ALL-CAN ENGINEERING & SURVEYS (1976) LTD.

APPENDIX "A"

WHMIS PROGRAM

MSDS Relating to Dangerous Goods in Immediate, Daily Work Areas

In accordance with Safety Manual Section 7.1 – Training Policy, all workers working with or near controlled products must be WHMIS trained. This training should be taken prior to commencing work and renewed every 3 years. The workers should be informed any time a controlled product changes or a new product is introduced.

MSDS should be obtained for all controlled products and will be made readily available to all workers. MSDS's will be kept at the office and at all worksites. Attached MSDS material relates to dangerous goods in your immediate, daily work areas. Consult on regular basis for your own safety as well as for the public, if transported in your vehicle.

Product Name	**Shipping Name (TDG)**	**Pin #**	**Classification**	**Packaging Group**
Air Compressed	Air Compressed	UN1002	2.2	X
Antifreeze	Anti-Freeze	N/R	N/R	N/R
Battery Acid Liquid	Sulphuric Acid	UN2796	8	II
Diesel	Fuel Oil/ Gas Oil	UN1202	3.3	II
Chainsaw Oil	Chainsaw Oil	N/R	N/R	N/R
Gasoline	Gasoline	UN1203	3.1	II
Motor Oil	Motor Oil	N/R	N/R	N/R
Propane	Liquefied Petroleum Gas	UN1075	2.1	X
Windshield Washer Fluid	Windshield Washer Antifreeze	N/R	N/R	N/R

Replace supplier labels with workplace label when necessary - (container contents should always be known). Ensure that product is properly documented, classified and marked while in your possession as carriers. If a controlled product is transferred from original container into an unmarked container, a workplace label must be attached to the unmarked container.

INTERPRETATION OF TERMS

Material Safety Data Sheets (MSDS)

Section 1	**Product Identification and Use**
Section 2	**Hazardous Ingredients**
Section 3	**Physical Data**
Section 4	**Fire and Explosion Data**
Section 5	**Reactivity Data**
Section 6	**Toxicological Data**
Section 7	**Preventative Measures**
Section 8	**First Aid Measures**
Section 9	**Preparation of MSDS**

SECTION 1 PRODUCT IDENTIFICATION AND USE

1. Product Identifier

   This is to be exactly the same as is on the label. This name will refer to either the common name, chemical name, trade name, brand name, generic name, code name or code specified by the supplier.

2. Product Identification Number

   This 4-digit number is used as a reference for the shipper and receiver during the transportation of the product.

3. Product Use

   This is an important piece of information to you, the worker. This section specified the product use(s) as was intended by the supplier. Use other than those intended may pose a risk to workers. For example, a solvent meant for degreasing tanks may pose a significant explosion risk to workers if used as a manual cleaning agent because of the tendency of this solvent to evaporate easily into air.

4. Manufacturer Identifier

   Name, address and emergency telephone number.

5. Supplier Identifier

   Name, address and emergency telephone number.

SECTION 2 HAZARDOUS INGREDIENTS

1. Chemical Identity and Concentration of Ingredients

   This will advise you of the percentage of a controlled ingredient in the controlled product.

2. LD_{50} of the Ingredients

   During laboratory tests, when animals are administered an amount of the pure controlled ingredient (the amount is a specific weight in accordance with the size of the animal) by a specific route (i.e. eating, skin) which causes 50% of the animals to die; then the LD_{50} (Lethal Dose) is established. The closer this number is to one (1), the more toxic it is. For example, you might see "Rat, oral, LD_{50}: 200 MG/KG. That means that half of the test population of rats were killed when they swallowed a dose of 200 mg of the ingredient for every one kg of body weight.

3. LC_{50} of the Ingredients

   This works the same way, except that this value refers to the concentration of the ingredients in air (expressed as PPM -- parts per million or MG/M).

SECTION 3 PHYSICAL DATA

1. Physical State

At room temperature is the controlled product a:

- Gas?
- Solid?
- Liquid?

This information is important in understanding the difficulty of containing the product and helps predict the response of the product to change in temperature and pressure.

Example: When propane is used at room temperature as a heat source it works well as the vapour is burned. At -42EC propane becomes a liquid, producing little or no vapour and now can be a potential hazard if not handled properly.

2. Odour and Appearance

Look for such indication such as:

- quality of odour (e.g. fruity, sharp, sweet)
- intensity (e.g. strong, weak, mild)
- irritant properties (pleasant, unpleasant)

Appearance refers to color (including colorless), surface texture (e.g. greasy, waxy, soft) and degree of aggregation (e.g. flakes, granules).

