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):	**ASPEN 2**
CHEMICAL NAME/CLASS:	Hydrocarbon Mixture
USES:	Fuel for Internal Combustion Engines
MANUFACTURER'S NAME:	**Lantmännen Aspen AB**
Address:	Iberovägen 2 SE-438 54 Hindås, Sweden
Business Phone:	+ 46 (0)301 230 000
Email:	info@aspen.se
Website:	www.aspen.se
DISTRIBUTOR'S NAME:	**CESCO Marketing Inc.**
Address:	3921 Phillips Avenue Burnaby, BC V5A 3K4 Canada
Business Phone:	1-888-661-3155 (Toll free), (604) 294-6294, (604) 220-5849 (after hours)
Business Fax:	1-800-661-3155 (Toll free), (604) 294-1687
Email:	aspensalescanada@gmail.com
EMERGENCY PHONE:	1-800-424-9300 (CHEMTREC) 24-hr [North America] +1-703-527-3887 (CHEMTREC) 24-hr [International]
DATE OF PREPARATION:	August 13, 2012

NOTE: ALL United States Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards, and Canadian WHMIS [Controlled Products Regulations] required information is included in appropriate sections based on the U.S. ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the countries listed above.

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Product Description: This product is a yellow, volatile liquid with a characteristic petroleum odor. **Health Hazards:** The chief health hazard associated with responses would be dizziness after inhalation exposure to vapors and irritation of tissues that come in contact with the liquid or mists of this product. Large releases can cause an oxygen-deficient atmosphere and present a hazard of asphyxiation. **Flammability Hazards:** This product is a Class IB Flammable Liquid; it can be readily ignited under almost all ambient conditions. Vapors of this product are heavier than air and can travel long distances or accumulate in low-lying areas. Distant ignition and flashback are possible. If involved in a fire this product will combust to produce toxic gases (e.g., carbon monoxide and carbon dioxide). **Reactivity Hazards:** Negligible. **Environmental Hazards:** The effect of this product on plants is related to removal of natural oils and the prevention of respiration. Plants may die if this product is spilled on them. Animals may exhibit narcotic effects as described for humans. This product floats on water and may prevent oxygenation of the aquatic environment. **Emergency Recommendations:** Emergency responders must wear proper personal protective equipment for the releases to which they are responding.

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	%
Gasoline/Petrol	86290-81-5	100
The components of this gasoline are as follows:		
Naphtha (Petroleum), Full-range Alkylate	64741-64-6	85.00–95.00
Naphtha (Petroleum), Isomerization	64741-70-4	5.00–10.00
Benzene	71-43-2	0.01–0.10
Other components. Each of the other components is present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers, and mutagens).	There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.	Balance

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

4. FIRST-AID MEASURES

Contaminated individuals must be taken for medical attention, especially if adverse effects continue after initial treatment. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to health professional with victim.

4. FIRST-AID MEASURES (Continued)

SKIN EXPOSURE: If this product contaminates the skin, immediately begin decontamination with soap and water. Remove exposed or contaminated clothing before decontaminating skin, taking care not to contaminate eyes. The contaminated individual must seek medical attention if adverse effects continue after flushing.

EYE EXPOSURE: If this product enters 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 20 minutes. Contaminated individuals should seek medical attention if adverse effect persists.

INHALATION: If mists, vapors, or sprays from the product are inhaled, remove the contaminated individual to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers. Contaminated individuals should seek medical attention if adverse effect persists.

INGESTION: If this product 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. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis, other skin conditions, and respiratory conditions may be aggravated by acute or chronic overexposures to this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure. Catharsis with magnesium or sodium sulfate is acceptable.

In cases of respiratory compromise secure airway and respiration via endotracheal intubation. If not possible, perform cricothyroidotomy if equipped and trained to do so. Administer supplemental oxygen by mask to patients who have respiratory symptoms. Patients in respiratory distress or who have abnormal pulmonary examination will require pulse oximetry (or ABG measurements) and chest radiography.

Treat patients who have bronchospasm with aerosolized bronchodilators. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Do not administer epinephrine or related substances because they may induce cardiac arrhythmias.

Patients who are comatose, hypotensive, or are having seizures or cardiac arrhythmias should be treated according to advanced life support (ALS) protocols.

If evidence of shock or hypotension is observed begin fluid administration. For adults, bolus 1,000 mL/hour intravenous saline or lactated Ringer's solution if blood pressure is under 80 mm Hg; if systolic pressure is over 90 mm Hg, an infusion rate of 150 to 200 mL/hour is sufficient. For children with compromised perfusion administer a 20 mL/kg bolus of normal saline over 10 to 20 minutes, then infuse at 2 to 3 mL/kg/hour.

If liquid gasoline comes in contact with the skin for a prolonged period, chemical burns may occur; treat as thermal burns.

If eye irritation or injury is evident, test visual acuity. Examine the eyes for corneal damage and treat appropriately. Immediately consult an ophthalmologist for patients who have severe corneal injuries.

Routine laboratory studies for all exposed patients include CBC, glucose, and electrolyte determinations. Additional studies for patients exposed to gasoline include ECG monitoring and renal-function tests. Chest radiography and pulse oximetry (or ABG measurements) are recommended for severe inhalation exposure or if pulmonary aspiration is suspected.

