

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards and European EC Directives. This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard (29 CFR 1910.1200). Other government regulations must be reviewed for applicability to this product.

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

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): BIG HORN AND REPLACEMENT CARTRIDGE
CHEMICAL NAME/CLASS: Gas Aerosol
SYNONYMS: Not Applicable
PRODUCT USE: Air Horn
SUPPLIER: L.P.I. Consumer Products, Inc.
BUSINESS PHONE: 1-954-783-5858
MANUFACTURER'S NAME: Ultramotive Corporation
ADDRESS: PO Box 58, Cushing Blvd
Bethel, VT 05032
EMERGENCY PHONE: North America: 1-800-424-9300 (Chemtrec)
International: 1-703-527-3887 (Chemtrec)
BUSINESS PHONE: 1-802-234-9901
DATE OF PREPARATION: August 13, 2004
DATE OF REVISION: February 22, 2006

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product consists of 1,1,1,2-Tetrafluoroethane packaged in a pressurized aerosol can. **Health Hazards:** The health hazards associated with overexposure are minimal, due to the small size of the container and small volume of the contents. The gas is in such small quantity that it does not normally present a health hazard. If a release of many containers of this product occurs at the same time, inhalation may cause central nervous system depression. In addition, under these circumstances an oxygen-deficient environment can occur, resulting in a hazard of asphyxiation. If the container is heated or punctured, rupture of the container may occur, and may cause injury. Frostbite can be caused by contact with rapidly expanding gases or the liquefied gas. **Flammability Hazards:** Under normal conditions, the gas in this product is not flammable. However, if heated above 100°C (212°F) and in the presence of an ignition source, 1,1,1,2-Tetrafluoroethane is combustible. This gas may also become combustible in an oxygen-enriched atmosphere or in the presence of chlorine at certain concentrations. **Reactivity Hazards:** This product is not reactive. **Environmental Hazards:** Release of this product to the environment is not expected to cause harm. **Emergency Recommendations:** Persons responding to an emergency such as a fire that involves this product must take precautions to avoid potential injury from containers that rupture and for the potential of the gas to become combustible under conditions of high temperature or an oxygen-enriched atmosphere.

EC CLASSIFICATION: Due to the overall small amount of product contained in each can (less than 10 mL), no classification of this product is required, per Council Directive 83/265/EEC, 16 May, 1983, Article 6, 6

RISK PHRASES: Not applicable.

SAFETY PHRASES: Not applicable.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: Contact with this product is not expected to cause significant adverse health effects, due to the small size of container and limited amount of gas within the container.

INHALATION: Inhalation of this product is not expected to cause adverse health effects, due to the small size of container and limited quantity of gas contained within. In event of a release that involves a large quantity of containers (especially in a confined space), exposures to high concentrations of this gas may cause central nervous system depression and cause sensitization of the heart to epinephrine. Effects of such overexposure can include light-headedness, giddiness, shortness of breath and in extreme cases, irregular heartbeats, cardiac arrest, and death. In addition, such conditions may produce an oxygen-deficient environment may be created. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of overexposure, death may occur.

3. HAZARD IDENTIFICATION (Continued)

INHALATION (continued): The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN OBSERVED EFFECT

12-16% Oxygen: Breathing and pulse rate increase, muscular coordination slightly disturbed.

10-14% Oxygen: Emotional upset, abnormal fatigue, disturbed respiration.

6-10% Oxygen: Nausea, vomiting, collapse, or loss of consciousness.

Below 6%: Convulsive movements, possible respiratory collapse, and death.

1,1,1,2-Tetrafluoroethane vapors are 4 to 5 times heavier than air. High concentrations will accumulate in low-lying areas, resulting in hazard of inhalation of an oxygen-deficient atmosphere, which may be fatal.

CONTACT WITH SKIN OR EYES: Contact of this product with the skin is not expected to cause adverse effect. If this product is sprayed or released directly into the eyes or to the skin, frostbite may occur, with damage to tissue.

INGESTION: Not a likely route of exposure.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects.

ACUTE: There are no anticipated acute effects after exposure to this product. In the event that a very large number of containers are released simultaneously, adverse effects on the central nervous and/or cardiovascular systems may occur and an oxygen-deficient environment may be produced.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this gas.

