



MATERIAL SAFETY DATA SHEET

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

WARNING: PRODUCT COMPONENTS PRESENT HEALTH AND SAFETY HAZARDS. READ AND UNDERSTAND THIS MATERIAL SAFETY DATA SHEET (M.S.D.S.). ALSO, FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES. Use of this product may expose you or others to fumes and gases at levels exceeding those established by the American Conference of Governmental Industrial Hygienists (ACGIH) or the Occupational Safety and Health Administration (OSHA) The information contained herein relates only to the specific product. If the product is combined with other materials, all component properties must be considered. **BE SURE TO CONSULT THE LATEST VERSION OF THE MSDS. MATERIAL SAFETY DATA SHEETS ARE AVAILABLE FROM HARRIS PRODUCTS GROUP.** E-MAIL: salesinfo@jwharris.com; TELEPHONE: 513-754-2000; WEB SITE: www.harrisproductsgroup.com

STATEMENT OF LIABILITY-DISCLAIMER

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

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): ALCoR™
CHEMICAL NAME/CLASS: Solder/ Braze Alloy
SYNONYMS: Not Applicable
PRODUCT USE: Metal Soldering/Brazing
DOCUMENT NUMBER: ALCOR
SUPPLIER/MANUFACTURER'S NAME: HARRIS PRODUCTS GROUP
ADDRESS: 4501 Quality Place, Mason, Ohio 45040
EMERGENCY PHONE: CHEMTREC: 1-800-424-9300
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DATE OF PREPARATION: July 12, 2007

2. NOMINAL COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS # %w/w	EXPOSURE LIMITS IN AIR					OTHER mg/m ³
		ACGIH-TLV		OSHA-PEL		IDLH mg/m ³	
		TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³		
Aluminum (exposure limits are for aluminum, metal dust and aluminum, welding fume, as aluminum)	7429-90-5 4.0	10 (dust) 5 (fumes)	NE	15 (Total dust) 5 (Respirable fraction) 5 (fume) (vacated 1989 PEL)	NE	NE	NIOSH REL: TWA = 10 (Total dust); 5 (Respirable fraction); 5 (fumes) DFG MAK: TWA = 1.5 (dust - respirable fraction)
Cesium Aluminum Fluoride (exposure limits are for fluorides, as F; 7789-75-5)	138577-01-2 2.0	2.5	NE	2.5	NE	250	NIOSH REL:TWA = 2.5 DFG MAKs: TWA = 2.5 PEAK = 5•MAK 30 min., average value Carcinogen: IARC-3, TLV-A4
Zinc Exposure limits given are for Zinc oxide, Fume & Dust	7440-66-6 Balance	5 (fume) 10 (dust)	10 (fume)	5 (fume) 5 (total dust) 15 (dust, respirable dust) 5 (dust, respirable dust,	10 (fume, Vacated 1989)	500	NIOSH RELs: TWA = 5 (dust & fume) STEL = 10 (fume), 15 (ceiling, 15 min., dust) DFG MAK: TWA = 1.5 (Respirable

NE = Not Established. See Section 16 for Definitions of Terms Used. Single values shown are maximum, unless otherwise noted.

NOTE (1): The ACGIH has an established exposure limit for Brazing Fumes, Not Otherwise Classified. The Threshold Limit Value is 5 mg/m³. NIOSH classifies brazing fumes as carcinogens.

NOTE (2): 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.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: These products consist of gray to silver-colored, odorless wires, with a core through the center. There is no immediate health hazard associated with the wire product. The core of these products contains a sensitizer; prolonged or repeated exposure to the core may cause respiratory and skin allergy-like reactions. Though the wire is not flammable, if involved in a fire and exposed to extremely high temperatures, harmful fumes containing a variety of metal oxides may be generated. These products are not reactive under normal circumstances of use. 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: During brazing/soldering the most significant routes of exposure are inhalation, and contact of the skin and eyes.

INHALATION: If any exposure to these fumes does occur, however, the main health effect will be irritation of the nose, throat, and other tissues of the respiratory system. Inhalation of zinc oxide (components of this product) fumes can cause metal fume fever. Initial symptoms of metal fume fever can include a metallic or sweet taste in the mouth, dryness or irritation of the throat, and coughing. Later symptoms (after 4-48 hours) can include sweating, shivering, headache, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, and tiredness. Repeated over-exposures, via inhalation, to the dusts or fumes generated by these products during brazing/soldering operations may have adverse effects on the lungs with possible pulmonary edema and emphysema (life-threatening lung injuries). Exposure to large quantities of the core component of these products may cause irritation of the nose and respiratory system. Repeated or prolonged inhalation of these products, can cause allergy-like reactions (i.e. wheezing and asthma).