5. FIRE-FIGHTING MEASURES

FLASH POINT: < 0°C (32°F)

AUTOIGNITION TEMPERATURE: > 250°C (482°F)

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 0.6% Upper (UEL): 8.0%

FIRE EXTINGUISHING MATERIALS:

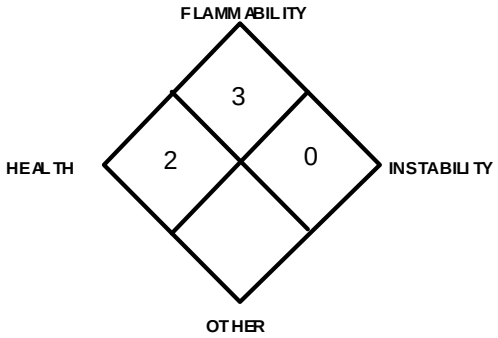
Water Spray: Yes (for cooling) Carbon Dioxide: Yes Foam: Yes
Dry Chemical: Yes Halon: Yes Other: Any "B" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is a Class IB Flammable Liquid; it can be readily ignited under almost all ambient conditions. When involved in a fire, this product will decompose to produce toxic gases (e.g., carbon monoxide and carbon dioxide).

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: The vapors of this product may be ignited by static electrical energy.

NFPA RATING



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

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary. Move containers from fire area if it can be done without risk to personnel. Water spray can be used to cool fire-exposed containers. Water fog or spray can also be used by trained firefighters to disperse this product's vapors and to protect personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas. Rinse contaminated equipment with soapy water before returning it to service.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Proper protective equipment should be used. In the event of a spill, clear the area and protect people. Eliminate all sources of ignition before cleanup begins. Use non-sparking, grounded tools. The atmosphere must have levels of components lower than those listed in Section 8, (Exposure Controls and Personal Protective Equipment) if applicable, and have at least 19.5 percent oxygen before personnel can be allowed into the area without Self-Contained Breathing Apparatus (SCBA). Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements, or confined areas. A vapor suppressing foam may be used to reduce vapors.

Small Spills: Wear rubber gloves, splash goggles, and appropriate body protection. Absorb or cover with dry earth, sand, or other non-combustible material. Wash contaminated area with soap and water, absorb with paper towels, and rinse with water.

Large Spills: Trained personnel following pre-planned procedures should handle non-incidental releases. Consider initial downwind evacuation for at least 300 meters (1000 feet). Minimum Personal Protective Equipment should be rubber gloves, rubber boots, face shield, and Tyvek suit**.** Minimum level of personal protective equipment for releases in which the level of oxygen is less than 19.5% or is unknown must be **Level B: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and Self-Contained Breathing Apparatus.** Dike far ahead of liquid spill for later disposal. Absorb or cover with dry earth, sand, or other non-combustible material. Monitor area and confirm levels are bellow exposure limits given in Section 8 (Exposure Controls-Personal Protection), if applicable, before non-response personnel are allowed into the spill area.

If necessary, discard all contaminated response equipment or rinse with soapy water before returning such equipment to service. Place all spill residue in an appropriate container and seal. Do not mix with wastes from other materials. Decontaminate the area thoroughly. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations). For spills on water, contain, minimize dispersion, and collect. Dispose of recovered material and report spill per regulatory requirements.

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

7. HANDLING and STORAGE

SAFE WORK AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Avoid breathing airborne mists, sprays or vapors generated by this product. Use in a well-ventilated location. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while working with this product. Remove contaminated clothing immediately. Use in work areas that can be easily decontaminated. Employ engineering controls to maintain employee exposure below occupational exposure limits given in Section 8 (Exposure Controls-Personal Protection). Eyewash stations/safety showers should be near areas where the product is used or stored. **WARNING! NEVER SIPHON THIS PRODUCT BY MOUTH!**

STORAGE AND HANDLING: All employees who handle this material should be trained to handle it safely. Keep away from heat, sparks, and other sources of ignition. Keep container tightly closed when not in use. Use non-sparking tools. Bond and ground containers during transfers of material. If this product is transferred into another container, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for flammable liquids. Store below 50°C (122°F). 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 (see Section 10, Stability and Reactivity). Containers should be separated from oxidizing materials by a minimum distance of 20 ft. or by a barrier of non-combustible material at least 5 ft. high having a fire-resistance rating of at least 0.5 hours. Storage areas should be made of fire resistant materials. Use closed, non-sparking ventilation systems, approved equipment, and appropriate electrical systems. Post warning and “NO SMOKING” signs in storage and use areas, as appropriate. Have appropriate extinguishing equipment in the storage area (e.g., sprinkler system, portable fire extinguishers). Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged. Refer to NFPA 30, *Flammable and Combustible Liquids Code*, for additional information on storage. Empty containers may contain residual liquid or vapors that are flammable; therefore, empty containers should be handled with care. Never perform any welding, cutting, soldering, drilling, or other hot work on an empty container or piping until all liquid, vapors, and residue have been cleared.

All electrical equipment and wiring in areas where this product is used, handled, or stored should meet the specifications of the NFPA 70, *National Electric Code*. Areas where this material is used, handled, or stored should be kept clear of materials that can burn. Access routes for fire-fighting personnel should be kept clear at all times. Areas where a potential for spillage exists should be monitored as appropriate. Due to the presence of Benzene, entrances to regulated areas (as defined by the OSHA Benzene Standard) must be posted with signs that read as follows:

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE- NO SMOKING
AUTHORIZED PERSONNEL ONLY

The OSHA Action Level for Benzene is 0.5 ppm, as an 8-hour, Time-Weighted Average.

SPECIFIC USE(S): This product is for use as a fuel. Follow all industry standards for use of this product.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Relieve pressure before attempting repairs. If necessary, ensure that application equipment is locked and tagged-out safely.