TARGET ORGANS: ACUTE: Eyes, respiratory system, cardiovascular and central nervous systems. CHRONIC: None.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD

(BLUE)

1

FLAMMABILITY HAZARD

(RED)

0

PHYSICAL HAZARD

(YELLOW)

0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For Routine Industrial Use and Handling Applications

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

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	EINECS #	% w/w
1,1,1,2-Tetrafluoroethane (HFC-134a)	811-97-2	212-377-0	100%

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

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

4. FIRST-AID MEASURES

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

SKIN EXPOSURE: If skin contact results in irritation or other adverse effect, seek the advice of a doctor.

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

INHALATION: If this gas inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if adverse effect occurs.

INGESTION: Not a likely route of exposure.

4. FIRST-AID MEASURES (Continued)

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing central nervous and/or cardiovascular system disorders may increase susceptibility to the gas in this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure. Because of possible disturbances of cardiac rhythm after exposure to 1,1,1,2-Tetrafluoroethane, catecholamine drugs, such as epinephrine, should only be used with special caution in situations of emergency life support in patients.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not flammable.

AUTOIGNITION TEMPERATURE: > 743°C (> 1369°F)

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: If this product is involved in a fire, use extinguishing materials appropriate for surrounding materials.

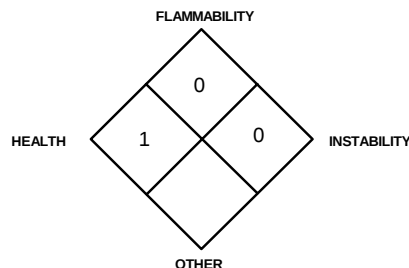
UNUSUAL FIRE AND EXPLOSION HAZARDS: Mixtures of 1,1,1,2-Tetrafluoroethane in air can become combustible at elevated pressure and temperatures above 100°C (212°F) in the presence of an ignition source. This gas also becomes combustible in an oxygen-enriched environment. Whether this gas becomes combustible is dependant on the temperature, the pressure and the proportion of oxygen in the environment. Data also indicate that this gas can become combustible in the presence of certain concentrations of chlorine. Containers of this product may explode in heat of fire. If this gas ignites, it may produce toxic gases (e.g., hydrogen fluoride, and carbonyl fluoride).

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 firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel. Use water spray to keep fire-exposed containers cool. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING



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

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: A release of a single container or several containers presents a minimal hazard. Allow containers to vent and remove container for appropriate disposal. If a large quantity of cans of this product are involved, evacuate immediate area. 1,1,1,2-Tetrafluoroethane is heavier than air; releases will concentrate in low-lying areas, creating pockets of an oxygen-deficient atmosphere. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. If a large quantity of product is involved, the minimum Personal Protective Equipment should be **Level B: Self-Contained Breathing Apparatus**. Allow the gas to dissipate. Monitor the surrounding area for the level of Oxygen. The atmosphere must have at least 19.5 percent Oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Dispose of involved cans in accordance with applicable U.S. Federal, State, or local procedures, or appropriate Canadian Standards and those of EC Member States (see Section 13, Disposal Considerations).

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

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: Do not eat or drink while handling this material. Use ventilation and other engineering controls to minimize potential exposure to the aerosol of this product.

STORAGE AND HANDLING PRACTICES: Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Do not incinerate empty or partially filled containers.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Not applicable.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

CHEMICAL NAME	CAS #	EINECS #	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
1,1,1,2-Tetrafluoroethane (HFC-134a)	811-97-2	212-377-0	There are no specific exposure limits for Tetrafluoroethane. Tetrafluoroethane is a simple asphyxiant. Oxygen levels should be maintained above 19.5%. Note: DuPont has a recommended exposure level of 1000 ppm for 8 and 12 TWA.				DFG MAKs: TWA = 1000 PEAK = 8•MAK 15 min. average value, 1-hr interval, 4 per shift DFG MAK Pregnancy Risk Classification: C AIHA WEELS: TWA = 1000	

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

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

VENTILATION AND ENGINEERING CONTROLS: Not necessary under normal conditions of use.

RESPIRATORY PROTECTION: No respiratory protection is normally required when using this product. Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients), if applicable. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces, and, the European Standard EN149, and EC member states. 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 use. If a hazard of flying debris may occur, wear safety glasses or goggles. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards and the European Standard EN166.

HAND PROTECTION: None needed under normal conditions of use. If necessary, refer to U.S. OSHA 29 CFR 1910.138 appropriate Standards of Canada and the European Standard DIN EN 374.

