
Carbon Dioxide**:** YES
Foam**:** YES
Dry Chemical**:** YES
Halon**:** YES
Other**:** Any "ABC" Class.

See Section 16 for Definition of Ratings



UNUSUAL FIRE AND EXPLOSION HAZARDS: These products pose a slight fire hazard at elevated temperatures. When involved in a fire, these films may decompose and produce irritating vapors, acrid smoke, and toxic gases (e.g., carbon monoxide, carbon dioxide, nitrogen oxides, dimethylamine). As with many plastic films, these product have the potential to form a static charge.

Explosion Sensitivity to Mechanical Impact**:** Not sensitive.
Explosion Sensitivity to Static Discharge**:** Not sensitive .

SPECIAL FIRE-FIGHTING PROCEDURES: Avoid scattering burning material. Fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move fire-exposed containers if it can be done without risk to firefighters. If possible, firefighters should control run-off water to prevent environmental contamination. Rinse contaminated equipment with soapy water before returning such equipment to service.

Section 6. ACCIDENTAL RELEASE MEASURES

SPILL RESPONSE PROCEDURES: If these products are dropped, film can be picked-up or swept-up. Persons cleaning-up the film should wear appropriate goggles, and suitable body protection. Dispose of waste product appropriately. No other response is normally necessary for clean-up

Section 7. HANDLING and USE

WORK AND HYGIENE PRACTICES: Wash thoroughly after handling these products. Do not eat, drink, smoke, or apply cosmetics while handling these products. Use in a well-ventilated location. These products may cause a slip hazard if good housekeeping practices are not followed.

STORAGE AND HANDLING PRACTICES: All employees who handle these films should be trained to handle them appropriately. Containers of these products must be properly labeled. Store product in a cool, dry location, away from direct sunlight, or sources of intense heat. Store away from incompatible materials (see Section 10, Stability and Reactivity). Keep containers tightly closed when not in use. Inspect all incoming product containers before storage to ensure containers are properly labeled and not damaged.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely.

Section 8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS FOR COMPONENTS: Please refer to exposure limits given in Section 2 (Composition and Information On Ingredients).

VENTILATION AND ENGINEERING CONTROLS: No special measures are normally needed when handling these films, beyond normal building ventilation.

RESPIRATORY PROTECTION: None needed under normal circumstances of use. Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients) if applicable. If respiratory protection is needed, 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, and the European Standard EN149, and EC member states, 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, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: None needed under normal circumstances of use. Wear safety glasses or goggles if during the use of this product operations may produce flying debris or particulates. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, the European Standard EN166 or applicable Standards of Japan for further information.

HAND PROTECTION: Due to possibility of cuts from film, light-weight gloves (fabric or latex) may be appropriate to wear when handling film. If necessary, refer to U.S. OSHA 29 CFR 1910.138 appropriate Standards of Canada, the European Economic Community and applicable Standards of Japan.

BODY PROTECTION: If necessary, use body protection appropriate for task. If necessary, refer to appropriate Standards of Canada, the European Economic Community or Japan.

Section 9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY (water = 1): Not applicable.
BOILING POINT: Not applicable.
SPECIFIC GRAVITY (water = 1): Not determined
SOLUBILITY IN WATER: Insoluble.
EVAPORATION RATE (n-BuAc = 1): Not applicable.
ODOR THRESHOLD: Not applicable.
PERCENT VOLATILES: 1% max.
SPECIFIC VOLUME: Not applicable.
MELTING POINT: May thermally degrade above 400°C (752°F)
pH: Not applicable.
MOLECULAR WEIGHT: Not available.
EXPANSION RATIO Not applicable.
VAPOR PRESSURE: Not applicable.
LOG COEFFICIENT WATER/OIL DISTRIBUTION: Not determined.

APPEARANCE, ODOR AND COLOR: These products are amber-colored, odorless films.
HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance is a good warning properties for this material in event of an accidental release.

Section 10. STABILITY and REACTIVITY

STABILITY: Stable under conditions of normal temperature and pressure.
DECOMPOSITION PRODUCTS: Thermal decomposition products include dimethylamine, carbon monoxide, carbon dioxide, and oxides of nitrogen.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: None known.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Exposure to extreme temperatures.

