

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

<u>TRADE NAME (AS LABELED):</u>	FIRESTOP PUTTY, FSP™
<u>CHEMICAL NAME/CLASS:</u>	Alkanoic acid mixture
<u>SYNONYMS:</u>	None
<u>PRODUCT USE:</u>	Firestop Product
<u>SUPPLIER/MANUFACTURER'S NAME:</u>	Nelson EGS
<u>ADDRESS:</u>	4135 E. 100 th East Ave. #100 Tulsa, Oklahoma 74146-3636
<u>CHEMTREC EMERGENCY NO.:</u>	1-800-424-9300 (United States)
<u>BUSINESS PHONE:</u>	(918) 627-5530/(800) 331-7325
<u>REVISION DATE:</u>	July 14, 2004

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH- TLV		OSHA- PEL		IDLH mg/m ³	OTHER mg/m ³
			TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³		
Melamine Crystal	108-78-1	13-16	NE	NE	NE	NE	NE	Carcinogenicity: IARC-3
Polybutene	9003-29-6	9-10	NE	NE	NE	NE	NE	NE
Polyphosphoric Acid, Ammonium Salt	68333-79-9	22-25	NE	NE	NE	NE	NE	NE
Pentaerythritol	115-77-5	13-15	10	NE	15 (total dust) 5 (respirable fraction) Vacated 1989 PELs: 10 (total dust) 5 (respirable fraction)	NE	NE	NIOSH RELs: TWA = 10 (total dust);5 (respirable fraction)
Dextrin	Proprietary	< 7	NE	NE	NE	NE	NE	NE
Calcium carbonate filler containing Aramide The following exposure limits are for Aramide (fibrous dust)	Proprietary	< 2	NE	NE	NE	NE	NE	Carcinogenicity: MAK-3

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.

2. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH- TLV		OSHA- PEL		IDLH mg/m ³	OTHER mg/m ³
			TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³		
Iron Oxide The following exposure limits are for iron oxide dust and fume, as Fe	1309-37-1	< 1	5, A4 (Particulate matter containing no asbestos and <1% crystalline silica)	NE	10	NE	2500	DFG MAKs: TWA = 1.5 (measured as respirable fraction of aerosol) CARCINOGENICITY: IARC-3, TLV-A4
Other components which are present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).	Balance	None of the other components contribute significant additional hazards at the concentrations present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards and Canadian Workplace Hazardous Materials Identification System Standards (CPR 4).						

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.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a light brown to brick red putty with a mild petroleum odor. The chief health hazard associated with overexposure would be the potential to slightly irritate the eyes, skin, nose, and other tissues that come in contact with the this product or in the event that particulates are generated from the product. This product is not flammable or reactive. Thermal decomposition of this product produces irritating vapors and toxic gases (e.g., carbon oxides). Emergency responders must wear proper personal protective equipment for the releases to which they are responding.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: Under normal circumstances of use, this product should not present significant health hazards. In event of thermal decomposition of the putty or if particulates are generated, the most significant routes of occupational overexposure would be via inhalation and contact with skin. The symptoms of overexposure to this product, via route of entry, are as follows:

INHALATION: Breathing airborne particulates, if generated during use of this product this product, may irritate the nose, throat, or respiratory system. Symptoms of such exposure could include coughing and sneezing. Symptoms are generally alleviated when exposure ends.

CONTACT WITH SKIN or EYES: Eye contact should not normally present a significant health hazard. In event of the generation of particulates, stinging, tearing, and redness from mechanical irritation could result. Skin contact with this product is not expected to present significant health hazards.

SKIN ABSORPTION: Skin absorption is not anticipated to be a significant route of overexposure for any component of this product.

INGESTION: Ingestion of this product is unlikely.

INJECTION: Injection of this product is unlikely.

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

ACUTE: The most likely symptom of acute overexposure would be slight to moderate irritation of contaminated skin or eyes after contact with particulates or fumes generated from thermal decomposition of this product.

CHRONIC: None anticipated.