BODY PROTECTION: None needed for normal circumstances of use. If necessary, refer to appropriate Standards of Canada and the European Economic Community. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR.

9. PHYSICAL and CHEMICAL PROPERTIES

The following values are for 1,1,1,2-Tetrafluoroethane.

BOILING POINT @ 1 atm: -26.5 °C (-15.7°F)

FREEZING/MELTING POINT: Not determined.

SPECIFIC GRAVITY @ 25°C: 1.208

SOLUBILITY IN WATER @ 25°C: 67 mg/L (est.)

EVAPORATION RATE (CCCL4): > 1

ODOR THRESHOLD: Not applicable. Odorless.

COEFFICIENT WATER/OIL DISTRIBUTION: Log Kow = 1.274 (est.)

VAPOR DENSITY @ 25°C: 3.6

VAPOR PRESSURE @ 25°C: 4730 mmHg (est.); 96 psia

pH: Not applicable.

MOLECULAR WEIGHT: 102.03

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft³/lb): Not available.

The following information is for the product:

APPEARANCE, ODOR and COLOR: This product is a colorless gas, with a mild ether-like odor in a pressurized can.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties in event of a release of this product.

10. STABILITY and REACTIVITY

STABILITY: Stable under conditions of normal temperature and pressure.

DECOMPOSITION PRODUCTS: If 1,1,1,2-Tetrafluoroethane is exposed to fire, it may decompose, yielding toxic products (e.g., hydrogen fluoride, carbonyl fluoride).

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: The following materials are not compatible with 1,1,1,2-Tetrafluoroethane: alkaline and alkaline earth metals (such as sodium, potassium, lithium, barium, and magnesium, powdered aluminum). Metals such as silver, brass, bronze and copper may enhance the decomposition of 1,1,1,2-Tetrafluoroethane at elevated temperatures. 1,1,1,2-Tetrafluoroethane may also decompose in the presence of moisture and alloys which contain more than 2% magnesium.

10. STABILITY and REACTIVITY (Continued)

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Extreme temperatures, incompatible materials.

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

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following are toxicological data for 1,1,1,2-Tetrafluoroethane:

LC₅₀ (Inhalation-Rat) 1500 gm/m³/4 hours
LC₅₀ (Inhalation-Mouse) 1700 gm/m³/2 hours
LC (Inhalation-Dog) > 32 pph/1 hour

TCLo (Inhalation-Rat) 50,000 ppm/6 hours/2 years-intermittent:
Tumorigenic: neoplastic by RTECS criteria
TCLo (Inhalation-Rat) 30 pph/6 hours: female 6-15 day(s) after conception:
Reproductive: Maternal Effects: other effects; Effects on Embryo or
Fetus: fetotoxicity (except death, e.g., stunted fetus)

EYE: A short duration of spray of vapor produced very slight eye irritation.

SKIN: Animal testing indicates this material is slight skin irritant, but not a skin sensitizer.

INHALATION: Single exposure to rats caused cardiac sensitization, a potentially fatal disturbance of heart rhythm associated with a heightened sensitivity to the action of epinephrine. The Lowest Observed Adverse Effect Level for cardiac sensitization was 75,000 ppm. Single exposure caused lethargy, narcosis and increased respiratory rates. These effects were temporary. Single exposures to near lethal doses caused pulmonary edema. Repeated exposure caused increased adrenals, liver and spleen weight, decreased uterine and prostate weight. Repeated dosing at higher concentrations also caused tremor and incoordination, which were temporary. In other toxicological studies, adverse health effects have not been observed following exposure to concentrations up to 10,000 ppm (41,700 mg/cu m).

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

The weight of evidence for carcinogenicity in tests involving 1,1,1,2-Tetrafluoroethane is limited to an increased incidence of Leydig cell adenomas following exposure to 50,000 ppm (208,500 mg/cu m) and 1,1,1,2-Tetrafluoroethane has not been found to be genotoxic in studies conducted to date.

IRRITANCY OF PRODUCT: 1,1,1,2-Tetrafluoroethane is not irritating; however, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: 1,1,1,2-Tetrafluoroethane is not known to be a human skin or respiratory sensitizer. 1,1,1,2-Tetrafluoroethane can sensitize the heart to effects of epinephrine.

