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: **KANE ACE MX-416**
SUPPLIER/MANUFACTURER'S NAME: KANEKA TEXAS CORPORATION
ADDRESS: 6161 Underwood Road
Pasadena, Texas 77507
EMERGENCY PHONE: **(281) 474-1836**
TECHNICAL INFORMATION PHONE: (281) 447-0755
CHEMICAL NAME: Epoxy Resin Mixture
CHEMICAL FAMILY NAME: Polyfunctional Liquid Epoxy Resin/Butadiene-Acrylic Copolymer Mixture
MSDS NUMBER: 02990

Section 2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	EINECS #	ENCS #	w/w %	EXPOSURE LIMITS IN AIR					
					ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
					TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	ppm
Butadiene-Acrylic Copolymer	Trade Secret	Exempt as Polymer	Exempt as Polymer	5 – 35%	NE	NE	NE	NE	NE	NE
Tetraglycidyl Methylenedianiline	28768-32-3	249-204-3	4-112	65 – 95%	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 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a orange-colored to opaque liquid to semi-solid with an epoxy odor. **Health Hazards:** Inhalation of dusts or particulates from this product may be irritating to the respiratory system. Eye contact can cause irritation. Skin contact may cause dermatitis if contact is prolonged. The Tetraglycidyl Methylenedianiline component is a known skin sensitizer, which can cause a severe allergic skin reaction in sensitized individuals.. Ingestion of this product may be harmful. Eye or skin contact with heated material may cause burns. **Flammability Hazard:** This product may ignite if substantially heated. The accumulation of dusts of this product can create a serious hazard of dust explosion. If involved in a fire or heated to decomposition, toxic fumes and gases can be released. **Reactivity Hazard:** This product is not reactive. **Environmental Hazard:** Release of large quantities of this product to a terrestrial or aquatic environment may cause harm to contaminated plants and animals. **Emergency Considerations:** Emergency responders must wear proper personal protective equipment for the incident to which they are responding.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	2
FLAMMABILITY HAZARD	(RED)	1
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

SEE SECTION 8

For Routine Industrial Use and Handling Applications

See Section 16 for Definition of Ratings

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational overexposure to this product via inhalation of dusts or fumes from the product if heated, and skin and eye contact. The symptoms of overexposure to this product, via route of entry, are as follows:

INHALATION: Inhalation of dust or particulates from this product may irritate the respiratory system. Symptoms may include coughing, and sneezing. Symptoms should be relieved upon removal to fresh air.

CONTACT WITH SKIN or EYES: Contact with the skin is not expected to cause adverse symptoms unless exposure is prolonged, in which case dermatitis may result, with symptoms of inflammation and reddening of the skin. The Tetraglycidyl Methylenedianiline component can cause dermal sensitization and allergic skin reaction in susceptible individuals. Symptoms may include redness, itching and rash. Persons who become sensitized may experience

allergic reaction after exposure to very small amounts of the material. Contact with the eyes may cause mild irritation, pain, reddening, and watering. Abrasion to eye tissue may occur and irritation may be delayed by several hours. Skin or eye contact with heated material can cause thermal burns.

SKIN ABSORPTION: The components of this product are not to be absorbed via intact skin.

INGESTION: Ingestion is not anticipated to be a likely route of exposure to this product. If large quantities of this product is swallowed, irritation of the mouth, throat, esophagus, and other tissues of the digestive system may occur. Symptoms may include stomach pains and vomiting. Ingestion of large quantities of the Tetraglycidyl Methylenedianiline component (5000 mg/kg/body weight) has caused bone marrow cell toxicity and bone marrow depression in mice.

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

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

ACUTE: Inhalation of dusts or fumes from the product may cause irritation. Contact with the eyes may cause mild to moderate irritation; symptoms may be delayed. Ingestion may cause irritation of the digestive system.

CHRONIC: Repeated skin contact may result in dermatitis. Exposure via skin contact can result in sensitization and allergic reaction in susceptible individuals. See Section 16 (Toxicity data) for additional information.

TARGET ORGANS: ACUTE: Respiratory system, skin, eyes. CHRONIC: Skin.

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: If dusts, particulates or 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 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 15 minutes. Do not interrupt flushing.

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: Pre-existing skin or immune system conditions may be aggravated by exposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

Section 5. FIRE-FIGHTING MEASURES

FLASH POINT: Not determined.