3. Odour Threshold

The lowest airborne concentration of a chemical in the air that can be perceived by the sense of smell and is normally expressed in ppm (parts per million). This information should be accompanied with "good warning properties", "fair warning properties" and "poor warning properties". It is important not to relate the amount of odour to the amount of chemicals in the air. Some chemicals do not give off a lot of odour, and yet the concentrations of the chemicals in the air can be very hazardous. This would be a "poor warning property" indicator. On the other hand, another chemical might give off a high odour. This would be indicated as "good warning properties".

However, odour thresholds must be used with caution, as some people do not smell in the same proportion to odourant concentration. Some people do not smell at all and some chemicals will shut down your ability to smell (e.g. hydrogen sulphide).

SECTION 3 PHYSICAL DATA - CONTINUED

4. Vapour Pressure

Vapour pressures are one measure of the ability of substances to form vapours. Materials with high vapour pressures can be hazardous, particularly in enclosed unventilated areas.

Solids (e.g. iodine) as well as liquids may have significant vapour pressures.

5. Vapour Density

The measure of a gas as to whether the gas is heavier or lighter than air. Products lighter than air have a vapour density of less than one (1) (e.g. helium, methane). Those heavier than air have densities of more than one (1) (e.g. chlorine, carbon dioxide).

However, remember, the tendency of a gas to rise or fall depends not only on density but also on temperature, air turbulence and time. In normal circumstances a gas released into air will eventually mix evenly with it.

This information is important for not only the handling but for air testing (you wouldn't want to test for methane at only the ground level nor would you test for the higher concentrations of carbon dioxide at shoulder or waist level).

This information is also important for ventilation procedures. (An air exchange system placed at the ceiling level may not be effective for ventilating chlorine from the workplace).

6. Evaporation Rate

The rate at which a particular material will evaporate (vaporize) in air relative to:

- Butyl acetate, either/or other specified solvents used for comparison must be listed.

This information is important. You need to know how fast a substance will evaporate and become airborne. This may have implications to your health (from breathing the airborne substance) and fire hazard potential.

7. Boiling Point

The temperature at which a liquid becomes a gas.

This is important as there can be a sudden volume change when the liquid becomes a gas (e.g. Propane increases 270 times in volume).

Care must be taken to keep liquids below their boiling point because of respiratory, fire and explosion hazards.

SECTION 3 PHYSICAL DATA - CONTINUED

8. Freezing Point

This is important as volume changes may occur and may rupture containers.

9. pH

This tells you whether the product is more acid or more alkaline or neutral.

The pH is rated for 0 to 14. pH which is lower than 7 is acid in nature and the closer to 0 the more acid the product is.

Seven is neutral and above 7 is of an alkaline nature.

This information is important, as you will have an indication of the type of personal protective equipment (e.g. face shield, goggles, rubber gloves, etc.) you should be using. As well, if you become over exposed what type of first aid treatment is needed.

10. Specific Gravity

This will tell you if the product is heavier or lighter than water. If the specific gravity is more than one (1) it will sink in water. If it is less than one (1) the product will float.

This information is important for such things as spills and firefighting (e.g. if gas is spilled and catches on fire, you would not want to use water as gas is lighter than water and would sit on top of water).

11. Coefficient of Water/Oil Distribution

This information tells you if the product is more likely to mix with grease and oil more quickly. It also means that the skin will likely absorb the product. If the product is listed as greater than one (1) then the product mixes better with water and is more likely to be absorbed by the tissue of the eye or the lungs. This information is needed when selecting personal protective equipment and for first aid treatment.

This information is also necessary when cleaning up a spill involving a body of water.

Liquids can be described by their viscosity (e.g. thick, thin, gelatin or jello-like).

SECTION 4 FIRE AND EXPLOSIVE DATA

1. Flammability

This information tells you if the product is flammable or combustible (remember, the word "inflammable" means the same as flammable) and to what extent. This is also Class B as it refers to your symbols. The flammable product could be:

- gases
- liquids
- solids
- aerosols
- reactive flammable materials

2. Means of Extinction

A list of extinguishers suitable for use on the burning product.

3. Flashpoint (^{o}C) and Method

The lowest temperature at which a liquid product gives off enough vapour to ignite if ignition source is available (e.g. open flame or spark).

The lower the flashpoint the greater the hazard. The normal room temperature ranges from 16^{o}C (61^{o}F) to 25^{o}C (77^{o}F). Chemicals with a flashpoint at or below room temperature can provide enough vapours to cause an explosive atmosphere if a source of ignition occurs.

