

# FREEDOM CHEMICAL CORPORATION

12026 Centralia Road, Suite C  
Hawaiian Gardens, CA 90716  
(562) 343-9697 (8:00 AM – 5:00 PM Pacific Time)

www.freedomchemicalcorp.com

## MATERIAL SAFETY DATA SHEET

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

#### 1. PRODUCT IDENTIFICATION

**TRADE NAME (AS LABELED):** **Freedom Tuff 6160 Curative, B Component**

**CHEMICAL NAME/CLASS:** Polyamine Solution

**PRODUCT USE:** Primer Curative

**SUPPLIER/MANUFACTURER'S NAME:** Freedom Chemical Corporation

**ADDRESS:** 12026 Centralia Road, Suite C  
Hawaiian Gardens, CA 90716

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

**DATE OF PREPARATION:** February 4, 2008

**REVISION DATE:** December 12, 2009

Si usted no entiende las Hojas de Informacion de Seguridad sobre Materials, busque a alguien para que se la explique a usted en detalle. (If you do not understand the Material Safety Data Sheet, find someone to explain it to you in detail.)

#### 2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		IDLH mg/m <sup>3</sup>	OTHER mg/m <sup>3</sup>
			TLV mg/m <sup>3</sup>	STEL mg/m <sup>3</sup>	PEL mg/m <sup>3</sup>	STEL mg/m <sup>3</sup>		
Formaldehyde, polymer with benzeneamine, hydrogenated	135108-88-2	40 - 70	NE	NE	NE	NE	NE	NE
benzyl alcohol	100-51-6	15-40	NE	NE	NE	NE	NE	WEEL (TWA) 44.2 (10 ppm)
Aminoethyl piperazine, 1-2-, (AEP)	140-31-8	<15	NE	NE	NE	NE	NE	NE
Methylenebis(cyclohexanamine, 4,4'-	1761-71-3	<5	NE	NE	NE	NE	NE	NE
Tris-2.4.6-(dimethylaminomethyl)phenol	90-72-2	<5	NE	NE	NE	NE	NE	NE
Water and other ingredients. The other ingredients are each present in less than 1 percent concentration in this product.		Balance	The components present in the balance of this product do not contribute any significant, additional hazards. All hazard information pertinent to this product has been presented in the remaining sections of this Material Safety Data Sheet, per the requirements of Federal Occupational Safety and Health Hazard Communication Standard (29 CFR 1910.1200).					
VOC: Component = 0 Grams/Liter			As Applied – 3 Grams/Liter (Part of Multi-Component System)					

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

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

**Freedom Tuff 6160 Curative, B Component MSDS**

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### 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** Warning! Corrosive liquid. Irritating to eyes and skin. Harmful if swallowed. May cause sensitization by skin contact.

**SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE:** The most significant route of occupational overexposure is contact with skin. The symptoms of overexposure to this product are as follows:

**INHALATION:** If mists or sprays of this solution are inhaled, this product may cause pulmonary irritation, irritation of the mucus membranes, runny nose, coughing, and a sore throat.

**CONTACT WITH SKIN or EYES:** Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and injure eye tissue. Prolonged or repeated skin contact may dry the skin. Symptoms may include redness, burning, drying and cracking of skin, burns and other skin damage. Additional symptoms of skin contact may include: allergic skin reaction (delayed skin rash which may be followed by blistering, scaling and other skin effects), and numbness. Passage of this material into the body through the skin is possible, and may add to toxic effects from breathing or swallowing.





**INGESTION:** Though ingestion is not anticipated to be a significant route of over-exposure to this product, if ingestion does occur, burning and irritation of the mouth, throat, esophagus, and other tissues of the digestive system will occur upon contact.

**INJECTION:** Though injection is not anticipated to be a significant route of over-exposure to this product, if it occurs, local reddening, tissue swelling, and discomfort may result.

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

**ACUTE:** This solution is corrosive, and can burn and damage eyes, skin, mucous membranes, and any other exposed tissue. If inhaled, irritation of the respiratory system may occur, with coughing, and breathing difficulty

**CHRONIC:** Repeated skin contact with this product may result in dermatitis (inflammation and reddening of the skin). Prolonged contact may result in chemical burns and permanent damage.

Hazardous Material Information System			
HEALTH (Blue)		3	
FLAMMABILITY (Red)		1	
REACTIVITY (Yellow)		0	
PROTECTIVE EQUIPMENT		X	
EYES	RESP.	HANDS	BODY
 Safety Glasses	 Vapor Respirator	 Gloves	 Protective Apron
For Routine Industrial Applications			

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

### 4. FIRST-AID MEASURES

**SKIN EXPOSURE:** For Skin contact, if available, wash with large amounts of running water and soap for 15 minutes. Remove contaminated clothing and shoes. Get immediate medical attention. Discard or decontaminate clothing before re-use, and destroy contaminated shoes.