7. HANDLING and STORAGE (Continued)

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT (continued): Decontaminate equipment by steaming and/or purging with an inert gas or using soapy water before maintenance begins. Entry into vessels used to store this material should be done after proper cleaning or purging and after proper confined-space entry and testing (see 20 CFR 1910.146). Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION, ENGINEERING, AND OCCUPATIONAL EXPSOURE CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in later in this Section. Detectors should be installed in or near areas where this product is used or stored. In addition, if appropriate, install monitoring equipment to detect the level of oxygen and the presence of potentially explosive air/gas mixtures. Provide natural or explosion-proof ventilation. Local exhaust ventilation is preferred as it prevents dispersion of vapors into the workplace by eliminating it at its source. Exhaust directly to the outside, taking necessary precautions for environmental protection. As with all products that contain chemicals, ensure proper decontamination equipment (e.g., eyewash/safety shower stations) are available near areas where this product is used as necessary.

EXPOSURE LIMITS:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELs		NIOSH	OTHER
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	ppm
Gasoline	86290-81-5	300 (bulk handling)	500 (bulk handling)	300 (vacated 1989 PEL)	500 (vacated 1989 PEL)	LOQ = 15		NE	Carcinogen: IARC-2B, NIOSH-Ca, TLV-A3
Naphtha (Petroleum), Full-range Alkylate	64741-64-6	NE	NE	NE	NE	NE	NE	NE	NE
Naphtha (Petroleum), Isomerization	64741-70-4	NE	NE	NE	NE	NE	NE	NE	NE
Benzene	71-43-2	0.5 (skin)	2.5	1*	3*	0.1	1	500	DFG MAK: Danger of cutaneous absorption MAK Germ Cell Mutations: 3A Carcinogen: EPA-K, IARC-1, MAK-1, NIOSH-Ca, NTP-K, OSHA-Ca, TLV-A1

NE = Not Established. *See Table Z-2 for exclusions in 29 CFR 1910.1028See Section 16 for Definitions of Terms Used

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) and equivalent standards of Canada (including CSA Standard Z94.4-02 and CSA Standard Z94.3-07). Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: If mists or sprays from this product are created during use, use appropriate respiratory protection. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, or Canadian CSA Standard Z94.4-02. 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 U.S. Federal OSHA's Respiratory Protection Standard (1910.134-1998). The following are NIOSH respiratory equipment guidelines for Gasoline and are provided for additional information:

GASOLINE

CONCENTRATION	RESPIRATORY PROTECTION
At Concentrations Above the NIOSH REL, or Where There is no REL, At Any Detectable Concentration:	Any Self-Contained Breathing Apparatus (SCBA) that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any Supplied-Air Respirator (SAR) that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.
Escape:	Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any appropriate escape-type, SCBA.

EYE PROTECTION: Splash goggles or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or Canadian CSA Standard Z94.3-07.

HAND PROTECTION: Wear nitrile rubber, Viton, or PVA gloves for routine industrial use. Use triple gloves for spill response. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate for task (e.g., lab coat, coveralls, Tyvek suit). If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment) or appropriate Standards of Canada. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136 and the Canadian CSA Standard Z195-02, *Protective Footwear*.

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): Not established.
SPECIFIC GRAVITY (water = 1): Not established.
SOLUBILITY IN WATER: Slightly soluble.
VAPOR PRESSURE @ 38℃ : 55–65 kPa
VISCOSITY @ 40℃ (interval) : < 1 mm^2/s
EVAPORATION RATE (*n*-BuAc = 100): > 1000
FREEZING/MELTING POINT: Not established.
BOILING RANGE: 40–190℃ (104–374℉)
pH: Not established.
PARTITION COEFFICIENT: Not established.
APPEARANCE and COLOR: This is a yellow, volatile liquid with a characteristic petroleum odor.
HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinguishing characteristics associated with this product.

10. STABILITY and REACTIVITY

DECOMPOSITION CONDITIONS/STABILITY: Stable.
DECOMPOSITION PRODUCTS: Combustion: Irritating fumes and toxic gases (e.g., carbon monoxide and carbon dioxide). Hydrolysis: None known.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers and strong acids.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Avoid exposures to or contact with extreme temperatures, sparks, flame, and incompatible materials.

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

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The chief symptoms associated with overexposure to this product in occupational use situations are described in the following sections.

INHALATION: Breathing vapors, mists, or aerosols from this product can irritate the nose, throat, or respiratory system. Symptoms of such exposure can include headache, dizziness, nausea, and loss of coordination. Higher concentrations may cause pulmonary congestions, edema, acute exudative tracheobronchitis, intrapulmonary hemorrhage, pneumonitis, loss of consciousness, cardiac sensitization, coma, and death. Chronic inhalation of mists may cause symptoms such as shortness of breath and coughing. Under some circumstances of overexposure, displacement of oxygen may be fatal. The following effects associated with various levels of oxygen are as follows:

CONCENTRATION	SYMPTOMS
20.9% Oxygen:	Normal oxygen concentration in air.
15–19% Oxygen:	Decreased ability to perform tasks. May impair coordination and may induce early symptoms in persons with heart, lung, or circulatory problems.
12–15% Oxygen:	Breathing increases, especially in exertion. Pulse up. Impaired coordination, perception, and judgment.
10–12% Oxygen:	Breathing further increases in rate and depth, poor coordination and judgment, lips slightly blue.
8–10% Oxygen:	Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea (upset stomach), and vomiting.
6–8% Oxygen:	8 minutes, may be fatal in 50–100% of cases; 6 minutes, may be fatal in 25 to 50% of cases; 4–5 minutes, recovery with treatment.
4–6% Oxygen:	Coma in 40 seconds followed by convulsion, breathing failure, death.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	2
FLAMMABILITY HAZARD	(RED)	3
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Use and Handling Applications

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

WARNING: Exposure to atmospheres containing 8–10% or less oxygen will bring about unconsciousness without warning and so quickly that individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.

CONTACT WITH SKIN or EYES: Vapors can cause skin inflammation. Prolonged contact with this product causes significant irritation (i.e., irritant contact dermatitis), degreasing, and burns with redness and blisters. Vapors may cause eye irritation with slight inflammation. When splashed in the eye, this product may cause burning pain and transient corneal injury. Chronic exposure may damage the cornea, retina, and ciliary body.