Section 11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The toxicity data available for components of greater than 1% are not applicable to these products due to the solid film form.
GENERAL TOXICITY INFORMATION: Due to the form of these products, no significant hazard is expected by any route of exposure. Heating to decomposition may form toxic and irritating fumes, including oxides of carbon and nitrogen.
SUSPECTED CANCER AGENT: The components of these products are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

N,N-DIMETHYL ACETAMIDE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen);
N,N-DIMETHYL FORMAMIDE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

The remaining components of these products are not found on the following lists: U.S. FEDERAL OSHA Z LIST, NTP, IARC, 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 dusts or fumes from heated product may cause respiratory irritation. Prolonged, skin contact may cause irritation. Eye contact can cause irritation, with the possibility of delayed symptoms.
SENSITIZATION TO THE PRODUCT: The components of these products are not known to be human skin or respiratory sensitizers.
REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of these products on the human reproductive system.

Mutagenicity**:** The components of these products are not reported to cause mutagenic effects in humans.
Embryotoxcity**:** The components of these products are not reported to cause embryotoxic effects in humans.
Teratogenicity**:** The components of these products are not reported to cause teratogenic effects in humans.
Reproductive Toxicity: The components of these products are not reported to cause adverse reproductive effects in humans.

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.

ACGIH BIOLOGICAL EXPOSURE INDICES: There are ACGIH Biological Exposure Indices (BEIs) determined for the N,N-Dimethyl Formamide and N,N-Dimethyl Acetamide components of these products. These BEIs are not presented in this MSDS as exposure to these compounds is unlikely, due to the form of the products.

Section 12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: No data currently, available. These products are not expected to bio-degrade significantly in the environment.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No data currently available.
EFFECT OF CHEMICAL ON AQUATIC LIFE: No data currently available.

Section 13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: As supplied, these products do not meet the definition of a hazardous waste. Recover, reclaim or recycle the product, as appropriate. May be disposed of as a solid waste, sealed in an appropriate container.

If mixed with other chemicals, the person using the product must determine if the waste mixture meets the definition of any hazard class and dispose of in accordance with appropriate U.S. Federal, State, and local regulations, or the applicable standards of Canada and its Provinces, those of EC Member States and of Japan.

U.S. EPA WASTE NUMBER: Not applicable.

Section 14. TRANSPORTATION INFORMATION

THESE PRODUCTS ARE 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

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): Not Applicable

MARINE POLLUTANT: The components of these products are not classified by the DOT as a Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: These products are not considered as hazardous goods, per the regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA) DESIGNATION: These products are not considered as dangerous goods, per rules of IATA.

INTERNATIONAL MARITIME ORGANIZATION (IMO): These products are not considered as dangerous goods, per rules of the IMO.

JAPAN SHIP SAFETY LAW, PORT REGULATION LAW: These products are not regulated according to Japan Ship Safety Law.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): These products are not considered by the United Nations Economic Commission for Europe to be dangerous goods.

Section 15. REGULATORY INFORMATION

ADDITIONAL UNITED STATES REGULATIONS:

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

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
N,N-Dimethyl Formamide	No	No	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of these products. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): N,N-Dimethyl Formamide = 100 lb (45.4 kg)

U.S. TSCA INVENTORY STATUS: This is an article and is not subject to the requirements of TSCA. The components of these products are listed on the TSCA Inventory or are excepted as polymers of listed compounds applies per 40 CFR 723.259(e)(2).

OTHER U.S. FEDERAL REGULATIONS: This product meets the definition of an "Article" under the U.S. Federal OSHA Hazard Communication Standard (29 CFR 1910.1200). For further information, the definition of "Article" is provided below.

Article means a manufactured item other than a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, *e.g.*, minute or trace amounts of a hazardous chemical, and does not pose a physical hazard or health risk to employees.