**EYE EXPOSURE:** For eye contact, immediately flush eyes for at least 15 minutes with running water. Hold eyelids apart to ensure rinsing of the entire eye surface and lids with water. If physician is not available, flush for an additional 15 minutes. Get immediate medical attention.

**INHALATION:** If inhaled, remove from area to fresh air. If not breathing, give artificial respiration. Get immediate medical attention. If breathing is difficult, transport to medical care and, if available, give supplemental oxygen.

**INGESTION:** If swallowed, do not induce vomiting. If vomiting occurs, give fluids again. Do not give anything by mouth to an unconscious or convulsing person. Get immediate medical attention. Have physician determine whether vomiting or stomach evacuation is necessary.

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## 5. FIRE-FIGHTING MEASURES

FLASH POINT, °C (method): >100°C (212°F) Closed Cup

AUTOIGNITION TEMPERATURE, °C: ND

FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): ND

Upper (UEL): ND

### FIRE EXTINGUISHING MATERIALS:

Water Spray: YES

Foam: YES

Halon: ND

Carbon Dioxide: YES

Dry Chemical: YES

Other: Any "ABC" Class.

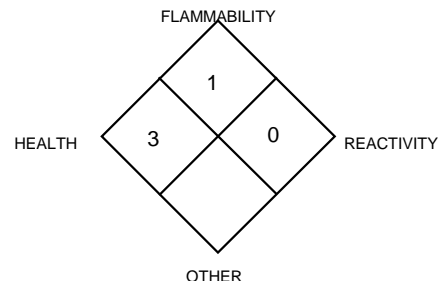
UNUSUAL FIRE AND EXPLOSION HAZARDS: Run-off from fire control may cause pollution. Keep fire-exposed containers cool with water spray to prevent rupture due to excessive heat. High pressure water hose may spread product from broken containers increasing contamination. If involved in a fire, this product may decompose to produce a variety of compounds (i.e. carbon monoxide, carbon dioxide, aldehydes, nitrogen oxides and compounds). Vapors can form flammable mixtures with air. Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding. Products of combustion are irritating to the respiratory tract and may cause breathing difficulty. Symptoms may be delayed several hours or longer depending upon the extent of exposure.

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. Move fire-exposed containers, if it can be done without risk to firefighters. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas. If necessary, discard or decontaminate fire response equipment before returning such equipment to service.

### NFPA RATING



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## 6. ACCIDENTAL RELEASE MEASURES

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

The proper personal protective equipment for incidental releases (e.g.-1 L of the product released in a well-ventilated area) use impermeable gloves, specific for the material handled, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard-hat. Self Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, Select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.

Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with sodium bicarbonate and water rinse. Decontaminate the area thoroughly. Test area with litmus paper to confirm neutralization. Place all spill residue in a suitable container. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).

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

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### **7. HANDLING and STORAGE**

**WORK PRACTICES AND HYGIENE PRACTICES:** As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash hands after handling this product. Do not eat or drink while handling this material. Remove contaminated clothing immediately. Discard contaminated clothing items, or launder before re-use. Inform anyone handling such contaminated laundry of the hazards associated with this product. Use ventilation and other engineering controls to minimize potential exposure to this product.

**STORAGE AND HANDLING PRACTICES:** All employees who handle this material should be trained to handle it safely. Avoid breathing mists or sprays generated by this product. Use in a well-ventilated location.

**For Non-Bulk Containers:** Open containers slowly, on a stable surface. Containers of this product must be properly labeled. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers, or in a diked area, as appropriate. Store containers away from incompatible chemicals. Keep container tightly closed when not in use. Wash thoroughly after using this material. Storage areas should be made of fire-resistant materials. 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. Empty containers may contain residual liquid, therefore, empty containers should be handled with care.

**Bulk Containers:** All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

**Tank Car Shipments:** Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tank (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be clean and free of incompatible chemicals, prior to connection to the tank car or vessel. Valves and hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

**PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:** Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment before maintenance begins by a triple-rinse with water followed, if necessary, by using sodium bicarbonate and an additional rinse. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

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### **8. EXPOSURE CONTROLS - PERSONAL PROTECTION**

**VENTILATION AND ENGINEERING CONTROLS:** If required use a corrosion-resistant ventilation system separate from other exhaust ventilation systems to ensure that there is no potential for overexposure to sprays, or mists of this product and that exposures are below those in section 2 (Composition and Information on Ingredients). Ensure eyewash/safety shower stations are available near areas where this product 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, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. If adequate ventilation is not available or if there is potential for airborne exposure above the exposure limits (listed in Section 2) a respirator may be worn up to respirator exposure limitations, check with respirator equipment manufactures recommendations/limitations. For a higher level of protection use positive pressure supplied air respiration protection or Self Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

**EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:**

Positive pressure, full-facepiece Self Contained Breathing Apparatus; or positive pressure, full-facepiece Self Contained Breathing Apparatus with an auxiliary positive pressure Self Contained Breathing Apparatus.