SKIN ABSORPTION: The Benzene component of this product can be absorbed via intact skin. Due to the low concentration of Benzene in this product, skin absorption is not anticipated to cause adverse effects.

11. TOXICOLOGICAL INFORMATION (Continued)

INGESTION: Though not anticipated to be a significant route of occupational exposure, ingestion of this product (especially in large volumes) can irritate the tissues of the mouth, esophagus, and other tissues of the digestive system. Symptoms of such overexposure can include nausea, vomiting, diarrhea, and restlessness. Aspiration (inadvertent suction) of liquid into the lungs must be avoided as even small quantities in the lungs can produce chemical pneumonitis, pulmonary edema/hemorrhage, and even death.

INJECTION: Though not anticipated to be a significant route of occupational exposure, injection of this material would cause pain, irritation, and swelling at the site of injection.

OTHER HEALTH EFFECTS: Chronic organic solvent intoxication is the name given to a pattern of nervous system effects resulting from heavy exposure to a variety of organic solvents. It is a rare condition and seems to develop only after repeated overexposures. Symptoms include headache; dizziness; reduced memory; tiredness; joint pain; sleep disturbances; pain, numbness, and tingling in the fingers and toes; decreased manual dexterity; depression; irritability; emotional instability; reduced ability to concentrate; and nausea. The severe forms of chronic organic solvent intoxication may be reversible or only slowly reversible.

IRRITANCY OF PRODUCT: This product can irritate or burn contaminated tissue, especially after prolonged or repeated exposure.

SENSITIZATION TO THE PRODUCT: The components of this product are not currently known to be sensitizers with prolonged or repeated use.

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

Acute: Severe inhalation and aspiration exposure may be fatal. Eye contact can cause transient corneal injury. Skin contact can be irritating or cause burns.

Chronic: Repeated skin overexposure may cause dermatitis (dry, red skin).

TARGET ORGANS: Acute: Skin, eyes, respiratory system, central nervous system. Chronic: Skin.

TOXICITY DATA: The following toxicological data are available for Gasoline. Currently, there are no toxicity data available for the individual components of this product present in greater than 1 percent concentration.

GASOLINE:

LD_{50} (Oral - rat) 92 g/kg

LD_{50} (Oral - mouse) 60 mL/kg; Autonomic Nervous System: other (direct) parasympathomimetic, Behavioral: convulsions or effect on seizure threshold, Lungs, Thorax, or Respiration: respiratory stimulation

GASOLINE (continued):

TCLo (Inhalation - rat) 100 mg/m^3/4 hr/17 weeks/intermittent; Blood: other changes, Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels (phosphatases & dehydrogenases)

TCLo (Inhalation - rat) 5283 $\mu g/m^3$/24 hr/15 weeks/continuous; Behavioral: muscle contraction or spasticity, Liver: other changes, Endocrine: other changes

GASOLINE (continued):

TCLo (Inhalation - rabbit) 6 g/m^3/4 hr/26 weeks/intermittent; Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol), Biochemical - Metabolism (Intermediary): other proteins

Sperm Morphology (Inhalation, rat) 300 mg/m^3/10 weeks/intermittent

CARCINOGENIC POTENTIAL OF COMPONENTS: Clinical studies indicate that test animals exposed to relatively high doses of unleaded gasoline for extended periods of time (78–104 weeks) indicate carcinogenic effects. The components of this product are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

GASOLINE: ACGIH-TLV-A3 (Confirmed Animal Carcinogen); IARC-2B (Possibly Carcinogenic to Humans); NIOSH-Ca (Potential Occupational Carcinogen with No Further Categorization)

BENZENE: ACGIH-A1 (Confirmed Human Carcinogen); EPA-K (Known Human Carcinogen); IARC-1 (Carcinogenic to Humans); MAK-1 (Substances that cause cancer in am an can be assumed to make a significant contribution to cancer risk); NIOSH-Ca (Potential Occupational Carcinogen, with no further categorization); NTP-K (Known to be a Human Carcinogen); OSHA-Ca (Carcinogen defined with no further details).

The remaining components of this product are not found on the following lists: U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, IARC, or ACGIH and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

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

Mutagenicity: The mutagenic potential of Naphthas has been reported to be largely negative in a variety of mutagenicity tests. Human mutation data are available for the Benzene component. Despite many limitations, virtually all studies have found positive evidence of mutagenic effects in exposed workers, usually at exposure levels that also produced changes to the blood system. Reports have included chromosomal aberrations in peripheral lymphocytes, clastogenic (DNA) effects as well as damaged chromosomes in hematopoietic (blood-forming) cells. A recent study analyzed chromosome aberrations in workers exposed to levels less than 10 ppm, with occasional peaks of about 100 ppm. There was a slight increase in the incidence of chromosomal aberrations in the exposed group, however this appeared to be caused by the results of few individuals rather than the group as a whole. In another study, peripheral lymphocytes of a group of 20 female workers exposed to less than 5 ppm benzene (as well as 100 ppm toluene) were examined. There was a significantly increased incidence of DNA damage. In workers who were reexamined 4 months after exposure stopped, the damage had decreased significantly.

Embryotoxicity: The Benzene component crosses the placenta but there is no conclusive evidence that it affects the fetus. Most of the studies had limitations such as poor exposure assessment, exposure to other chemicals and a small number of cases.

Teratogenicity: In a case study of one woman exposed to the Benzene component during two pregnancies (at levels producing severe maternal toxicity), both children were healthy and did not have chromosomal alterations. In another study, 14 children of female workers exposed to Benzene and other organic solvents did have chromosomal changes. There was no discussion of maternal toxicity nor birth defects. Animal evidence indicates that Benzene is not teratogenic, but is fetotoxic at exposure levels that also resulted in mild maternal toxicity.