TARGET ORGANS: ACUTE: Skin, eyes.

CHRONIC: None anticipated.




HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH	(BLUE)	1
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FLAMMABILITY	(RED)	0
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REACTIVITY	(YELLOW)	0
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PROTECTIVE EQUIPMENT	B
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EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		

For routine applications.

See Section 16 for Definition of Ratings

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

4. FIRST-AID MEASURES

Contaminated individuals must seek medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to physician or health professional with the contaminated individual.

SKIN EXPOSURE: Treat victim and seek medical attention if adverse reaction occurs.

EYE EXPOSURE: If fumes or particulates generated from the product contaminate the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have the contaminated individual "roll" eyes. The recommended minimum flushing time is 15 minutes. Seek medical attention if any adverse effect occurs.

INHALATION: If fumes or particulates generated from the product are inhaled, remove victim to fresh air. If adverse effect occurs after removal to fresh air, seek medical attention.

INGESTION: Not applicable.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Preexisting dermatitis, and other skin disorders can be aggravated by exposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Select fire extinguishing media appropriate for the surrounding area.

Water Spray: YES

Foam: YES

Halon: YES

Carbon Dioxide: YES

Dry Chemical: YES

Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is not combustible and does not contribute to the intensity of a fire. When involved in a fire, this material may decompose and produce irritating vapors, acrid smoke, and toxic gases (e.g., carbon oxides)

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 fire-exposed containers if it can be done without risk to firefighters. If possible, firefighters should control runoff water to prevent environmental contamination. Rinse contaminated equipment with soapy water before returning such equipment to service.

6. ACCIDENTAL RELEASE MEASURES

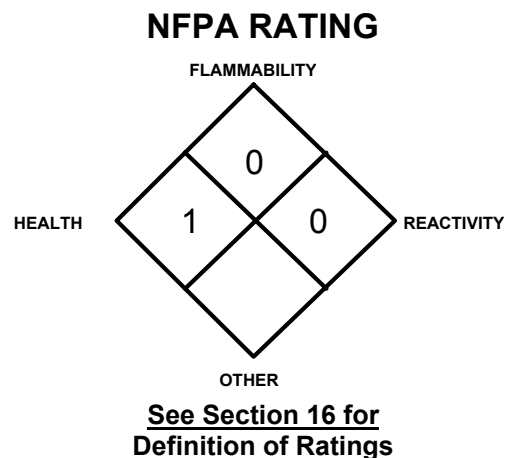
RELEASE RESPONSE: Due to the nature of this product, no special accidental release measures are normally required. Uncontrolled releases involving other materials released near this product should be responded to by appropriately trained personnel using pre-planned procedures.

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

7. HANDLING and STORAGE

WORK AND HYGIENE PRACTICES: If during the use of this product, vapors are generated during heating, avoid breathing the vapors or skin or eye contact with the vapors.

STORAGE AND HANDLING PRACTICES: Store this product in a cool, dry location, away from sources of intense heat. Store away from incompatible materials (see Section 10, Stability and Reactivity).



8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation and engineering controls are required for use of this product.

RESPIRATORY PROTECTION: None normally required for routine use of this product. Airborne contaminant concentrations must be maintained below guidelines listed in Section 2 (Composition and Information on Ingredients). 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. 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: No special eye protection is required for use of this product. Wear safety glasses or goggles if during use of this product operations may produce flying debris or particulates.

HAND PROTECTION: Wear Neoprene Rubber gloves for routine industrial use.

BODY PROTECTION: Use body protection appropriate for task.

9. PHYSICAL and CHEMICAL PROPERTIES

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

SPECIFIC GRAVITY @ 68°F (water = 1): 1.36

SOLUBILITY IN WATER: Slight.

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

PARTITION COEFFICIENT (n-octanol/water): Not applicable.

APPEARANCE, ODOR and COLOR: This product is a light brown to brick red putty, with a mild petroleum odor.

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

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

MELTING/FREEZING POINT: > 1000°C (1832°F)

BOILING POINT: > 500°C (932°F)

pH: Not applicable.

