



MATERIAL SAFETY DATA SHEET

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

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

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **ZINC CHLORIDE ANHYDROUS (95-100%)**

CHEMICAL NAME/CLASS: Inorganic Salt

TECHNICAL BULLETINS: Anhydrous Zinc Chloride

PRODUCT USE: Various Industrial Applications

SUPPLIER/MANUFACTURER'S NAME: **MINERAL RESEARCH AND DEVELOPMENT CORP.**

ADDRESS: 200 East Woodlawn Road
One Woodlawn Green – Suite 250
Charlotte, NC 28217

EMERGENCY PHONE: CHEMTREC: 1-800-424-9300

BUSINESS PHONE: 704-525-2771

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2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		IDLH mg/m ³	OTHER
			TLV mg/m ³	STEL mg/m ³	PEL mg/m ³	STEL mg/m ³		
Zinc Chloride The following exposure limits are for "Zinc Chloride Fumes"	7646-85-7	95-100	1	2	1	2 (Vacated 1989 PEL)	50	NIOSH REL: TWA = 1 mg/m ³ ST: 2 mg/m ³ Carcinogen: EPA-D
Other components each present in less than 1% concentration (or 0.1% for carcinogens, reproductive toxins, and respiratory sensitizers)		Balance	None of these components contribute additional, significant hazards to this product. All hazard information has been presented, per the requirements of the Federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards).					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used
NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Zinc Chloride is a white, odorless, crystalline solid. The primary health hazard associated with Zinc Chloride is related to its corrosivity; contact with the material (or fumes, mists, sprays or liquid from solutions containing this substance) can burn eyes, skin, and other contaminated tissue. Zinc Chloride is not flammable or reactive. Emergency responders must wear the personal protective equipment suitable for the situation to which they are responding.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The primary routes of overexposure for the solution are via inhalation and contact with skin and eyes. The following paragraphs describe the symptoms of overexposure to this material.

INHALATION: If Zinc Chloride dusts (or fumes, vapors, mists, or sprays of solutions containing this substance) are inhaled, they may irritate the nose, throat, and lungs. Damage to the tissues of the respiratory system may occur, such as burns and ulcers, especially after prolonged overexposures or overexposures to high concentrations of Zinc Chloride. Additional inhalation symptoms may include the following: choking, coughing, and difficulty breathing. Severe inhalation overexposures can lead to pulmonary edema, pneumonitis, and death.

Inhalation of Zinc Chloride fumes can cause metal fume fever. Symptoms of such overexposure include headache, fever, rapid breathing, sweating, pains in legs or chest. Extreme overexposures to fumes can cause liver and kidney disorders and may be fatal.

CONTACT WITH SKIN or EYES: Depending on the duration of overexposure, contact with the eyes will cause irritation, pain, reddening, and blindness. Depending on the duration of skin contact, skin overexposures will cause reddening, discomfort, irritation, ulceration, and chemical burns. Chemical burns can result in blistering of the skin and scarring. Repeated skin overexposures can result in dermatitis (inflammation and reddening of the skin).

SKIN ABSORPTION: Skin absorption is not a significant route of overexposure for Zinc Chloride.

INGESTION: If Zinc Chloride is swallowed, irritation and burns of the mouth, throat, esophagus, and other tissues of the digestive system will occur immediately upon contact. Symptoms of such overexposure can include drowsiness, confusion, difficulty swallowing, burning sensation in the esophagus and stomach, intense thirst, nausea, abdominal pain, vomiting, diarrhea, hypertension, convulsions, and collapse. A dose of 6 grams of Zinc Chloride has been reported as being fatal to humans. Ingestion of large volumes of Zinc Chloride may be fatal.




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

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. In the event of overexposure, the following symptoms may be observed:

ACUTE: Zinc Chloride is corrosive. Depending on the duration of contact, overexposures can irritate or burn the eyes, skin, mucous membranes, and any other exposed tissue. If inhaled, irritation of the respiratory system may occur, with coughing, and difficulty breathing. Inhalation of fumes may cause metal fume fever. Skin contact can cause blisters and scars. Eye contact can cause blindness. Severe inhalation and ingestion overexposures may be fatal.

CHRONIC: Stomach pains, metallic taste vomiting, diarrhea, lung irritation, chest pains, and edema can occur after prolonged or repeated overexposures via inhalation of high concentrations of Zinc Chloride. Prolonged or repeated skin contact can lead to dermatitis. Animal studies indicate that there are potentially adverse effects on the reproductive system and developing fetuses. See Section 11 (Toxicology Information) for additional data.