Reproductive Toxicity: Exposure of Naphtha (Petroleum), Full-range Alkylate to pregnant rats at concentrations of 137, 3425 and 6850 ppm did not adversely affect reproduction or cause maternal or fetal toxicity. Data on reproductive effects on ovaries and testes are available from clinical studies involving test animals exposed to relatively high doses of the Benzene component. These data were obtained at doses which caused toxic effects on other organs.

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION (continued):

Reproductive Toxicity (continued): Although there are concerns that historical, high occupational exposures to Benzene may be related to menstrual and reproductive problems in women, the available studies have too many limitations to draw any conclusions. Limited animal evidence suggests that Benzene may affect reproductive organs at exposure levels which also cause significant toxicity.

A mutagen is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical that 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 that causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance that interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES: The following Biological Exposure Indices (BEIs) are currently applicable for Benzene.

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
BENZENE		
• S-Phenylmercapturic Acid in urine	• End of shift	• 25 µg/g creatinine
• *t,t*-Muconic Acid in urine	• End of shift	• 500 µg/g creatinine

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES SHOULD BE AIMED AT PREVENTING RELEASES INTO THE ENVIRONMENT.

MOBILITY: This product is volatile and will evaporate quickly.

PERSISTENCE AND BIODEGRADABILITY: Not easily biodegradable, may persist in the environment. May degrade photo-chemically.

BIO-ACCUMULATION POTENTIAL: This product may bio-accumulate. Log $P_{OW} > 3$

ECOTOXICITY: The effect of this product on plants is related to removal of natural oils and the prevention of respiration. Plants may die if this product is spilled on them. Animals may exhibit narcotic effects as described for humans. This product floats on water and may prevent oxygenation of the aquatic environment. All releases to terrestrial, atmospheric and aquatic environments should be avoided. Ecotoxicity data are available for components of this product as follows:

NAPHTHA (PETROLEUM), FULL-RANGE ALKYLATE:

IC_{50} (*Selenastrum capricornutum*, algae) = 13 mg/L/72 hr

EL50 (Daphnia magna) > 1000 mg/L/OECD TG no. 202

OTHER ADVERSE EFFECTS: None currently known.

ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHODS: It is the responsibility of the generator to determine at the time of disposal whether the product meets the criteria of a hazardous waste per regulations of the area in which the waste is generated and/or disposed of. Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Shipment of wastes must be done with appropriately permitted and registered transporters.

PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING: Wear proper protective equipment when handling waste materials. Dispose of in accordance with applicable Federal, State, and local procedures and standards.

DISPOSAL CONTAINERS: Waste materials must be placed in and shipped in appropriate 5-gallon or 55-gallon poly or metal waste pails or drums. Permeable cardboard containers are not appropriate and should not be used. Ensure that any required marking or labeling of the containers be done to all applicable regulations.

U.S. EPA WASTE NUMBER: Wastes of this product should be tested to determine if they meet the criteria of D001 (Waste Characteristic-Flammability).

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS: This product is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

Proper Shipping Name:	Gasoline
Hazard Class Number and Description:	3 (Flammable)
UN Identification Number:	UN 1203
Packing Group:	II
Hazard Label:	Class 3 (Flammable)
Emergency Response Guidebook Number (2008):	128

Marine Pollutant: No component of this product is classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is classified as dangerous goods, per regulations of Transport Canada.

Proper Shipping Name:	Petrol
Hazard Class Number and Description:	3 (Flammable)
UN Identification Number:	UN 1203
Packing Group:	II
Hazard Label:	Class 3 (Flammable)

14. TRANSPORTATION INFORMATION (Continued)

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS (continued):

Special Provisions:	None
Explosive Limit and Limited Quantity Index:	1
ERAP Index:	None
Passenger Carrying Ship Index:	None
Passenger Carrying Road Vehicle Or Passenger Carrying Railway Vehicle Index:	5
Emergency Response Guidebook Number (2008):	128

15. REGULATORY INFORMATION

ADDITIONAL UNITED STATES REGULATIONS:

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

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Benzene	No	No	Yes

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): Benzene = 10 lb (4.54 kg)

U.S. TSCA INVENTORY STATUS: The components of this product listed by CAS# in Section 3 (Composition and Information on Ingredients) are on the TSCA Inventory. It cannot be confirmed that the remaining components of this product are on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Benzene is listed as a Hazardous Air Pollutant (HAP) generally known or suspected to cause serious health problems, under Section 112 of the Clean Air Act. Benzene is listed as a Toxic Pollutant under the Clean Water Act, Federal Water Pollution Control Act, Section 307(A)(1) and Section 311(B)(2)(A), and is subject to effluent limitations. For certain operations, the requirements of the Federal OSHA Permit-Required Confined Spaces Standard (29 CFR 1910.146) may be applicable.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Benzene component of this product, as well as Unleaded Gasoline (wholly vaporized) are listed on the California Proposition 65 Lists. WARNING! This product contains chemicals known to the State of California to cause cancer or reproductive harm.