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

Mutagenicity: 1,1,1,2-Tetrafluoroethane is not reported to produce mutagenic effects in humans. Tests involving 1,1,1,2-Tetrafluoroethane show that it does not cause genetic damage in bacterial or mammalian cell cultures or in the reproductive cells of mammals.

Embryotoxicity: 1,1,1,2-Tetrafluoroethane is not reported to produce embryotoxic effects in human. Animal data show slight fetal toxicity but only at levels that were toxic to the adult animals.

Teratogenicity: 1,1,1,2-Tetrafluoroethane is not reported to cause teratogenic effects in humans.

Reproductive Toxicity: 1,1,1,2-Tetrafluoroethane is not reported to cause adverse reproductive effects in humans. A reduction in maternal weight gain in rabbits exposed to 40,000 ppm (166,800 mg/cu m) of 1,1,1,2-Tetrafluoroethane and signs of delayed fetal development in rats following exposure of the dams to 50,000 ppm (208,500 mg/cu m). This chemical has been noted in developmental toxicity studies. In a two-year inhalation study, 1,1,1,2-Tetrafluoroethane at 50,000 ppm produced an increase in late-occurring benign testicular tumors, testicular hyperplasia and testicular weight.

*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 following Biological Exposure Indices (BEIs) determined for the components of this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The following is environmental fate information for 1,1,1,2-Tetrafluoroethane.

Terrestrial Fate: If released to soil, an estimated vapor pressure for 1,1,1,2-Tetrafluoroethane of 4730 mm Hg at 25°C indicates that it will rapidly volatilize from dry soil to the atmosphere. Estimated soil adsorption coefficients ranging from 117-432 indicate that it will display moderate to high mobility in soil. An estimated Henry's Law constant of 1.53 atm-cu m/mole at 25°C indicates that 1,1,1,2-Tetrafluoroethane will also rapidly volatilize from moist soil to the atmosphere.

12. ECOLOGICAL INFORMATION (Continued)

ENVIRONMENTAL STABILITY (continued):

Aquatic Fate: If released to water, an estimated Henry's Law constant of 1.53 atm-cu m/mole at 25°C for 1,1,1,2-Tetrafluoroethane indicates that it will rapidly volatilize to the atmosphere. The estimated half-life for volatilization from a model river 1 m deep flowing at 1 meter/second with a wind speed of 3 meter/second is 3.0 hours. Estimated bioconcentration factors ranging from 5 to 58 indicate that 1,1,1,2-Tetrafluoroethane will not bioconcentrate in fish and aquatic organisms. Estimated soil adsorption coefficients ranging from 117-432 indicate that it will not adsorb to sediment or suspended organic matter.

Atmospheric Fate: If released to the atmosphere, 1,1,1,2-Tetrafluoroethane will undergo a slow gas-phase reaction with photochemically produced hydroxyl radicals. The recommended rate constant for this process of 8.54×10^{-15} cu cm/molec-second translates to an atmospheric half-life of 1878 days using an average atmospheric hydroxyl radical concentration of 5×10^5 molec/cu cm. The atmospheric lifetime of 1,1,1,2-Tetrafluoroethane, calculated using both 1 and 2 dimensional models, ranges from 12.5 to 24 years. The estimated water solubility of 1,1,1,2-Tetrafluoroethane, 67 mg/L at 25°C, indicates that it may undergo atmospheric removal by wet deposition processes; however, any removed is expected to rapidly re-volatilize to the atmosphere.

Bioconcentration: Estimated bioconcentration factors ranging from 5 to 58 can be calculated for 1,1,1,2-Tetrafluoroethane based on its estimated log octanol/water partition coefficient, 1.274, and estimated water solubility, 67 mg/L at 25°C, in turn estimated from its estimated Henry's Law constant and estimated vapor pressure, using appropriate regression equations. These values indicate that 1,1,1,2-Tetrafluoroethane will not bioconcentrate in fish and aquatic organisms.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product is not expected to be harmful to plant and animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product is not expected to cause adverse effects to an aquatic environment. The low toxicity of 1,1,1,2-Tetrafluoroethane to the few aquatic organisms tested as well as high volatility indicate negligible risk to aquatic organisms. The following are aquatic toxicity data for 1,1,1,2-Tetrafluoroethane:

EC₅₀ (*Daphia magna*) 48 hours = 980 mg/L

LC₅₀ (*Salmo gairdneri*, rainbow trout) 96 hours = 450 mg/L

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Product removed from the cylinder must be disposed of in accordance with appropriate U.S. Federal, State, and local regulations, those of Canada and its Provinces and the EC and EC Member States.