CONTACT WITH SKIN or EYES: Contact of the wire form of these products with skin is not anticipated to be irritating. Symptoms of skin over-exposures to the fumes or core of these products may include irritation and redness; prolonged or repeated skin over-exposures may lead to dermatitis. Contact of the core of these products with the skin can cause allergic reactions (i.e. rashes and inflammation of the skin). Contact with the wire form of these products can be physically damaging to the eye. Fumes generated during brazing/soldering operations can be irritating to the skin and eyes. Symptoms of eye over-exposure include pain, redness, irritation, and tearing. Contact with the molten core solder will burn contaminated skin or eyes.

SKIN ABSORPTION: No component of these products can be absorbed through the skin.

INGESTION: Not applicable.



INJECTION: Though not a likely route of occupational exposure for these products, injection of these products (via punctures or lacerations in the skin) may cause local reddening, tissue swelling, and discomfort.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Symptoms associated with over-exposure to these products, and the fumes generated during operations, are as follows:

ACUTE: Inhalation zinc oxide fumes can cause metal fume fever. Inhalation of large amounts of particulates generated by these products during metal processing operations can result in pneumoconiosis (a disease of the lungs). Contact with the molten alloy will burn contaminated skin or eyes.

CHRONIC: Chronic skin over-exposure to the fumes of these products generated during soldering operations may produce dermatitis (red, inflamed skin). The core of these products contains a sensitizer, prolonged or repeated exposure to this can cause respiratory and skin allergy-like reactions. Refer to Section 11 (Toxicological Information) for further information.

TARGET ORGANS: For Fumes: ACUTE: Skin and eyes, respiratory system. CHRONIC: Skin, respiratory system.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH		(BLUE)	1
FLAMMABILITY		(RED)	0
REACTIVITY		(YELLOW)	0
PROTECTIVE EQUIPMENT			X
EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8
For routine industrial applications for rods			

See Section 16 for Definition of Ratings

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. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with victim.

SKIN EXPOSURE: If the fumes or core of the product irritates the skin, begin decontamination with running water. Victim must seek medical attention if any adverse reaction occurs. If molten alloy contaminates the skin, immediately begin decontamination with cold, running water. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

EYE EXPOSURE: If the product's fumes, or core 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. If molten alloy contaminates the eyes, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

INHALATION: If fumes of these products are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions.

INGESTION: If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Rinse mouth with water if person is conscious. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin disorders may be aggravated by prolonged over-exposures to these products.

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

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not flammable.

AUTOIGNITION TEMPERATURE: Not flammable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES

Halon: YES

Dry Chemical: YES

Carbon Dioxide: YES

Foam: YES

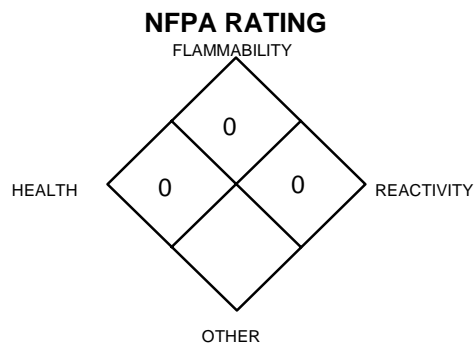
Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this material may melt and produce fumes, zinc, aluminum compounds and a variety of metal oxides.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Not applicable.



**See Section 16 for
Definition of Ratings**

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Not applicable.

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 these products ON YOU or IN YOU. Wash hands after handling these products. Do not eat or drink while handling this material. Use ventilation and other engineering controls to minimize potential exposure to these products.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing fumes of these products during soldering/brazing operations. Packages of these products must be properly labeled.

During soldering/brazing operations, it is recommended that the requirements of the Federal Occupational Safety and Health Welding and Cutting Standard (29 CFR 1910 Subpart Q) and the safety standards of the American National Standards Institute for welding and cutting (ANSI Z49.1) be followed.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure limits are below those provided in Section 2 (Composition and Information on Ingredients). Use a mechanical fan or vent area to outside. Prudent practice is to ensure eyewash/safety shower stations are available near areas where these products are used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed (i.e. a Weld Fume Respirator, or Air-Line Respirator for welding in confined spaces), 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. Respiratory Protection is recommended to be worn during welding operations. 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). For additional information, the following respirator selection guidelines from NIOSH for Zinc Oxide (the main component of these products) are provided:

CONCENTRATION:

Up to 10 mg/m³:

Up to 20 mg/m³:

RESPIRATORY EQUIPMENT:

Dust and mist respirator.