ANSI LABELING (Z129.1): **WARNING!** FLAMMABLE LIQUID. MAY FORM EXPLOSIVE MIXTURES IN AIR. POSSIBLE CANCER HAZARD-MAY CAUSE CANCER BASED ON ANIMAL DATA. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. INHALATION MAY CAUSE CENTRAL NERVOUS SYSTEM EFFECTS. VAPOR REDUCES OXYGEN AVAILABLE FOR BREATHING. CAUSES SKIN, EYE, AND RESPIRATORY SYSTEM IRRITATION. PROLONGED OR REPEATED SKIN CONTACT WITH LIQUID MAY CAUSE DEFATTING RESULTING IN DRYING, REDNESS, AND POSSIBLE BLISTERING. Do not breathe vapor, mists or spray. Avoid contact with skin, eyes, and clothing. Use only with adequate ventilation. Keep container tightly closed. Wash thoroughly after handling. Wear gloves and goggles. Keep away from heat, sparks, and flame. Do NOT enter storage areas or confined spaces unless adequately ventilated. **FIRST-AID:** In case of skin contact, immediately flush skin with large amounts of water and then wash with soap. In case of eye contact, immediately flush eyes for at least 20 minutes with large amounts of water. If inhaled, move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, do not induce vomiting. Get medical attention immediately. **IN CASE OF FIRE:** Evacuate personnel in area of release and contact trained personnel to respond to fire. Eliminate all sources of ignition. If safe to do so, close valves or move containers away from fire area. **IN CASE OF RELEASE:** Evacuate personnel in area of release and contact trained response personnel. If safe to do so, move containers away from personnel and potential fire hazards. Eliminate all sources of ignition. Refer to Material Safety Data Sheet for additional information on this product.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product listed by CAS# in Section 3 (Composition and Information on Ingredients) are on the DSL or NDSL Inventory. It cannot be confirmed that the remaining components of this product are on the DSL or NDSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITY SUBSTANCES LISTS: The Benzene component of this product is on the CEPA Priority Substances Lists, as a PSL1 Toxic Substance, per Section 64 of CEPA 1999.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS:

Class B2: Flammable and combustible material (flammable liquid)
Class D2B: Toxic Material Causing Other Toxic Effects

16. OTHER INFORMATION

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 1961, Hilo, HI 96721
800/441-3365

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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 that uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

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

DFG MAKs: Federal Republic of Germany Maximum Concentration Values in the workplace. Exposure limits are given as TWA (Time-Weighted Average) or PEAK (short-term exposure) values.

DFG MAK Germ Cell Mutagen Categories: 1: Germ cell mutagens that have been shown to increase the mutant frequency in the progeny of exposed humans. **2:** Germ cell mutagens that have been shown to increase the mutant frequency in the progeny of exposed mammals. **3A:** Substances that have been shown to induce genetic damage in germ cells of human of animals, or which produce mutagenic effects in somatic cells of mammals *in vivo* and have been shown to reach the germ cells in an active form. **3B:** Substances that are suspected of being germ cell mutagens because of their genotoxic effects in mammalian somatic cell *in vivo*; in exceptional cases, substances for which there are no *in vivo* data, but that are clearly mutagenic in vitro and structurally related to known in vivo mutagens. **4:** Not applicable (Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic. Therefore, a Category 4 for germ cell mutagens cannot apply. At some time in the future, it is conceivable that a Category 4 could be established for genotoxic substances with primary targets other than DNA [e.g. purely aneugenic substances] if research results make this seem sensible.) **5:** Germ cell mutagens, the potency of which is considered to be so low that, provided the MAK value is observed, their contribution to genetic risk for humans is expected not to be significant.

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

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

LOQ: Limit of Quantitation.

NE: Not Established. When no exposure guidelines are established, an entry of NE is made for reference.

NIC: Notice of Intended Change.

NIOSH CEILING: The exposure that shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, the ceiling shall be assumed as a 15-minute TWA exposure (unless otherwise specified) that shall not be exceeded at any time during a workday.

NIOSH RELs: NIOSH's Recommended Exposure Limits.

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

SKIN: Used when a there is a danger of cutaneous absorption.

STEL: Short Term Exposure Limit, usually a 15-minute time-weighted average (TWA) exposure that should not be exceeded at any time during a workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA.

TLV: Threshold Limit Value. An airborne concentration of a substance that represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour.

TWA: Time Weighted Average exposure concentration for a conventional 8-hr (TLV, PEL) or up to a 10-hr (REL) workday and a 40-hr workweek.

WEEL: Workplace Environmental Exposure Limits from the AIHA.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS:

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

HEALTH HAZARD: **0** Minimal Hazard: No significant health risk, irritation of skin or eyes not anticipated. *Skin Irritation*: Essentially non-irritating. Mechanical irritation may occur. PII or Draize = 0. *Eye Irritation*: Essentially non-irritating, minimal effects clearing in < 24 hours. Mechanical irritation may occur. Draize = 0. *Oral Toxicity LD_{50} Rat*: > 5000 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: > 2000 mg/kg. *Inhalation Toxicity 4-hrs LC_{50} Rat*: > 20 mg/L. **1** Slight Hazard: Minor reversible injury may occur; may irritate the stomach if swallowed; may defat the skin and exacerbate existing dermatitis. *Skin Irritation*: Slightly or mildly irritating. PII or Draize > 0 < 5. *Eye Irritation*: Slightly to mildly irritating, but reversible within 7 days. Draize > 0 ≤ 25. *Oral Toxicity LD_{50} Rat*: > 500–5000 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: > 1000–2000 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: > 2–20 mg/L.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

