

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

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

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **SHRINK TUBING, POLY/CHEM SHRINK, CHEMICAL**

CHEMICAL NAME/CLASS: Mixed Solvents

SYNONYMS: Not Applicable

PRODUCT USE: Preparation of Rubber Coverings for Cable Connectors

SUPPLIER/MANUFACTURER'S NAME: CONTECH SYSTEMS, INC.

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DATE OF PREPARATION: September 8, 2010

2. COMPOSITION and INFORMATION ON INGREDIENTS

This product consists of a solid, synthetic-rubber product which has absorbed at least 49% by volume of an evaporative solvent. The synthetic-rubber product is not hazardous, as defined by the Federal Occupational Health and Safety Administration's Hazard Communication Standard (29 CFR 1910.1200). The composition of the solvent mixture is described in the table below.

CHEMICAL NAME	CAS #	% v/v	EXPOSURE LIMITS IN AIR					OTHER
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	
Proprietary Compound 1 It is recommended that the following exposure be used.		40-70	300	375	500 300 (Vacated 1989 PEL)	375 (Vacated 1989 PEL)	1000	NIOSH REL: 75 TWA; 385 C (15 minute) DFG MAK: 500
Proprietary Compound 2 It is recommended that the following exposure limits be used.		20-30	400	500	500 300 (Vacated 1989 PEL)	500 (Vacated 1989 PEL)	750	NIOSH REL: 85 TWA; 440 C (15 minute) DFG MAK: 500
Fluorocarbon 141b (1,1-Dichloro-1-Fluoroethane)	171-00-6	5-10	NE	NE	NE	NE	NE	NE

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

NOTE (1): All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

NOTE (2): The specific identities of this product's components are not released, because they are being claimed as proprietary. All hazard information pertinent to this product has been presented in the remaining sections of this Material Safety Data Sheet, per the requirements of Federal Occupational Safety and Health Hazard Communication Standard (29 CFR 1910.1200). Contech Systems, Inc. will release the information to users of this product if the conditions stated in the regulations are met.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a synthetic rubber product which has absorbed an evaporative solvent. The product has a light, aromatic odor. In terms of emergency response situations involving this product, the chief health hazard associated with this product is the potential for irritation of eyes and skin contaminated by the solvent or its vapors. Inhalation of the vapors from the solvent mixture may be harmful, producing symptoms of central nervous system depression (i.e. headaches, dizziness, drowsiness). This product must be substantially preheated before ignition can occur. This product is not normally reactive. Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The chief routes of over-exposure for this product are via inhalation of the vapors from the solvent mixture, and contact of the skin or eyes with a small amount of the solvent before evaporation is complete. The symptoms of over-exposure to this product are as follows:

INHALATION: Inhalation of mists or vapors of this product may cause mild irritation of the nose and throat. Though unlikely to occur under typical circumstances of use, inhalation of large concentrations of this product's vapors (as may occur if working with large in poorly-ventilated areas or in confined spaces) can cause central nervous system depression, producing symptoms such as headaches, nausea, dizziness, and drowsiness.

NOTE: Inhalation of 1000 ppm of the solvent components of this product can irritate the respiratory tract. An open pouch liberates approximately 6-8 ppm of these components.

CONTACT WITH SKIN or EYES: Under conditions of routine industrial use, over-exposure to this product should not occur. Exposure to high concentrations of this product's vapors (as may occur if working with large volumes of this product in poorly-ventilated areas or in confined spaces) can be irritating to the eyes. Contact of the solvent mixture with the eyes may cause redness and pain. Prolonged or repeated skin over-exposures can cause redness, irritation, and potentially dermatitis (inflammation of the skin).

SKIN ABSORPTION: Skin absorption is not a potential route of over-exposure for any component of this product.



INGESTION: Ingestion is not anticipated to be a significant route of over-exposure for this product. If this product is swallowed, symptoms of such exposure can include nausea, swelling of the abdomen, headache, and depression.

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

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

ACUTE: In terms of routine use of this product, the chief health hazard associated with this product is the potential for irritation of eyes and skin contaminated by the solvent mixture or its vapors. Inhalation of high concentrations of this product's vapors can be harmful, producing symptoms of central nervous system depression (i.e. headaches, dizziness, drowsiness).