Dust and mist respirator except single-use and quarter-mask respirator; or Supplied Air Respirator (SAR).

RESPIRATORY PROTECTION (continued):

CONCENTRATION:

Up to 50 mg/m³:

Up to 100 mg/m³:

RESPIRATORY EQUIPMENT:

SAR operated in a continuous-flow mode; or powered air-purifying respirator with dust and mist filter(s).

Full-facepiece respirator with high-efficiency particulate filter(s); or full-facepiece Self-Contained Breathing Apparatus (SCBA); or full-facepiece SAR.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape: Full-facepiece respirator with high-efficiency particulate filter(s); or escape-type SCBA.

EYE PROTECTION: Safety glasses. When these products are used in conjunction with soldering/brazing, wear safety glasses, goggles or face-shield with filter lens of appropriate shade number (per ANSI Z49.1-1988, "Safety in Welding and Cutting"), as necessary.

HAND PROTECTION: Wear gloves for routine industrial use. When these products are used in conjunction with soldering or brazing, wear gloves that protect from sparks and flame (per ANSI Z49.1-1988, "Safety in Welding and Cutting"), as necessary.

BODY PROTECTION: Use body protection appropriate for task (i.e. leather apron).

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Zinc, a main component of this product:

RELATIVE VAPOR DENSITY (air = 1): Not applicable.

SPECIFIC GRAVITY (water = 1): 7.14

SOLUBILITY IN WATER: Insoluble.

VAPOR PRESSURE, mm Hg @ 20°C: Not applicable.

FREEZING/MELTING POINT: 149°C (786°F)

EVAPORATION RATE (nBuAc = 1): Not applicable.

pH: Not applicable.

ODOR THRESHOLD: Not applicable.

BOILING POINT: 907°C (1665°F)

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable

The following information is for the product:

APPEARANCE, ODOR AND COLOR: These products are a gray to silver, odorless metal wires, which may have a core running through the middle.

HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance is a distinctive characteristic of these products.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Aluminum and zinc compounds and metal oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: These products are not compatible with strong acids (i.e. nitric acid), strong bases (i.e. sodium hydroxide), and strong oxidizers (i.e. hydrogen peroxide).

HAZARDOUS POLYMERIZATION: Will not occur.

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

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

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following human toxicological data are available for the components of these products. Other data for animals are available but are not presented in this Material Safety Data Sheet.

SUSPECTED CANCER AGENT: The components of these products are listed as follows:

ZINC: EPA-D (Not Classifiable as to Human Carcinogenicity (inadequate human and animal evidence of carcinogenicity or no data available))

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

IRRITANCY OF PRODUCT: The fumes of these products, generated during soldering operations, can be irritating to contaminated skin and eyes.

SENSITIZATION TO THE PRODUCT: These products contain flux, which is an allergen and can cause respiratory and skin reactions (i.e. asthma, rashes, and welts).

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of these products and their components on the human reproductive system.

Mutagenicity: These products are not reported to produce mutagenic effects in humans.

Embryotoxicity: These products are not reported to produce embryotoxic effects in humans.

Teratogenicity: These products are not reported to cause teratogenic effects in humans.

Reproductive Toxicity: These products are 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, Biological Exposure Indices (BEIs) have not been determined for the components of these products.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: These products, if released into the environment, may cause local heavy metal contamination with potential impact on plant, animal, and aquatic life. The metal is not biodegradable, and will persist in the environment for an extended period of time. The following environmental data are available for the components of these products.

ZINC: Solubility: Insoluble in water. Biological Half-Life for normal humans 162-500 days. Bioconcentration: The Bioconcentration Factor in edible portions of *Crassostrea virginica*, adult oyster is 16,700 (total zinc).

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product may be harmful or fatal to contaminated plant and animal-life (especially if large quantities of this product are released). Specific data on test animals are available, but are not presented in this Material Safety Data Sheet.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product may cause adverse effects on aquatic life. Additional environmental data are available as follows:

ZINC: Odorless zinc poisoning causes inflamed gills in fish. Laboratory studies of Atlantic salmon, rainbow trout, carp, and goldfish have shown avoidance reactions by these fish to zinc in water

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. These products, 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 to waste consisting only of this product..