HEALTH HAZARD (continued): **2** Moderate Hazard: Temporary or transitory injury may occur; prolonged exposure may affect the CNS. *Skin Irritation*: Moderately irritating; primary irritant; sensitizer. PII or Draize ≥ 5, with no destruction of dermal tissue. *Eye Irritation*: Moderately to severely irritating; reversible corneal opacity; corneal involvement or irritation clearing in 8–21 days. Draize = 26–100, with reversible effects. *Oral Toxicity LD_{50} Rat*: > 50–500 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: > 200–1000 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: > 0.5–2 mg/L. **3** Serious Hazard: Major injury likely unless prompt action is taken and medical treatment is given; high level of toxicity; corrosive. *Skin Irritation*: Severely irritating and/or corrosive; may cause destruction of dermal tissue, skin burns, and dermal necrosis. PII or Draize > 5–8, with destruction of tissue. *Eye Irritation*: Corrosive, irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days. Draize > 80 with effects irreversible in 21 days. *Oral Toxicity LD_{50} Rat*: > 1–50 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: > 20–200 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: > 0.05–0.5 mg/L. **4** Severe Hazard: Life-threatening; major or permanent damage may result from single or repeated exposures; extremely toxic; irreversible injury may result from brief contact. *Skin Irritation*: Not appropriate. Do not rate as a 4, based on skin irritation alone. *Eye Irritation*: Not appropriate. Do not rate as a 4, based on eye irritation alone. *Oral Toxicity LD_{50} Rat*: ≤ 1 mg/kg. *Dermal Toxicity LD_{50} Rat or Rabbit*: ≤ 20 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: ≤ 0.05 mg/L.

FLAMMABILITY HAZARD: **0** Minimal Hazard: Materials that will not burn in air when exposure to a temperature of 815.5℃ (1500℉) for a period of 5 minutes. **1** Slight Hazard: Materials that must be pre-heated before ignition can occur. Material requires considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur. This usually includes the following: Materials that will burn in air when exposed to a temperature of 815.5℃ (1500℉) for a period of 5 m inutes or less; Liquids, solids and semisolids having a flash point at or above 93.3℃ (200℉) (i.e. OSHA Class IIIB); and Most ordinary combustible materials (e.g. wood, paper, etc.). **2** Moderate Hazard: Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not, under normal conditions, form hazardous atmospheres in air, but under high ambient temperatures or moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres with air. This usually includes the following: Liquids having a flash-point at or above 37.8℃ (100℉); Solid materials in the form of course dusts that may burn rapidly but that generally do not form explosive atmospheres; Solid materials in a fibrous or shredded form that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp); and Solids and semisolids (e.g. viscous and slow flowing as asphalt) that readily give off flammable vapors. **3** Serious Hazard: Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures, or, unaffected by ambient temperature, are readily ignited under almost all conditions. This usually includes the following: Liquids having a flash point below 22.8℃ (73℉) and having a boiling point at or abov e 38℃ (100° □F) and those liquids having a flash point at or above 22.8℃ (73℉) and below 3 7.8℃ (100℉) (i.e. OSHA Class IB and IC); Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air (e.g., dusts of combustible solids, mists or droplets of flammable liquids); and Materials that burn extremely rapidly, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). **4** Severe Hazard: Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air, and that will burn readily. This usually includes the following: Flammable gases; Flammable cryogenic materials; Any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8℃ (73℉) and a boiling point below 37.8℃ (100 ℉) (i.e. OSHA Class IA); and Materials that ignite spontaneously when exposed to air at a temperature of 54.4℃ (130℉) or below (pyrophoric).

PHYSICAL HAZARD: **0** *Water Reactivity*: Materials that do not react with water. *Organic Peroxides*: Materials that are normally stable, even under fire conditions and will not react with water. *Explosives*: Substances that are Non-Explosive. *Compressed Gases*: No Rating. *Pyrophorics*: No Rating. *Oxidizers*: No 0 rating. *Unstable Reactives*: Substances that will not polymerize, decompose, condense, or self-react.). **1** *Water Reactivity*: Materials that change or decompose upon exposure to moisture. *Organic Peroxides*: Materials that are normally stable, but can become unstable at high temperatures and pressures. These materials may react with water, but will not release energy violently. *Explosives*: Division 1.5 & 1.6 explosives. Substances that are very insensitive explosives or that do not have a mass explosion hazard. *Compressed Gases*: Pressure below OSHA definition. *Pyrophorics*: No Rating. *Oxidizers*: Packaging Group III oxidizers; Solids: any material that in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65%)/cellulose mixture and the criteria for Packing Group I and II are not met. *Unstable Reactives*: Substances that may decompose condense, or self-react, but only under conditions of high temperature and/or pressure and have little or no potential to cause significant heat generation or explosion hazard. Substances that readily undergo hazardous polymerization in the absence of inhibitors.

DEFINITIONS OF TERMS (Continued)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued): **2** *Water Reactivity*: Materials that may react violently with water. *Organic Peroxides*: Materials that, in themselves, are normally unstable and will readily undergo violent chemical change, but will not detonate. These materials may also react violently with water. *Explosives*: Division 1.4 explosives. Explosive substances where the explosive effects are largely confined to the package and no projection of fragments of appreciable size or range are expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package. *Compressed Gases*: Pressurized and meet OSHA definition but < 514.7 psi absolute at 21.1℃ (70℉) [500 psig]. *Pyrophorics*: No Rating. *Oxidizers*: Packing Group II oxidizers. Solids: any material that, either in concentration tested, exhibits a mean burning time of less than or equal to the mean burning time of a 2:3 potassium bromate/cellulose mixture and the criteria for Packing Group I are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise of a 1:1 aqueous sodium chlorate solution (40%)/cellulose mixture and the criteria for Packing Group I are not met. *Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure, but have a low potential (or low risk) for significant heat generation or explosion. Substances that readily form peroxides upon exposure to air or oxygen at room temperature. **3** *Water Reactivity*: Materials that may form explosive reactions with water. *Organic Peroxides*: Materials that are capable of detonation or explosive reaction, but require a strong initiating source or must be heated under confinement before initiation; or materials that react explosively with water. *Explosives*: Division 1.3 explosives. Explosive substances that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but do not have a mass explosion hazard. *Compressed Gases*: Pressure ≥ 514.7 psi absolute at 21.1℃ (70℉) [500 psig]. *Pyrophorics*: No Rating. *Oxidizers*: Packing Group I oxidizers. Solids: any material that, in either concentration tested, exhibits a mean burning time less than the mean burning time of a 3:2 potassium bromate/cellulose mixture. Liquids: any material that spontaneously ignites when mixed with cellulose in a 1:1 ratio, or which exhibits a mean pressure rise time less than the pressure rise time of a 1:1 perchloric acid (50%)/cellulose mixture. *Unstable Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a moderate potential (or moderate risk) to cause significant heat generation or explosion. **4** *Water Reactivity*: Materials that react explosively with water without requiring heat or confinement. *Organic Peroxides*: Materials that are readily capable of detonation or explosive decomposition at normal temperature and pressures. *Explosives*: Division 1.1 & 1.2 explosives. Explosive substances that have a mass explosion hazard or have a projection hazard. A mass explosion is one that affects almost the entire load instantaneously. *Compressed Gases*: No Rating. *Pyrophorics*: Add to the definition of Flammability 4. *Oxidizers*: No 4 rating. *Unstable Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure and have a high potential (or high risk) to cause significant heat generation or explosion.