**EYE PROTECTION:** Splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

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

**BODY PROTECTION:** Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from natural rubber are generally acceptable, depending upon the task.

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## 9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): ND

SPECIFIC GRAVITY (water = 1): 1.03

SOLUBILITY IN WATER: <0.1 g/l

VAPOR PRESSURE, mm Hg @ 21 °C: <1

ODOR: Amine

LOG WATER/OIL DISTRIBUTION COEFFICIENT: Not available.

APPEARANCE AND COLOR: This product is an amber liquid solution.

HOW TO DETECT THIS SUBSTANCE (warning properties): Litmus paper will turn blue upon contact with this solution.

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EVAPORATION RATE (n-BuAc=1): ND

MELTING/FREEZING POINT: Not established.

BOILING POINT: >392°F (>200°C)

pH: >7

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## 10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition products of this solution can include a variety of compounds. (i.e. carbon monoxide, carbon dioxide, aldehydes, nitrogen oxides and other compounds).

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product reacts with strong oxidizers and acids

HAZARDOUS POLYMERIZATION: Will not occur by itself. Considerable exothermic reaction with epoxy resins is possible.

CONDITIONS TO AVOID: Avoid exposure or contact to extreme temperatures and incompatible chemicals i.e. mineral acids, organic acids, oxidizing agents and reactive metals.

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

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### 11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Additional toxicology information for components greater than 1 percent in concentration is provided below.

Ingestion: LD50: >500 mg/kg (Rat) estimated

Inhalation: ND

Inhalation-Components

Benzyl Alcohol: LC50 (4hr): > 4.178 mg/l (Rat)

Skin: ND

Skin – Components

Formaldehyde, polymer with LD50: > 1,000 mg/kg (Rabbit)

Benzeneamine, hydrogenated

Benzyl alcohol LD50: 2,000 mg/kg (Rabbit)

Aminoethyl piperazine, 1-2-, LD50: 880 mg/kg (Rabbit)

Methylenebiscyclohexanamine, 4,4'- LD50: 2,110 mg/kg (Rabbit)

Eye irritation/corrosion: Severe eye irritation

Acute dermal irritation/corrosion: Severe skin irritation

#### Chronic Health Hazard

The product or a component may be mutagenic, the data is inconclusive. Mixed polycycloaliphatic amines was test in rats for systemic effects in a subchronic (28-day) oral study at doses ranging from 15 to 300 mg/kg/day. Effects seen at 300 mg/kg/day included decreased survival, decreased body weight gain, increased liver, kidney, and adrenal weights and histological changes in the liver, kidney, adrenals and spleen. The No-Observed-Adverse-Effect-Level (NOAEL) was 15 mg/kg/day. Rats exposed orally to 800 mg/kg benzyl alcohol for thirteen weeks exhibited CNS depression and histopathological changes in the brain, thymus and skeletal muscles. The No-Observed-Adverse-Effect-Level (NOAEL) was 400 mg/kg. No evidence of carcinogenicity was seen in a two-year study with rats and mice.

SUSPECTED CANCER AGENT: The major components of this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA in concentrations > 0.1 %; and are therefore not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This product is severely irritating and corrosive to contaminated tissue.

SENSITIZATION TO THE PRODUCT: Prolonged or repeated skin contact can result in the development of rashes, and other allergy-like symptoms.

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

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

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

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

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

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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.

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

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE** Skin disorders can be aggravated by over-exposure to this product. Inhalation of this products mists may aggravate respiratory conditions.

**RECOMMENDATIONS TO PHYSICIANS:** Treat symptoms and eliminate over-exposure to this product.

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## 12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

Aquatic toxicity:	ND
Toxicity to fish – Components	
Benzyl alcohol	LC50 (96 h): 10 mg/l Bluegill sunfish ( <i>Lepomis macrochirus</i> )
Benzyl alcohol	LC50 (96 h): 460 mg/l Fathead minnow ( <i>Pimephales promelas</i> )
Methylenebiscyclohexamine, 4,4'-	LC50 (96 h) 46-100 mg/l Golden orfe ( <i>Leuciscus idus</i> )
Toxicity to daphnia – Components	
Methylenebiscyclohexanime, 4,4'-	EC50 (48 h): 6.84 mg/l <i>Daphnia magna</i>
Toxicity to algae – Components	
Benzyl alcohol	IC50 (72 h): 700 mg/l Algae
Methylenebiscyclohexanamine, 4,4'-	EC50 (72 h): 140-200 mg/l Algae
Toxicity to other organisms:	ND