TARGET ORGANS: All forms: Skin, eyes, respiratory system. Fumes: Liver, kidneys.

HAZARDOUS MATERIAL INFORMATION SYSTEM			
HEALTH		(BLUE)	3
FLAMMABILITY		(RED)	0
REACTIVITY		(YELLOW)	0
PROTECTIVE EQUIPMENT			H
EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		
For routine industrial applications			

See Section 16 for Definition of Ratings

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

4. FIRST-AID MEASURES

SKIN EXPOSURE: If Zinc Chloride contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE: If Zinc Chloride dusts (or fumes, vapors, mists, or sprays of solutions containing this substance) enter the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

INHALATION: If Zinc Chloride dusts (or vapors, mists, or sprays of solutions containing this substance) are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

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

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

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

Foam: YES

Halon: YES

Carbon Dioxide: YES

Dry Chemical: YES

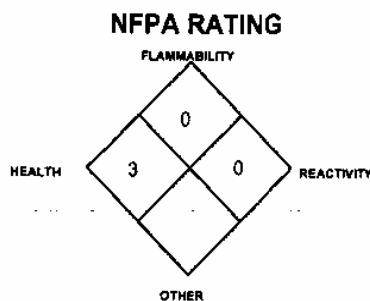
Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Zinc Chloride is corrosive, and presents a severe contact hazard to fire-fighters. When involved in a fire, this material may decompose and produce zinc compounds, hydrogen chloride, hydrogen, chlorine, and acidic vapors.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary. Move containers from fire area if they have not been exposed to heat and if it can be done without risk to personnel. If Zinc Chloride is involved in a fire, fire run-off water should be contained to prevent possible environmental damage.



See Section 16 for Definition of Ratings

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a large spill, clear the affected area, and protect people.

In the event of a non-incident release, minimum Personal Protective Equipment should be **Level B: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemically resistant suit and boots, hard-hat, and Self Contained Breathing Apparatus**. Sweep-up or vacuum area, minimizing the generation of dusts. If necessary, neutralize remaining residue with sodium bicarbonate or other acid neutralizing agent and triple rinse area with water. Decontaminate the area thoroughly. Test area with litmus paper to ensure than neutralization is complete. Place all spill residue in a suitable container and seal. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).

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

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Zinc Chloride ON YOU or IN YOU. Wash hands after handling this substance. Do not eat, drink, smoke or apply cosmetics while handling Zinc Chloride. All work practices should minimize the generation of this product's dusts (or fumes, vapors, mists, or sprays of solutions containing this substance). Remove contaminated clothing immediately. Sweep-up area periodically to prevent accumulation of dusts.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing dusts generated by Zinc Chloride (or mists and sprays from solutions containing this substance). Use in a well-ventilated location. Open containers slowly, on a stable surface. Containers of Zinc Chloride must be properly labeled. Empty containers may contain material; therefore, empty containers should be handled with care.

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials (see Section 10, Stability and Reactivity). Material should be stored in secondary containers, or in a diked area, as appropriate. Keep container tightly closed when not in use. Use corrosion-resistant structural materials, lighting, and ventilation systems in the storage area. Floors should be sealed to prevent absorption of this material. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely, if necessary. Decontaminate equipment using acid neutralizing agent, followed by a triple-rinse with water, before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients), if applicable. Use a corrosion-resistant ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside. Use local exhaust ventilation, and process enclosure if necessary, to control dust or mist formation. Supply sufficient replacement air to make up for air removed by system. Ensure eyewash/safety shower stations are available near areas where Zinc Chloride is used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed (e.g., air-purifying respirator with dust, mist, and fume-filters), use only protection authorized in 29 CFR 1910.134, or applicable State regulations. Use supplied air respiration protection during response procedures to non-incident releases and if oxygen levels are below 19.5% or are unknown. The following are NIOSH recommendations for Zinc Chloride (Fume) concentrations in air:

CONCENTRATION	RESPIRATORY EQUIPMENT
UP TO 10 mg/m ³ :	Dust, mist, and fume respirator; or Supplied-Air Respirator (SAR).
UP TO 25 mg/m ³ :	Powered air-purifying respirator with dust, mist, and fume-filter(s); or SAR operated in a continuous-flow mode.
UP TO 50 mg/m ³ :	Full-facepiece respirator with high-efficiency filter(s); or powered air-purifying respirator with tight-fitting facepiece and high-efficiency particulate filter(s); or full-facepiece 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.
NOTE:	The IDLH concentration for zinc chloride fume is 50 mg/m ³ .