ODOR THRESHOLD: Not established.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition can generate carbon oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids, mineral acids and strong oxidizers.

HAZARDOUS POLYMERIZATION: Will not occur.

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

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

11. TOXICOLOGICAL INFORMATION

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

MELAMINE:

Standard Draize Test (Eye-Rabbit) 500 mg/24 hours: Mild

LD₅₀ (Oral-Rat) 3161 mg/kg

LD₅₀ (Oral-Mouse) 3296 mg/kg

LD₅₀ (Skin-Rabbit) > 1 gm/kg

LD₅₀ (Unreported-Rat) 6 gm/kg

LD₅₀ (Unreported-Mouse) 1 gm/kg

LC₅₀ (Inhalation-Rat) 3248 mg/m³

TDLo (Oral-Rat) 32760 mg/kg/13 weeks-continuous: Kidney, Ureter, Bladder: other changes; Related to Chronic Data: death

LDLo (Intraperitoneal-Rat) 3200 mg/kg: Sense Organs and Special Senses (Eye): lachrymation; Behavioral: tremor; Lungs, Thorax, or Respiration: cyanosis

LDLo (Intraperitoneal-Mouse) 800 mg/kg: Sense Organs and Special Senses (Eye): lachrymation; Behavioral: tremor; Lungs, Thorax, or Respiration: cyanosis

TD (Oral-Rat) 197 gm/kg/2 years-continuous: Tumorigenic: Carcinogenic by RTECS criteria; Kidney, Ureter, Bladder: tumors

TD (Oral-Rat) 162 gm/kg/2 years-continuous: Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Kidney, Ureter, Bladder: tumors

TDLo (Oral-Rat) 195 gm/kg/2 years-continuous: Tumorigenic: Carcinogenic by RTECS criteria; Kidney, Ureter, Bladder: tumors

MELAMINE (continued):

TDLo (Oral-Mouse) 93,600 mg/kg/13 weeks-continuous: Kidney, Ureter, Bladder: other changes

TCLo (Inhalation-Rat) 58 ug/m³/17 weeks-intermittent: Liver: other changes; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: transaminases

TCLo (Inhalation-Rat) 500 ug/m³: male 17 week(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count); Fertility: pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea); Effects on Embryo or Fetus: fetal death

Phage Inhibition Capacity (Escherichia coli) 78 ug/well

Micronucleus Test (Oral-Mouse) 1 gm/kg

PENTAERYTHRITOL:

LD₅₀ (Oral-Rat) 19,500 mg/kg: Behavioral: general anesthetic; Gastrointestinal: ulceration or bleeding from stomach; Liver: other changes

PENTAERYTHRITOL (continued):

LD₅₀ (Oral-Mouse) 25,500 mg/kg: Behavioral: altered sleep time (including change in righting reflex), tremor, ataxia

LD₅₀ (Oral-Guinea Pig) 11300 mg/kg: Behavioral: altered sleep time (including change in righting reflex), tremor, ataxia

LD₅₀ (Oral-Rabbit) 18500 mg/kg: Behavioral: general anesthetic; Gastrointestinal: ulceration or bleeding from stomach; Liver: other changes⁷¹

LC (Inhalation-Rat) > 11 gm/m³/6 hours

TDLo (Oral-Rabbit) 10,605 mg/kg/30 weeks-intermittent: Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: true cholinesterase, Metabolism (Intermediary): histamines (including liberation not immunochemical in origin)

TDLo (Oral-Rat) 10,600 ug/kg/30W weeks-intermittent: Behavioral: alteration of classical conditioning

POLYBUTENES:

TCLo (Inhalation-Rat) 700 mg/m³/7 hours/2 weeks-intermittent: Liver: changes in liver weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain

11. TOXICOLOGICAL INFORMATION (Continued)

SUSPECTED CANCER AGENT: The components of this product are listed by agencies tracking potential carcinogenic effects, as follows:

MELAMINE: IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

ARAMIDE: DFG MAK-3 (Substances which cause concern that they could be carcinogenic for man but which cannot be assessed conclusively because of lack of data)

IRON OXIDE: ACGIH TLV-4 (Not classifiable as to Human Carcinogenicity), IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

The remaining components of this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, and CAL/OSHA and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Contact with this product is not expected to be irritating

SENSITIZATION TO THE PRODUCT: The components of this product are not known to be SKIN OR RESPIRATORY sensitizers.