CHRONIC: Prolonged or repeated skin over-exposures to the solvent mixture can cause dermatitis. Refer to Section 11 (Toxicological Information) for additional hazard information.

HAZARDOUS MATERIAL INFORMATION SYSTEM			
HEALTH	(BLUE)	1	
FLAMMABILITY	(RED)	1	
REACTIVITY	(YELLOW)	0	
PROTECTIVE EQUIPMENT			B
EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8
For industrial use of this solvent-saturated rubber product.			

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

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product contaminates the skin and redness or irritation develops, begin decontamination with running water. If necessary, remove exposed or contaminated clothing, taking care not to contaminate eyes. Contaminated individuals must seek medical attention if adverse effects continue after the area is flushed.

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

INHALATION: If vapors of this product are inhaled and adverse effects occur, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

Contaminated individuals must be taken for medical attention if adverse effects occur. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with the affected individual.

5. FIRE-FIGHTING MEASURES

FLASH POINT, °C (method): > 60.5°C (> 140°F) [Solvent Mixture; EPA 1010]

AUTOIGNITION TEMPERATURE, °C: > 220°C (> 428°F)

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES (for cooling) Carbon Dioxide: YES

Foam: YES Dry Chemical: YES

Halon: YES Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product must be substantially pre-heated before ignition can occur. When involved in a fire, this material may decompose and produce irritating fumes and toxic gases (including carbon dioxide, carbon monoxide, and a variety of chloride and fluoride compounds).

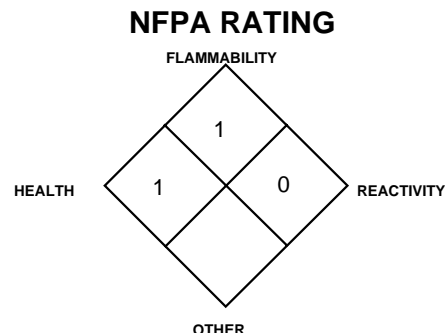
Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. Small quantity releases can be cleaned-up by personnel trained about the hazards of this material. Pick-up released product. If any of the evaporative solvent was spilled, use polypads to clean-up released liquid (if necessary). Personnel must wear safety glasses and nitrile gloves during clean-up procedures.



6. ACCIDENTAL RELEASE MEASURES (Continued)

In the event of a non-incident release (i.e. release of a large shipment), minimum Personal Protective Equipment should be **Level B: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemically resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus**. Pick-up released product. If any of the evaporative solvent was spilled, use polypads to clean-up released liquid (if necessary). Decontaminate the area thoroughly. Place all spill residue in an appropriate container. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).

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

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product's solvent mixture ON YOU or IN YOU. Avoid breathing vapors generated by this product. Wash hands after handling this product. Do not eat or drink while handling this material.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Use in a well-ventilated location. Open packages of this product slowly, on a stable surface. Packages of this product must be properly labeled. Store packages in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials (see Section 10, Stability and Reactivity). Inspect all incoming 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. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment using soapy water before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients), if applicable. Ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: None needed under normal circumstances of use. If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown.

EYE PROTECTION: None needed under normal circumstances of use. Splash goggles or safety glasses should be considered if certain operations involving this product (i.e. if there is a potential for exposure to relatively high concentrations of the evaporative solvent).

HAND PROTECTION: None needed under normal circumstances of use. Nitrile gloves should be considered if certain operations involving this product (i.e. if prolonged skin contact with the evaporative solvent is anticipated). Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS.

BODY PROTECTION: None needed under normal circumstances of use.

9. PHYSICAL and CHEMICAL PROPERTIES

Unless otherwise specified, the following information is for Proprietary Compound 1, the main component of the solvent mixture.

RELATIVE VAPOR DENSITY (air = 1): 3.94

SPECIFIC GRAVITY (water = 1): 0.69

SOLUBILITY IN WATER: Insoluble.

VAPOR PRESSURE, mm Hg @ 20°C: 41

ODOR THRESHOLD: Approximately 200 ppm

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not available.