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

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

FLAMMABILITY HAZARD: **0** Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand. Materials that will not burn in air when exposed to a temperature of 816℃ (1500℉) for a period of 5 minutes in according with Annex D of NFPA 704. **1** Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur:

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

FLAMMABILITY HAZARD (continued): **1 (continued)** Materials that will burn in air when exposed to a temperature of 816℃ (1500℉) for a pe riod of 5 minutes in according with Annex D of NFPA 704. Liquids, solids, and semisolids having a flash point at or above 93.4℃ (200℉) (i.e. Class IIIB liquids). Liquids w ith a flash point greater than 35℃ (95℉) that do not sustain combustion when tested using the *Method of Testing for Sustained Combustibility*, per 49 CFR 173, Appendix H or the UN *Recommendations on the Transport of Dangerous Goods, Model Regulations* (current edition) and the related *Manual of Tests and Criteria* (current edition). Liquids with a flash point greater than 35℃ (95℉) in a water-miscible solution or dispersion with a water non-combustible liquid/solid content of more than 85% by weight. Liquids that have no fire point when tested by ASTM D 92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup*, up to the boiling point of the liquid or up to a temperature at which the sample being tested shows an obvious physical change. Combustible pellets with a representative diameter of greater than 2 mm (10 mesh). Most ordinary combustible materials. Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **2** Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air. Liquids having a flash point at or above 37.8℃ (100℉) and below 93.4℃ (200℉) (i.e. Class II and Class IIIA liquids.) Solid materials in the form of powders or coarse dusts of representative diameter between 420 microns (40 mesh) and 2 mm (10 mesh) that burn rapidly but that generally do not form explosive mixtures with air. Solid materials in fibrous or shredded form that burn rapidly and create flash fire hazards, such as cotton, sisal, and hemp. Solids and semisolids that readily give off flammable vapors. Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **3** Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions. Liquids having a flash point below 22.8℃ (73℉) and having a boiling point at or above 37.8℃ (100℉) and those liquids having a flash point at or above 22.8℃ (73℉) and below 37.8℃ (100℉) (i.e. Class IB and IC liquids). Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air. Flammable or combustible dusts with representative diameter less than 420 microns (40 mesh). Materials that burn with extreme rapidity, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **4** Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily. Flammable gases. Flammable cryogenic materials. Any liquid or gaseous materials that is liquid while under pressure and has a flash point below 22.8℃ (73℉) and a boiling point below 37.8℃ (100 ℉) (i.e. Class IA liquids). Materials that ignite when exposed to air, Solids containing greater than 0.5% by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

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

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 vapor to form an ignitable mixture with air near the surface of the liquid or within the test vessel used. Autoignition Temperature: Minimum temperature of a solid, liquid, or gas required to initiate or cause self-sustained combustion in air with no other source of ignition. LEL: Lowest concentration of a flammable vapor or gas/air mixture that will ignite and burn with a flame. UEL: Highest concentration of a flammable vapor or gas/air mixture that will ignite and burn with a flame.

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. LD_{50}: Lethal Dose (solids & liquids) that kills 50% of the exposed animals. LC_{50}: Lethal Concentration (gases) that kills 50% of the exposed animals. ppm: Concentration expressed in parts of material per million parts of air or water. mg/m^3: 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. TDLo: Lowest dose to cause a symptom. TCLo: Lowest concentration to cause a symptom. TDo, LDLo, and LDo, or TC, TCo, LCLo, and LCo: Lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** IARC: International Agency for Research on Cancer. NTP: National Toxicology Program. RTECS: Registry of Toxic Effects of Chemical Substances. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other Information:** BEI: ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed

DEFINITIONS OF TERMS (Continued)

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: Effect concentration in water. BCF: Bioconcentration Factor, which is used to determine if a substance will concentrate in life forms that consume contaminated plant or animal matter. TLm: Median threshold limit. log K_{OW} or log K_{OC}: Coefficient of Oil/Water Distribution is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

U.S.:

EPA: U.S. Environmental Protection Agency. ACGIH: American Conference of Governmental Industrial Hygienists, a professional association that establishes exposure limits. OSHA: U.S. Occupational Safety and Health Administration. NIOSH: National Institute of Occupational Safety and Health, which is the research arm of OSHA. DOT: U.S. Department of Transportation. TC: Transport Canada. SARA: Superfund Amendments and Reauthorization Act. TSCA: U.S. Toxic Substance Control Act. CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act. Marine Pollutant status according to the DOT; CERCLA or Superfund; and various state regulations. This section also includes information on the precautionary warnings that appear on the material's package label.

CANADA:

WHMIS: Canadian Workplace Hazardous Materials Information System. TC: Transport Canada. DSL/NDSL: Canadian Domestic/Non-Domestic Substances List.