U.S. EPA WASTE NUMBER: Not applicable to wastes consisting only of this product.

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS: This product is classified (per 49 CFR 172.101) by the U.S. Department of Transportation, as follows.

PROPER SHIPPING NAME: Consumer commodity

HAZARD CLASS NUMBER and DESCRIPTION: ORM-D

UN IDENTIFICATION NUMBER: Not Applicable

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 171

MARINE POLLUTANT: The components of this product are not designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is classified, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

PROPER SHIPPING NAME: Consumer commodity (1,1,1,2-Tetrafluoroethane)

HAZARD CLASS NUMBER and DESCRIPTION: Class 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 3159

PACKING GROUP: Not Applicable

HAZARD LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)

MARINE POLLUTANT: Not Applicable

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 0.125

ERAP INDEX: None

PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: 75

14. TRANSPORTATION INFORMATION (Continued)

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA): This product is considered as dangerous goods under the rules of IATA.

UN IDENTIFICATION NUMBER: UN 8000
PROPER SHIPPING NAME: Consumer commodity
HAZARD CLASS NUMBER and DESCRIPTION: 9 (Miscellaneous Hazardous Material)
PACKING GROUP: Not Applicable
HAZARD LABEL(S) REQUIRED: Class 9 (Miscellaneous)
PASSENGER & CARGO AIRCRAFT PACKING INSTRUCTION: 910
PASSENGER & CARGO AIRCRAFT MAXIMUM NET QUANTITY/PKG: 25 kg
CARGO AIRCRAFT ONLY PACKING INSTRUCTION: 910
CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY/PKG: 25 kg
SPECIAL PROVISIONS: A112
ERG CODE: 9L

INTERNATIONAL MARITIME ORGANIZATION (IMO): This product is classified as follows, per rules of the IMO.

UN IDENTIFICATION NUMBER: UN 3159
PROPER SHIPPING NAME: 1,1,1,2-Tetrafluoroethane
CLASS: 2.2
SUBSIDIARY RISK: None
PACKING GROUP: Not Applicable
SPECIAL PROVISIONS: None
HAZARD LABEL(S) REQUIRED: Class 2 (Non-Flammable Gas)
LIMITED QUANTITIES: 120 mL
PACKING INSTRUCTION: P200
EmS: F-C, S-V
STOWAGE AND SEGREGATION: Category A

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This is classified as follows, per regulations of the U.N. Economic Commission for Europe.

UN NUMBER: UN 3159
NAME AND DESCRIPTION: 1,1,1,2-Tetrafluoroethane
CLASS: 2
CLASSIFICATION CODE: 2A
PACKING GROUP: Not Applicable
LABELS: 2.2
SPECIAL PROVISIONS: None
LIMITED QUANTITIES: LQ2
PACKING INSTRUCTION: P200
MIXED PACKING INSTRUCTION: MP9
HAZARD IDENTIFICATION NUMBER: 20

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The component of this product is 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 component 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. TSCA INVENTORY STATUS: The component of this product is listed on the TSCA Inventory.

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

OTHER FEDERAL REGULATIONS: Not applicable.

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

15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS (continued):

ANSI LABELING (Z129.1) [Precautionary Statements]: **CAUTION!** KEEP AWAY FROM CHILDREN. LIQUID AND GAS UNDER PRESSURE. IF RELEASED IN LARGE QUANTITY, REDUCES OXYGEN AVAILABLE FOR BREATHING. MAY CAUSE ADVERSE CENTRAL NERVOUS AND CARDIOVASCULAR SYSTEM EFFECTS. Avoid breathing gas, vapor, or mists. Avoid contact with skin, clothing, and eyes. Use only with adequate ventilation. Wash thoroughly in case of contact. Wear gloves, goggles, and appropriate body protection when handling. Do not puncture or incinerate container. Dispose of in accordance with federal, state, and local requirements. **FIRST-AID:** In case of contact, immediately flush skin or eyes for at least 15 minutes with water. Remove contaminated clothing and shoes. If inhaled, move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately. **IN CASE OF FIRE:** Use fog, foam, dry chemical or carbon dioxide. Refer to Material Safety Data Sheet for additional information on this product.