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS (Per 49 CFR 172.101) BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Not applicable. **DOT LABEL(S) REQUIRED:** Not applicable.

UN IDENTIFICATION NUMBER: Not applicable. **PACKING GROUP:** Not applicable.

HAZARD CLASS NUMBER and DESCRIPTION: Not applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER, 2000: Not applicable.

MARINE POLLUTANT: No component of this product is designated as a marine pollutant by the Department of Transportation (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This material is not considered as dangerous goods, per regulations of Transport Canada.

15 REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

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

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Aluminum (fume or dust)	No	No	Yes
Zinc	No	Yes	Yes (fume or dust)

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

U.S. TSCA INVENTORY STATUS: The components of these products are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): , Zinc = 1000 lbs (454 kg), (Note: No reporting is required if the diameter of the metal equals or exceeds 100 micrometers).

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

Alaska-Designated Toxic and Hazardous Substances: Aluminum,.

California-Permissible Exposure Limits for Chemical Contaminants: Aluminum, Zinc,.

Florida-Substance List: Aluminum, Zinc,.

Illinois-Toxic Substance List: Aluminum, Zinc,

Kansas-Section 302/313 List: Aluminum, Zinc.

Massachusetts-Substance List: Aluminum, Zinc,.

Michigan Critical Materials Register:, Zinc.

Minnesota-List of Hazardous Substances: Copper Dust & Mists, Nickel, Tin, Antimony and compounds, Silver.

Missouri-Employer Information/Toxic Substance List: Aluminum

New Jersey-Right to Know Hazardous Substance List: Aluminum ,Zinc.

North Dakota-List of Hazardous Chemicals, Reportable Quantities: Zinc

Pennsylvania-Hazardous Substance List: Aluminum, Zinc,.

Rhode Island-Hazardous Substance List: Aluminum, Zinc.

Texas-Hazardous Substance List:

West Virginia-Hazardous Substance List:

Wisconsin-Toxic and Hazardous Substances:

CALIFORNIA PROPOSITION 65: No component of these products is on the California Proposition 65 lists **The State of California requires the following information: WARNING: This product may contain chemicals, and when used for welding/brazing/soldering may produce fumes or gases containing chemicals, known to the State of California to cause cancer, and/or birth defects (or other reproductive harm.)**

LABELING (Precautionary Statements): CAUTION! FUMES MAY BE HARMFUL IF INHALED. FUMES CAN CAUSE SKIN AND EYE IRRITATION. FUMES OR CONTACT WITH CORE MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTIONS. MOLTEN ALLOY CAN CAUSE THERMAL BURNS. Avoid inhalation of fumes. Avoid contact with skin, eyes, and clothing. Wash thoroughly after handling. Use in well-ventilated area. Wear gloves, safety glasses (or colored-absorptive lens), body protection and respiratory protection, as appropriate, for brazing or soldering operations. **FIRST-AID:** In case of skin or eye contact with fumes, flush skin with copious amounts of water. In case of thermal burn, flush area with water for 15 minutes. Remove contaminated clothing and shoes. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If ingested, do not induce vomiting. Seek medical attention if adverse reaction occurs, or in the event of a thermal burn. **IN CASE OF FIRE:** Use water spray, foam, dry chemical or CO₂. **IN CASE OF SPILL:** Sweep-up or vacuum spilled material, absorb spilled liquid with inert materials. If molten material is released, allow it to cool before clean-up. Place in a suitable container. Consult Material Safety Data Sheet before use.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: The components of these products are on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

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

CANADIAN WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

DATE OF PRINTING:

July 12, 2007

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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.

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 (**C**). 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 overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure 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 causes 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:

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; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other Information:** **BEI** - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. **Ecological Information:** **EC** is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. 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:

This section explains the impact of various laws and regulations on the material. **U.S.:** **EPA** is the U.S. Environmental Protection Agency. **DOT** is the U.S. Department of Transportation. **SARA** is the Superfund Amendments and Reauthorization Act. **TSCA** is the U.S. Toxic Substance Control Act. **CERCLA (or Superfund)** refers to the Comprehensive Environmental Response, Compensation, and Liability Act. Labeling is per the American National Standards Institute (**ANSI Z129.1**). **CANADA:** **CEPA** is the Canadian Environmental Protection Act. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **TC** is Transport Canada. **DSL/NDSL** are the Canadian Domestic/Non-Domestic Substances Lists. **The CPR is the Canadian Product Regulations.** This section also includes information on the precautionary warnings which appear on the materials package label.