APPEARANCE AND COLOR: This product consists of a synthetic rubber product which has absorbed at least 49% by volume of an evaporative solvent.

HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance and odor may act as distinguishing characteristics for this product.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Carbon dioxide, carbon monoxide, and a variety of fluoride and chloride compounds.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposure or contact to extreme temperatures, incompatible chemicals.

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

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The specific toxicology data available for components greater than 1% in concentration in the solvent mixture are as follows.

PROPRIETARY COMPOUND 1:

INHALATION: This compound was highly irritating to mice after exposure at 1000 ppm for 5 minutes. Exposures of 16000 ppm caused respiratory arrest within 6 minutes in 25% of the test mice, while 32000 ppm caused respiratory arrest in all animals after 3-4 minutes. Concentration necessary to induce narcosis has not been determined; however, exposure of mice to 8000 ppm for 5 minutes does not cause narcosis. Narcotic effects probably occur at about 8000-10000 ppm.(7)

LIVER: Feeding of 2 mL/kg/day for 10 days to male rats caused liver damage.

KIDNEY: Rats given oral doses of 2 mL/kg/day for 2 days developed kidney problems. In another oral study with rats, kidney damage was seen as early as 8 hours after doses of 0.5-2 g/kg were given.

LUNGS: Aspiration into the lungs causes pulmonary lesions in rats.

PROPRIETARY COMPOUND 2: There are currently no toxicology data available for this component of the product.

FLUOROCARBON 141b:

LD₅₀ (oral, rat) > 5000 mg/kg

LD₅₀ (dermal, rat) > 2000 mg/kg

LC₅₀ (inhalation, rat) = 62000 ppm

LD₅₀ (inhalation, rat) = 240 g/m³/2 hours

LD₅₀ (inhalation, mouse) =151 g/m³/2 hours

SUSPECTED CANCER AGENT: This product's ingredients are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This product's vapors may be irritating to contaminated eyes; the solvent mixture may be irritating to the skin, especially after prolonged or repeated exposures.

SENSITIZATION TO THE PRODUCT: The components of this product are not known to be skin or respiratory sensitizers with repeated or prolonged use.

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

Mutagenicity: This product is not reported to produce mutagenic effects in humans.

Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.

Teratogenicity: This product is not reported to cause teratogenic effects in humans.

Reproductive Toxicity: This product is not reported to cause reproductive effects in humans.

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

BIOLOGICAL EXPOSURE INDICES: Currently there are no Biological Exposure Indices (BEIs) associated with the components of this product.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory problems, dermatitis and skin disorders may be aggravated by exposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The synthetic rubber component of this product is extremely stable. The solvent mixture components of this product will slowly decompose in the environment, releasing a variety of organic compounds. Specific environmental data for the components of this product are as follows:

FLUOROCARBON 141b: This compound decomposes rapidly in the lower atmosphere. The atmospheric lifetime is 11.4 years. The products of decomposition will be highly dispersed, and hence will have a very low concentration. This compound does not influence photochemical smog. Fluorocarbon 141b is regulated as a Class II Ozone depleting agent under Title VI of the Clean Air Act.

COMPOUND SIMILAR TO PROPRIETARY COMPOUND 1: Log K_{ow} = 5.18 Water Solubility = 0.66 mg/L at 25°C. Log BCF = calculated, 2.89 and 3.71, respectively. BOD (theoretical) = 1.0%, 4.6%, and 28.4%, respectively, after 6, 24 and 72 hours. Bioconcentration factors indicate that bioconcentration may be important.