EYE PROTECTION: Splash goggles or safety glasses. Face shields recommended when using quantities of Zinc Chloride in excess of 1 lb.

HAND PROTECTION: Wear Neoprene or Rubber gloves for routine industrial use. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS.

BODY PROTECTION: Use body protection appropriate for task. An apron, or other impermeable body protection is suggested. Full-body chemical protective clothing is recommended for emergency response procedures.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: < 1.0

SPECIFIC GRAVITY @15°C (59°F): 2.907

SOLUBILITY IN WATER: Completely

VAPOR PRESSURE: Practically zero.

ODOR THRESHOLD: Not applicable.

LOG WATER/OIL DISTRIBUTION COEFFICIENT: Not available.

APPEARANCE AND COLOR: Zinc Chloride is an odorless, white, crystalline solid.

HOW TO DETECT THIS SUBSTANCE (warning properties): Litmus paper will turn red upon contact with concentrated Zinc Chloride solutions.

EVAPORATION RATE (n-BuAc=1): Not applicable.

FREEZING POINT or RANGE: 290°C (554°F)

BOILING POINT: 732°C (1350°F)

pH: < 2 (concentrated solutions); 4.0 (10% solution)

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Zinc compounds, hydrogen chloride, and chlorine.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong bases, alkali metals, and strong oxidizing agents.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Extreme heat and contact with incompatible chemicals.

PART IV

Is there any other useful information about this material?

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicology data for Zinc Chloride are provided below.

Microsomal Mutagenicity Assay-*Salmonella typhimurium* 90 mmol/L

DNA Inhibition-Human: lymphocyte 360 mmol/L

Intraperitoneal-Rat TDLo: 30 g/kg (female 7-8 days post): Teratogenic effects

Intravaginal-Rabbit, adult TDLo: 29,184 mg/kg (female 1 day pre): Reproductive effects

Parenteral-Hamster TDLo: 17 mg/kg: Equivocal tumorigenic agent

Parenteral-Chicken, adult TDLo: 15 mg/kg :Equivocal tumorigenic agent, Reproductive effects

Inhalation-Man TCLo: 4800 mg/m³/30 minutes: Pulmonary system effects

Inhalation-Human TCLo: 4800 mg/m³/3 hours

Inhalation-Rat LCLo :1960 mg/m³/10 minutes

Intraperitoneal-Rat LD₅₀: 58 mg/kg

Intravenous-Rat LDLo: 30 mg/kg

Oral-Mouse LD₅₀: 350 mg/kg

Intraperitoneal-Mouse LD₅₀: 24 mg/kg

SUSPECTED CANCER AGENT: Zinc Chloride is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, and CAL/OSHA and therefore is not considered to be, nor suspected to be, a cancer causing agent by these agencies. Zinc Chloride is listed as follows: EPA-D (Not Classifiable as to Human Carcinogenicity).

IRRITANCY OF PRODUCT: Zinc Chloride is severely irritating and corrosive to contaminated tissue, especially after prolonged contact.

SENSITIZATION OF PRODUCT: Zinc Chloride is not known to be a sensitizer with repeated or prolonged use.

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

Mutagenicity: Zinc Chloride is not reported to produce mutagenic effects in humans. Human mutation data are available for Zinc Chloride; these data were obtained during clinical studies on specific human tissues exposed to high doses of this compound.

Embryotoxicity: Zinc Chloride is not reported to produce embryotoxic effects in humans.

Teratogenicity: Zinc Chloride is not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of Zinc Chloride indicate teratogenic effects.

Reproductive Toxicity: Zinc Chloride is not reported to cause reproductive toxicity effects in humans. Clinical studies on test animals exposed to relatively high doses of Zinc Chloride indicate adverse reproductive effects. Large doses of zinc chloride caused decreased testes size and infertility.

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.

11. TOXICOLOGICAL INFORMATION (Continued)

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis, other skin disorders, respiratory diseases, and disorders of the Target Organs (see Section 3, Hazard Identification) may be aggravated by overexposure to Zinc Chloride.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure. Be observant for signs of pulmonary edema in the event of severe inhalation overexposures.