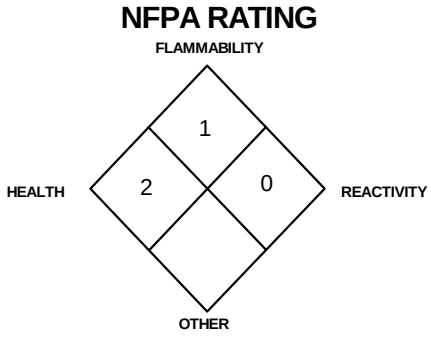
AUTOIGNITION TEMPERATURE: Not determined.

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: This product poses a slight fire hazard at elevated temperatures. When involved in a fire, this material may decompose and produce irritating vapors, acrid smoke, and toxic gases (e.g., carbon monoxide, carbon dioxide, aldehydes, and various polymer compounds). An accumulation of large amounts of dust or large dust clouds from this material in air can cause a severe risk of an air/dust explosion.

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

Explosion Sensitivity to Static Discharge**:** Although this product is not sensitive to static discharge, dusts of this material can be ignited by static discharge, especially if large amounts of dusts are allowed to accumulate. All equipment in used in the handling of this material should be electrically grounded.

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: Small releases can be swept-up or cleaned-up using a damp sponge. Responders should wear appropriate goggles, and suitable body protection during the clean-up operations to avoid inhalation of dusts and dust contamination of the eyes. Dispose of spilled product appropriately. No other response is normally necessary for clean-up. Spills of this product are not hazardous unless other chemicals are involved. In the event of involvement with other chemicals, releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. Self-Contained Breathing Apparatus must be selected if releases occur in confined or poorly-ventilated areas, or in situations in which the level of oxygen is below 19.5%. Sweep-up or vacuum spilled solid (an explosion-proof vacuum should be used). Rinse area with soap and water solution, followed by a water rinse. Close-off sewers and take other measures to protect human health and the environment, as necessary. Decontaminate the area thoroughly. Place all spill residue in appropriate container which is properly labeled. Seal the container immediately and dispose of in accordance with U.S. Federal, State and local regulations and those of Canada and it's provinces and those of EC Member States and Japan (see Section 13, Disposal Considerations).

Section 7. HANDLING and USE

WORK AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated of this product. Use in a well-ventilated location. Wipe-down area routinely to avoid the accumulation of dusts.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Containers of this product must be properly labeled. Store product in a cool, dry location, away from direct sunlight, or sources of intense heat. Store at or below 4.4°C (40°F) in a sealed container. Do not heat product in bulk, as this may create a danger of violent exothermic reaction. The maximum temperature that this product should be subjected to while thawing is 66°C (150°F) for no more than 12 hours. Store away from incompatible materials (see Section 10, Stability and Reactivity). Keep containers tightly closed when not in use. Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged. Care should be taken to avoid the accumulation of dusts, which can create a serious dust-explosion hazard. All equipment used in the handling of this material should be electrically grounded.

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: Use with adequate ventilation to ensure exposures are below limits provided in Section 2 (Composition and Information on Ingredients). Prudent practice is to ensure eyewash/safety shower stations are available near areas where this product is used.

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: Splash goggles or safety glasses may be worn if operations can generate dusts. 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: None needed under normal circumstances of use. 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 (e.g., Tyvek suit, rubber apron). 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: Negligible.
EVAPORATION RATE (n-BuAc = 1): Not applicable.
ODOR THRESHOLD: Not applicable.
SPECIFIC VOLUME: Not applicable.
MELTING POINT: Not available.
pH: Not applicable.
MOLECULAR WEIGHT: Not available.
EXPANSION RATIO: Not applicable.
VAPOR PRESSURE: Not applicable.
PERCENT VOLATILES: Not determined.
LOG COEFFICIENT WATER/OIL DISTRIBUTION: Not determined.
APPEARANCE, ODOR AND COLOR: This product is an orange to opaque liquid to semi-solid with any epoxy odor.
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. Contact with heat can cause polymerization.
DECOMPOSITION PRODUCTS: Thermal decomposition products include carbon monoxide, carbon dioxide, aldehydes and various polymer compounds.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product is incompatible with oxidizing materials, Lewis or mineral acids, mineral and organic bases, amines. Avoid unintended contact with water, especially if material is molten as this can cause violent reactions and splatter hot material or ignite other flammable materials nearby..
HAZARDOUS POLYMERIZATION: Will not occur with product by itself. Extended heating will result in irreversible polymerization with generation of considerable heat..
CONDITIONS TO AVOID: Contact with incompatible materials and exposure to extreme temperatures.

Section 11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicological data are available for the Tetraglycidyl Methylenedianiline component of this product. No data are available for the Butadiene-Acrylic Copolymer component.