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

Mutagenicity: This product is not reported to produce mutagenic effects in humans. Human and animal mutation data are available for the Melamine component of this product; these data were obtained during clinical studies on specific human and animal tissues exposed to high doses of this compound.

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

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

Reproductive Toxicity: This product is not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of the Melamine component of this product provided reproductive toxicity data.

*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.*

ACGIH BIOLOGICAL EXPOSURE INDICES: Currently, there are no ACGIH 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: This product will persist in the environment.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product may be harmful to contaminated plant and animal-life (especially if large quantities are released).

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product may be harmful to contaminated aquatic plant and animal life.

13. DISPOSAL CONSIDERATIONS

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

U.S. EPA WASTE NUMBER: Not applicable.

14. TRANSPORTATION INFORMATION

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

PROPER SHIPPING NAME: Not applicable.

HAZARD CLASS NUMBER and DESCRIPTION: Not applicable.

UN IDENTIFICATION NUMBER: Not applicable.

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Not applicable.

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): Not applicable.

MARINE POLLUTANT: This product is not designated by the DOT to be a Marine Pollutant (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This material is not considered as dangerous goods by Transport Canada.

IATA DESIGNATION: This material is not considered as dangerous goods by the International Air Transport Association.

UPS SHIPPING: This material is not considered as Hazardous Materials by the United Parcel Service.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

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

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

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

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

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

Alaska - Designated Toxic and Hazardous Substances: None.

California - Permissible Exposure Limits for Chemical Contaminants: None.

Florida - Substance List: None.

Illinois - Toxic Substance List: None.

Kansas - Section 302/313 List: None.

Massachusetts - Substance List: None.

Michigan - Critical Materials Register: None.

Minnesota - List of Hazardous Substances: None.

Missouri - Employer Information/Toxic Substance List: None.

New Jersey - Right to Know Hazardous Substance List: None.

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

Pennsylvania - Hazardous Substance List: None.

Rhode Island - Hazardous Substance List: None.

Texas - Hazardous Substance List: None.

West Virginia - Hazardous Substance List: None.

Wisconsin - Toxic and Hazardous Substances: None.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 lists.

ANSI LABELING (Z129.1): **CAUTION!** PARTICULATES OR FUMES IF INVOLVED IN FIRE GENERATED BY THE PRODUCT MAY IRRITATE SKIN AND EYES. PARTICULATES OR FUMES IF INVOLVED IN FIRE MAY BE HARMFUL IF INGESTED OR INHALED. PRODUCT MAY POSE CUT OR ABRASION HAZARD. Avoid contact with skin, eyes, or clothing. Wash thoroughly after handling. Avoid breathing airborne particulates. Work in well-ventilated area. Do not taste or swallow. Wear gloves, goggles, and appropriate body protection. **FIRST-AID:** In case of contact with skin or eyes, flush skin with plenty of water for 15 minutes. If particulates or fumes are inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if adverse effects develop. **IN CASE OF FIRE:** Use water fog, dry chemical, CO₂, or "alcohol" foam. Consult Material Safety Data Sheet for additional information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: The components of this product are listed on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITY SUBSTANCES LISTS: The components of this product are not on the CEPA Priority Substances Lists.

CANADIAN WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

DATE OF PRINTING:

July 14, 2004

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. EGS Nelson 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, EGS Nelson 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 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; **TDLo**, **LDLo**, and **LDLo**, 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. Sub rankings (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 life forms 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/NDL** are the Canadian Domestic/Non-Domestic Substances Lists.