U.S. STATE REGULATORY INFORMATION: The components of these products are covered under specific State regulations, as denoted below**:**

Alaska - Designated Toxic and Hazardous Substances: Dimethyl Acetamide, Dimethyl Formamide.
California - Permissible Exposure Limits for Chemical Contaminants: Dimethyl Acetamide, Dimethyl Formamide.
Florida - Substance List: Dimethyl Acetamide, Dimethyl Formamide.
Illinois - Toxic Substance List: Dimethyl Acetamide, Dimethyl Formamide.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Dimethyl Acetamide, Dimethyl Formamide.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Dimethyl Acetamide, Dimethyl Formamide.
Missouri - Employer Information/Toxic Substance List: Dimethyl Acetamide, Dimethyl Formamide.
New Jersey - Right to Know Hazardous Substance List: Dimethyl Acetamide, Dimethyl Formamide
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Dimethyl Acetamide, Dimethyl Formamide
Rhode Island - Hazardous Substance List: Dimethyl Acetamide, Dimethyl Formamide.
Texas - Hazardous Substance List: Dimethyl Acetamide, Dimethyl Formamide.
West Virginia - Hazardous Substance List: Dimethyl Acetamide, Dimethyl Formamide.
Wisconsin - Toxic and Hazardous Substances: Dimethyl Acetamide, Dimethyl Formamide.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The components of these products are not on the California Proposition 65 Lists.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The N,N-Dimethyl Formamide and N,N-Dimethyl Acetamide components are on the DSL Inventory. The 4,4'-Diaminodiphenyl ether-p-phenylenediamine-pyromellitic dianhydride block copolymer is not listed.

OTHER CANADIAN REGULATIONS: These products meet the definition of an article under WHMIS Regulations (Hazardous Products Act, 6&7, Part II (Sections 11 and 12).

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

CANADIAN WHMIS CLASSIFICATION AND SYMBOL: Not applicable.

ADDITIONAL EUROPEAN COMMUNITY INFORMATION:

EC LABELING AND CLASSIFICATION: These products do not meet the definition of any hazard class as defined by the European Community Council Directive 67/548/EEC. As an article, this product is not regulated as a dangerous substance (Council Directive 88/379/EEC; Articles 1, 2 and 3) because it does not meet the applicable definitions.

EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOLS: Not applicable.

ADDITIONAL JAPANESE REGULATIONS:

JAPANESE ENCS INVENTORY: The 4,4'-Diaminodiphenyl Ether-P-Phenylenediamine-Pyromellitic Dianhydride Block Copolymer component of this product is not on the ENCS Inventory. The remaining components are on the ENCS Inventory.

POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW: The components of these products are not listed under the Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

Section 16. OTHER INFORMATION

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
619/670-0609

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.

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 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.

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.

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.

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.

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 LD_{50} Rat*: < 5000 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: < 2000 mg/kg. *Inhalation Toxicity 4-hrs LC_{50} 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 LD_{50} Rat*: > 500-5000 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: > 1000-2000 mg/kg. *Inhalation Toxicity LC_{50}* 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 LD_{50} Rat*: > 50-500 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: > 200-1000 mg/kg. *Inhalation Toxicity LC_{50} 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 LD_{50} Rat*: > 1-50 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: > 20-200 mg/kg. *Inhalation Toxicity LC_{50} 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 LD_{50} Rat*: ≤ 1 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: ≤ 20 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: ≤ 0.05 mg/L).

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DEFINITIONS OF TERMS (Continued)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

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: 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. *Explosives*: 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.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued):

1 (continued): *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.).

DEFINITIONS OF TERMS (Continued)

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

HEALTH HAZARD: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury).

FLAMMABILITY HAZARD: **0** Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand. **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 **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. **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. **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.

INSTABILITY HAZARD: **0** Materials that in themselves are normally stable, even under fire conditions. **1** Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures. **2** Materials that readily undergo violent chemical change at elevated temperatures and pressures. **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. **4** Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures.

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the **N**ational **F**ire **P**rotection **A**ssociation (**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: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - 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/m^3** 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:

ACGIH: American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

This section explains the impact of various laws and regulations on the material. **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. **O**ccupational **S**afety and **H**ealth **A**dministration (**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/NDSL)**; 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 and INTERNATIONAL:

The DFG: This is the Federal Republic of Germany's Occupation Health Agency, similar to the U.S. OSHA. **EC** is the European Community (formerly known as the **EEC,** European Economic Community). **EINECS:** This is 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. **AICS** is the Australian Inventory of Chemical Substances. **MITI** is the Japanese Minister of International Trade and Industry