ADDITIONAL CANADIAN REGULATIONS:

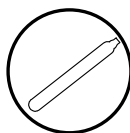
CANADIAN DSL/NDL INVENTORY STATUS: The component of this product is on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The component of this product is not on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS:

Class A: Compressed Gas



EUROPEAN COMMUNITY REGULATIONS:

EU LABELING AND CLASSIFICATION: This product is defined as an Aerosol, as defined in EC Directive, 75/324/EEC. As such containers and packings of this product must be clearly and legibly marked as follows: "Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use. Do not spray on naked flame or any incandescent material".

EU CLASSIFICATION: Due to the overall small amount of product contained in each can (less than 10 mL), no classification of this product is required, per Council Directive 83/265/EEC, 16 May, 1983, Article 6, 6

EU RISK PHRASES: Not applicable.

EU SAFETY PHRASES: Not applicable.

EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOLS: Not applicable.

16. OTHER INFORMATION

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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. Ultramotive Corporation 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, Ultramotive Corporation, 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.

DEFINITIONS OF TERMS

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

CAS #: This is the Chemical Abstract Service Number that uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

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

DFG MAK Germ Cell Mutagen Categories: **1:** Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed humans. **2:** Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed mammals. **3A:** Substances which have been shown to induce genetic damage in germ cells of human or animals, or which produce mutagenic effects in somatic cells of mammals *in vivo* and have been shown to reach the germ cells in an active form. **3B:** Substances which are suspected of being germ cell mutagens because of their genotoxic effects in mammalian somatic cell *in vivo*; in exceptional cases, substances for which there are no *in vivo* data, but which are clearly mutagenic *in vitro* and structurally related to known *in vivo* mutagens.

EXPOSURE LIMITS IN AIR (continued):

DFG MAK Germ Cell Mutagen Categories (continued): **4:** Not applicable (Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic. Therefore, a Category 4 for germ cell mutagens cannot apply. At some time in the future, it is conceivable that a Category 4 could be established for genotoxic substances with primary targets other than DNA [e.g. purely aneugenic substances] if research results make this seem sensible.) **5:** Germ cell mutagens, the potency of which is considered to be so low that, provided the MAK value is observed, their contribution to genetic risk for humans is expected not to be significant.

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

DEFINITIONS OF TERMS (Continued)

EXPOSURE LIMITS IN AIR (continued):

DFG MAK Pregnancy Risk Group Classification (continued): Group B: Currently available information indicates a risk of damage to the developing embryo or fetus must be considered to be probable. Damage to the developing organism cannot be excluded when pregnant women are exposed, even when MAK and BAT values are observed. **Group C:** There is no reason to fear a risk of damage to the developing embryo or fetus when MAK and BAT values are observed. **Group D:** Classification in one of the groups A-C is not yet possible because, although the data available may indicate a trend, they are not sufficient for final evaluation.

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

LOQ: Limit of Quantitation.

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 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.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD

RATINGS: This rating system was developed by the National Paint and Coating Association and has been adopted by industry to identify the degree of chemical hazards.

HEALTH HAZARD:

0 (Minimal Hazard): No significant health risk, irritation of skin or eyes not anticipated. *Skin Irritation:* Essentially non-irritating. PII or Draize = "0". *Eye Irritation:* Essentially non-irritating, or minimal effects which clear in < 24 hours [e.g. mechanical irritation]. Draize = "0". *Oral Toxicity LD₅₀ Rat:* < 5000 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* < 2000 mg/kg. *Inhalation Toxicity 4-hrs LC₅₀ Rat:* < 20 mg/L.; **1 (Slight Hazard):** Minor reversible injury may occur; slightly or mildly irritating. *Skin Irritation:* Slightly or mildly irritating. *Eye Irritation:* Slightly or mildly irritating. *Oral Toxicity LD₅₀ Rat:* > 500-5000 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* > 1000-2000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 2-20 mg/L.; **2 (Moderate Hazard):** Temporary or transitory injury may occur. *Skin Irritation:* Moderately irritating; primary irritant; sensitizer. PII or Draize > 0, < 5. *Eye Irritation:* Moderately to severely irritating and/or corrosive; reversible corneal opacity; corneal involvement or irritation clearing in 8-21 days. Draize > 0, ≤ 25. *Oral Toxicity LD₅₀ Rat:* > 50-500 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* > 200-1000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 0.5-2 mg/L.; **3 (Serious Hazard):** Major injury likely unless prompt action is taken and medical treatment is given; high level of toxicity; corrosive. *Skin Irritation:* Severely irritating and/or corrosive; may destroy dermal tissue, cause skin burns, dermal necrosis. PII or Draize > 5-8 with destruction of tissue. *Eye Irritation:* Corrosive, irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days. Draize > 80 with effects irreversible in 21 days. *Oral Toxicity LD₅₀ Rat:* > 1-50 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* > 20-200 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 0.05-0.5 mg/L.; **4 (Severe Hazard):** Life-threatening; major or permanent damage may result from single or repeated exposure. *Skin Irritation:* Not appropriate. Do not rate as a "4", based on skin irritation alone. *Eye Irritation:* Not appropriate. Do not rate as a "4", based on eye irritation alone. *Oral Toxicity LD₅₀ Rat:* ≤ 1 mg/kg. *Dermal Toxicity LD₅₀ Rat or Rabbit:* ≤ 20 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* ≤ 0.05 mg/L).