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## 13. DISPOSAL CONSIDERATIONS

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

**EPA WASTE NUMBER:** D002 (Characteristic, corrosive), applicable to wastes consisting only of this solution.

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## 14. TRANSPORTATION INFORMATION

**Department of Transportation:**

Proper Shipping Name:	Amines, liquid, corrosive, n.o.s. (Formaldehyde, polymer with benzeneamine, hydrogenated, Aminoethyl) piperazine, 1-(2-,)
Class:	8
UN/ID No.:	UN2735
Packing Group:	III

**IATA/IMDG/CTC Shipping Data:**

Proper Shipping Name:	Amines, liquid, corrosive, n.o.s. Formaldehyde, polymer with benzeneamine, hydrogenated, Aminoethyl) piperazine, 1-(2-,)
Class:	8
UN/ID No.:	UN2735
Packing Group:	III

**Freedom Tuff 6160 Curative, B Component MSDS**

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## 15. REGULATORY INFORMATION

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA): This Material Safety Data Sheet (MSDS) has been prepared in compliance with the federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

OSHA Hazard Communication Standard (29CFR1910.1200) hazard class (es) -- Corrosive, Sensitizer.

SARA REPORTING REQUIREMENTS: The components of this product are not subject to the reporting requirements of Sections 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act. Hazard classification: Acute Health Hazard, Chronic Health Hazard.

SARA Threshold Planning Quantity: Not applicable.

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

CERCLA REPORTABLE QUANTITY (RQ): None

OTHER FEDERAL REGULATIONS: Not applicable.

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

**New Jersey Right-to-know:** The following is required composition information:

CAS Number: 140-31-8

Chemical Name: n-Aminoethylpiperazine

RTK No.: 75

**Pennsylvania Right-to-know:** The following is required composition information:

CAS Number: 100-51-6

Chemical Name: Benzenemethanol

Common Name: Benzyl Alcohol

Comment: Hazardous Substance.

CAS Number: 140-31-8

Chemical Name: n-Aminoethylpiperazine

CALIFORNIA PROPOSITION 65: Not listed.

WHMIS SYMBOLS:

**D2B-** Poisonous and Infectious Materials/Other Effects



Class D - Poisonous and Infectious Material  
Division 2 Materials Causing Other Toxic  
Effects

**E- Corrosive Material**



Class E - Corrosive  
Material

## 16. OTHER INFORMATION

PREPARED BY:

ALAN BROWN  
FREEDOM CHEMICAL CORPORATION

THIS INFORMATION IS DRAWN FROM RECOGNIZED SOURCES BELIEVED TO BE RELIABLE. FREEDOM CHEMICAL CORPORATION MAKES NO GUARANTEES NOR ASSUMES ANY LIABILITY IN CONNECTION WITH THIS INFORMATION. THE USER SHOULD BE AWARE OF CHANGING TECHNOLOGY, RESEARCH, REGULATIONS AND ANALYTICAL PROCEDURES THAT MAY REQUIRE CHANGES HEREIN. THE ABOVE DATA IS SUPPLIED UPON THE CONDITION THAT PERSONS WILL EVALUATE THIS INFORMATION AND THEN DETERMINE ITS SUITABILITY FOR THEIR USE.

### DEFINITIONS OF TERMS

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

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

#### EXPOSURE LIMITS IN AIR:

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

**TLV - Threshold Limit Value** - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour **Time Weighted Average (TWA)**, the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling Level**. Skin adsorption effects must also be considered.

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

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

**IDLH - Immediately Dangerous to Life and Health** - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. The **DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). **NIOSH** issues exposure guidelines called **Recommended Exposure Levels (RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

#### HAZARD RATINGS:

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

**NATIONAL FIRE PROTECTION ASSOCIATION:** Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

#### FLAMMABILITY LIMITS IN AIR:

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

#### TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD<sub>50</sub>** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC<sub>50</sub>** - 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/m<sup>3</sup>** 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 **TDL<sub>0</sub>**, the lowest dose to cause a symptom and **TCL<sub>0</sub>** the lowest concentration to cause a symptom; **T<sub>0</sub>**, **LDL<sub>0</sub>**, and **LDo**, or **TC**, **TCo**, **LCL<sub>0</sub>**, and **LCo**, the lowest dose (or concentration) to cause death. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

#### REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Other acronyms used are: **Superfund Amendments and Reauthorization Act (SARA)**; the **Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act (**Proposition 65**); the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)**; and various state regulations. This section also includes information on the precautionary warnings which appear on the materials package label.