COMPOUND SIMILAR TO PROPRIETARY COMPOUND 2: Log K_{ow} = 4.66. Water Solubility = 2.93 mg/L at 25°C. Log BCF = calculated, 2.53 and 3.31. BOD (theoretical) = 28, 63, 70 and 70% after 2, 5, 10 and 20 days. The potential for bioconcentration in the environment may be important.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Based on the size of the packaging, no unusual effects are anticipated to occur if one package of this product is released in the environment. In the event that a release of a large shipment occurs, the solvent mixture component of this product may be harmful to contaminated plants or animals. The effect of this product on plants is related to the removal of natural oils from the plants or the prevention of respiration. Refer to Section 11 (Toxicology Information) for specific data on the effects of this product's components on test animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Based on the size of the packaging, no unusual effects are anticipated to occur if one package of this product is released in the environment. In the event that a release of a large shipment occurs, the solvent mixture component of this product may be harmful to contaminated aquatic life. The solvent mixture floats on water and may prevent oxygen from entering the water. The bio-concentration factors for the components, which are provided in the previous section, indicate that bio-concentration may be an important factor in aquatic systems. Releases of this product to water systems may prove damaging to aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: Not applicable.

14. TRANSPORTATION INFORMATION

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

PROPER SHIPPING NAME: Not applicable.

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, 1996: Not applicable.

MARINE POLLUTANT: No component of this product is designated as a Marine Pollutant, per Appendix B to 49 CFR 172.101

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS NOT CONSIDERED AS DANGEROUS GOODS.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPONENT	SARA 302	SARA 304	SARA 313
Fluorocarbon 141b	No	No	Yes

15. REGULATORY INFORMATION (Continued)

SARA THRESHOLD PLANNING QUANTITY: Not applicable.

TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER FEDERAL REGULATIONS: Fluorocarbon 141b subject to the requirements under Title VI of the Clean Air Act Amendments of 1990: "Stratospheric Ozone Protection". Fluorocarbon 141b is listed as a Class II ozone-depleting chemical. This product may be required to bear the following label:

Warning: Contains Fluorocarbon, a substance which harms public health and environment by destroying ozone in the upper atmosphere.

STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: None.

California - Permissible Exposure Limits for Chemical Contaminants: None.

Florida - Substance List: Proprietary Compound 1.

Illinois - Toxic Substance List: None.

Kansas - Section 302/313 List: None.

Massachusetts - Substance List: Proprietary Compound 1.

Michigan - Critical Materials Register: None.

Minnesota - List of Hazardous Substances: None.

Missouri - Employer Information/Toxic Substance List: None.

New Jersey - Right to Know Hazardous Substance List: Proprietary Compound 1.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: None.

Pennsylvania - Hazardous Substance List: Proprietary Compound 1, Proprietary Compound 2.

Rhode Island - Hazardous Substance List: None.

Texas - Hazardous Substance List: None.

West Virginia - Hazardous Substance List: None.

Wisconsin - Toxic and Hazardous Substances: None.

CALIFORNIA PROPOSITION 65: No component of this product is on the California Proposition 65 lists.

LABELING (Precautionary Statements): **CAUTION! MAY CAUSE SKIN AND EYE IRRITATION. HARMFUL IF INHALED. CAUSES CENTRAL NERVOUS SYSTEM EFFECTS.** Avoid breathing vapor. Avoid prolonged contact with skin. Avoid contact with eyes. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, and goggles, as necessary. **FIRST-AID:** In case of contact, flush skin or eyes for with large amounts of water. If inhaled, move to fresh air. If ingested, do not induce vomiting. Get medical attention immediately. **IN CASE OF FIRE:** Use fog, foam, dry chemical or CO₂. **IN CASE OF SPILL:** Pick up released material. Wipe up spilled solvent with inert material and place in suitable container. Refer to Material Safety Data Sheet for additional information on this product.

TARGET ORGANS: Skin, eyes, respiratory system.

WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

PREPARED BY:

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DATE OF PRINTING:

September 24, 1996

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Contech Systems Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Contech Systems Inc. assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.
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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 which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

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

TLV - Threshold Limit Value - an airborne concentration of a substance which 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 **Time Weighted Average (TWA)**, the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling Level**. Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

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

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. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called **Recommended Exposure Levels (RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime over-exposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime over-exposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: 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 and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

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

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. 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 measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TD₀₁**, **LDLo**, and **LDo**, or **TC**, **TC₀₁**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause death. **BEI** - 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.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Other acronyms used are: **Superfund Amendments and Reauthorization Act (SARA)**; the **Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act (**Proposition 65**); 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.