BIOLOGICAL EXPOSURE INDICES: Currently, there are no Biological Exposure Indices (BEIs) associated with Zinc Chloride.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: Zinc Chloride is relatively stable under ambient, environmental conditions. Additional environmental data are available as follows:

ZINC CHLORIDE: Water solubility: 432 g/ 100 mL (25°C), 614 g/ 100 mL (100°C). Zinc can persist indefinitely as a cation. Radioactive zinc (⁶⁵Zn) has been found to concentrate in plants, milk, and aquatic life. Acute Hazard Level Threshold: For vegetables and other crops - 750 ppm (Zn).

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Plants contaminated with Zinc Chloride may be adversely affected or destroyed. Animals contaminated with this substance can be severely injured or killed. Refer to Section 11 (Toxicology Information) for clinical data on the effects of Zinc Chloride on test animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Due to the acidic nature of Zinc Chloride, a release of this substance in a river or other body of water (especially in large volumes) will kill fish and other aquatic life. Additional aquatic toxicity data are available as follows:

ZINC CHLORIDE:

Acute Hazard Level Threshold: For fish - 0.1 ppm (Zn)

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.

Radioactive zinc (⁶⁵Zn) has been found to concentrate in aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Zinc Chloride, 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 wastes consisting only of Zinc Chloride.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Zinc chloride, anhydrous

HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive)

UN IDENTIFICATION NUMBER: UN 2331

PACKING GROUP: III

DOT LABEL(S) REQUIRED: Corrosive

NORTH AMERICAN EMERGENCY RESPONSE GUIDE NUMBER (1996): 154

MARINE POLLUTANT: Zinc Chloride is not designated by the Department of Transportation to be Marine Pollutants (per 49 CFR 172.101 Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Refer to information above for Canadian Shipments.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Zinc Chloride is 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)
ZINC CHLORIDE	NO	YES	YES (as a Zinc Compound)

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Zinc Chloride = 1000 lb.

CANADIAN DSL INVENTORY: The components of this material are listed on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: The components of this material are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Zinc Chloride is designated as a hazardous substance under Section 311(b)(2)(A) of the Federal Water Pollution Control Act.

U.S. STATE REGULATORY INFORMATION: Zinc Chloride is covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Zinc Chloride (fume).

California - Permissible Exposure Limits for Chemical Contaminants: Zinc Chloride (fume).

Florida - Substance List: Zinc Chloride (fume).

Illinois - Toxic Substance List: Zinc Chloride (fume).

Kansas - Section 302/313 List: Zinc Chloride (fume).

Massachusetts - Substance List: Zinc Chloride (fume).

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: Zinc Chloride (fume).

Missouri - Employer Information/Toxic Substance List: Zinc Chloride (fume).

New Jersey - Right to Know Hazardous Substance List: Zinc Chloride (fume).

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Zinc Chloride (fume).

Pennsylvania - Hazardous Substance List: Zinc Chloride.

Rhode Island - Hazardous Substance List: Zinc Chloride (fume).

Texas - Hazardous Substance List: Zinc Chloride (fume).

West Virginia - Hazardous Substance List: Zinc Chloride (fume).

Wisconsin - Toxic and Hazardous Substances: Zinc Chloride (fume).

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Zinc Chloride is not on the California Proposition 65 lists.

LABELING (Precautionary Statements): **DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. CAUSES SKIN AND EYE BURNS. HARMFUL IF INHALED.** Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing dusts. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, face-shield, suitable body protection, and NIOSH/MSHA approved respirator as necessary. **FIRST-AID:** In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL:** Sweep-up or vacuum spilled solid. If necessary, use neutralizing agent for acids. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

CANADIAN WHMIS SYMBOLS:

Class D1B: Materials Causing Immediate and Serious Toxic Effects
Class E: Corrosive



16. OTHER INFORMATION

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
(619) 565 - 0302

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DEFINITIONS OF TERMS

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

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (**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).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued):

Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

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

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** - concentration expressed in parts of material per million parts of air or water; **mg/m³** - concentration expressed in weight of substance per volume of air; **mg/kg** - quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TD₀**, **LDLo**, and **LD₀**, or **TC**, **TC₀**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: **EC** is the effect concentration in water.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDL**); 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.