TETRAGLYCIDYL METHYLENEDIANILINE
Draize Irritation (Skin-Rabbit) 5.4/110
LD_{50} (Oral-Rat) > 10,000 mg/kg
LD_{50} (Oral-Mouse) > 5,000 mg/kg
LC_{50} (Inhalation-Rat) > 30 mg/m^2 air 4 hours

GENERAL TOXICITY INFORMATION: Routine use of this product should cause only transient irritation by all routes of exposure. Prolonged skin contact may cause dermatitis. Prolonged eye contact may result in mechanical abrasion to the eye, causing delayed irritation Certain individuals may be susceptible to skin sensitization and subsequent allergic reaction.
SUSPECTED CANCER AGENT: The components of this product 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: Exposure via skin contact may result in sensitization and allergic reaction in susceptible individuals.

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

Mutagenicity**:** The components of this product are not reported to cause mutagenic effects in humans. Tests involving the Tetraglycidyl Methylenedianiline component in the Ames Test have yielded positive results. In addition, mutagenicity tests for Tetraglycidyl Methylenedianiline have yielded positive results in mouse lymphoma and mouse micronucleus assay (*in vivo*).
Embryotoxcity**:** The components of this product are not reported to cause embryotoxic effects in humans.
Teratogenicity**:** The components of this product are not reported to cause teratogenic effects in humans.
Reproductive Toxicity: The components of this product 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 no ACGIH Biological Exposure Indices (BEIs) determined for the components of this product.

Section 12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: No data currently, available. This product is not expected to bio-degrade significantly in the environment.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No data currently available. This product may be harmful to contaminated plant and animal life (especially if large quantities are released).

EFFECT OF CHEMICAL ON AQUATIC LIFE: No data currently available. This product may be harmful to contaminated aquatic plant and animal life (especially if large quantities are released).

Section 13. DISPOSAL CONSIDERATIONS

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

If mixed with other chemicals, it 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

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

PROPER SHIPPING NAME:	Not Regulated
HAZARD CLASS NUMBER and DESCRIPTION:	Not Applicable
UN IDENTIFICATION NUMBER:	Not Applicable
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Not Applicable

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

MARINE POLLUTANT: The components of this product 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: This product is not considered as hazardous goods, per the regulations of Transport Canada. The components of this product are not designated by the TDG to be Marine Pollutants.

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

INTERNATIONAL MARITIME ORGANIZATION (IMO): This product is not considered as dangerous goods, per rules of the IMO. The components of this product are not designated by the IMO to be Marine Pollutants.

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

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not 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 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 THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. 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): Not applicable.
U.S. TSCA INVENTORY STATUS: The components of this product 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: Not applicable.
U.S. STATE REGULATORY INFORMATION: The components of this product are not covered under specific State regulations, as denoted below**:**

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

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

ADDITIONAL CANADIAN REGULATIONS:
CANADIAN DSL/NDSL INVENTORY STATUS: The Tetraglycidyl Methylenedianiline component is on the DSL Inventory. The Butadiene-Acrylic Copolymer is not listed.
OTHER CANADIAN REGULATIONS: Not applicable.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITY SUBSTANCES LISTS: The components of this product are not on the CEPA Priority Substances Lists.
CANADIAN WHMIS CLASSIFICATION AND SYMBOL: Class D2B: Materials Causing Other Toxic Effects – Sensitization.

ADDITIONAL EUROPEAN COMMUNITY INFORMATION:
EC LABELING AND CLASSIFICATION: This product meets the following definition, per the European Community Council Directives.

EC CLASSIFICATION: Xn (Harmful); Xi (Irritating)
EC RISK PHRASES: [R: 36/37/38]: Irritating to eyes, respiratory system and skin. [R: 42, 43]: May cause sensitization by inhalation and skin contact.
EC SAFETY PHRASES: Keep locked up and out of the reach of children.* **This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.* Keep container tightly closed and in a well ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show label where possible). [S:(1/2)*, 7/9, 26, 36/37/39, 45]

EC LABELING AND CLASSIFICATION (continued):
EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOLS:

ADDITIONAL JAPANESE REGULATIONS:
JAPANESE ENCS INVENTORY: The Tetraglycidyl Methylenedianiline component of this product is on the ENCS Inventory (# 4-112). The Butadiene-Acrylic Copolymer component is on the ENCS Inventory.
POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW: The components of this product 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).

(continued on following page)

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. *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.);

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued):

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 $\geq$ 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.). PPE Rating B: Hand and eye protection is required for routine chemical use. PPE Rating C: Hand, eye, and body protection may be required for routine chemical use.

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