FLAMMABILITY HAZARD:

0 (Minimal Hazard): Materials that will not burn in air when exposure to a temperature of 815.5°C [1500°F] for a period of 5 minutes.; **1 (Slight Hazard):** Materials that must be pre-heated before ignition can occur. Material require considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur,

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS:

FLAMMABILITY HAZARD (continued):

1 (continued): 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 coarse 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.; **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:* Packaging 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.

DEFINITIONS OF TERMS (Continued)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued):

3 (continued): *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.).

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

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

FLAMMABILITY HAZARD: 0 Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand: Materials that will not burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in accordance with Annex D.

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

FLAMMABILITY HAZARD (continued): 1 Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur: Materials that will burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in accordance with Annex D. Liquids, solids and semisolids having a flash point at or above 93.4°C (200°F) (i.e. Class IIIB liquids). Liquids with a flash point greater than 35°C (95°F) that do not sustain combustion when tested using the *Method of Testing for Sustained Combustibility*, per 49 CFR 173, Appendix H or the UN *Recommendation on the Transport of Dangerous Goods, Model Regulations* (current edition) and the related *Manual of Tests and Criteria* (current edition). Liquids with a flash point greater than 35°C (95°F) in a water-miscible solution or dispersion with a water non-combustible liquid/solid content of more than 85 percent by weight. Liquids that have no fire point when tested by ASTM D 92 Standard Test Method for Flash and Fire Points by Cleveland Open Cup, up to a boiling point of the liquid or up to a temperature at which the sample being tested shows an obvious physical change. Combustible pellets with a representative diameter of greater than 2 mm (10 mesh). Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed up flash point of the solvent. Most ordinary combustible materials. **2** Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air: Liquids having a flash point at or above 37.8°C (100°F) and below 93.4°C (200°F) (i.e. Class II and Class IIIA liquids.) Solid materials in the form of powders or coarse dusts of representative diameter between 420 microns (40 mesh) and 2 mm (10 mesh) that burn rapidly but that generally do not form explosive mixtures in air. Solid materials in fibrous or shredded form that burn rapidly and create flash fire hazards, such as cotton, sisal and hemp. Solids and semisolids that readily give off flammable vapors. Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **3** Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions: Liquids having a flash point below 22.8°C (73°F) and having a boiling point at or above 37.8°C (100°F) and those liquids having a flash point at or above 22.8°C (73°F) and below 37.8°C (73°F) and below 37.8°C (100°F) (i.e. Class IB and IC liquids). Materials that, on account of their physical form or environmental conditions, can form explosive mixtures with air and are readily dispersed in air. Flammable or combustible dusts with a representative diameter less than 420 microns (40 mesh). Materials that burn with extreme rapidity, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **4** Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily: Flammable gases. Flammable cryogenic materials. Any liquid or gaseous materials that is liquid while under pressure and has a flash point below 22.8°C (73°F) and a boiling point below 37.8°C (100°F) (i.e. Class IA liquids). Materials that ignite when exposed to air. Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

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

DEFINITIONS OF TERMS (Continued)

FLAMMABILITY LIMITS IN AIR:

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

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TD₀**, **LDLo**, and **LD₀**, or **TC**, **TC₀**, **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. Occupational Safety and Health Administration (**OSHA**). **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/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