4. Flammable Limits in Air

(Upper Flammable Limit [UFL] and Lower Flammable Unit [LFL])

This information will tell you the upper (maximum) and the lower (minimum) concentrations of a gas or vapour in the air when an explosion can take place if an ignition source is available.

Flammable limits are sometimes termed "explosive limits" (e.g. [LEL] Lower Explosive Limit and [UEL] Upper Explosive Limit).

Either way, whether UFL and UEL and whether LFL or LEL, this information tells you that if you have a gas or vapour concentration of less than the LFL/LEL the mixture is too lean to burn or explode. If the amount of gas or vapour is more or less that the UFL/UEL, the mixture is too rich to burn or explode.

SECTION 4 FIRE AND EXPLOSIVE DATA - CONTINUED

5. Auto-Ignition Temperature

This tells you when a gas or vapour will automatically ignite with no ignition source. This is important information in the event a gas or vapour could be exposed to a high temperature or hot surface, thereby raising the temperature to this explosive level.

6. Hazardous Combustion Products

When there is a problem of hazardous product being formed during the process of burning, then that information would be indicated here.

For example, during the operation of a gas motor, carbon monoxide is formed. That information would be included under this section (Fire and Explosive Data) and this sub-heading.

Another example is the PVC coating (yellow jacket) on piping. If heat is applied and the PVC burns, a toxic fume is released from the decomposition of the plastic.

7. Explosion Data -- Sensitivity to Impact

This would tell you the likelihood of the product exploding if there were a jarring of the product.

We are all familiar with the jarring consequences of nitro-glycerine.

8. Explosion Data -- Sensitivity to Static Discharge

A description of the likelihood the product may explode when exposed to static discharge.

This information may be required when dealing with gas, vapour, or dust products. For example, under the perfect circumstances some saturated hydro carbon vapours will ignite if a static energy of 0.25 millijoules (a measure of energy) is present -- for hydrogen as little as .017 millijoules is required.

SECTION 5 REACTIVITY DATA

This section will tell you if the product is stable or unstable, and if unstable, under what conditions. This section will also tell you if this product will violently react when exposed to such things as:

- other chemicals
- temperature changes
- water
- shock, vibrations, pressure

1. Chemical Stability

   Some of the results of a reaction are:
   - explosion
   - excessive heat and fire
   - production of toxic or corrosive by-products

   An example of a product becoming unstable is acetylene when it is exposed to pressures over 15 P.S.I.

2. Incompatibility

   Examples of products reacting to each other are:

   - strong mineral acids cannot be mixed with caustics
   - sodium cannot be mixed with water
   - flammable substances cannot be mixed with oxidizers

   Handling and storage is very important when dealing with potentially reactive products.

3. Reactivity

   This provides information not included under the headings "Chemical Stability" and "Incompatibility".

   This type of information here would tell you if, for example, a product could react if one of the chemicals called an "inhibitor" was removed. You do not want to put a material that reacts with plastic in a plastic container. It is also very important when choosing personal protective equipment; rubber gloves are of no use if a product reacts with rubber.

4. Hazardous Decomposition Products

   The sub-section must tell you if there are dangerous products released (e.g. gas, vapours) should the hazardous material be exposed to aging, heating, burning, oxidation or is allowed to react.

   When aging is a factor shelf life must be listed, usually under section 7, "Preventive Measures".

SECTION 6 TOXICOLOGICAL PROPERTIES

This section will tell you how the controlled product will enter the body and the short (immediately dangerous) and long term health effects to the worker if overexposed. This section is important for preventative and first aid measures.

1. Route of Entry

   This will tell you of the possible route the hazardous product will use to get onto or into your body. These include:

   - skin contact (e.g. burn from acid)
   - skin absorption (e.g. including absorption through mucous membranes such as eyes)
   - eye contact
   - inhalation (short term such as hydrogen sulphide or long-term effects such as free silica or both).
   - ingestion (this not only includes hazardous materials which may be transferred from hands and fingers to mouth but from larger particles originally breathed in, coughed and then swallowed).

   Routes of entry are important from a preventive stand point (e.g. what personal protective equipment to use, good hygiene) but for first aid treatment as well. The two most common routes of entry are inhalation and absorption.

2. Effects of Acute Exposure to Hazardous Materials

   This will tell you if there can be unfavourable health effects if you are overexposed to the hazardous product for a short time. This could be single exposure or many exposures within a 24-hour period.

   An example is overexposure to carbon monoxide. Depending on the dose, you could experience headaches, dizziness or as bad as coma or death.

   The signs of acute (immediately dangerous) symptoms are tear formation, feeing sick to the stomach, vomiting, breathing could stop and unconsciousness.

3. Effects of Chronic Exposure to Hazardous Materials

   This refers to a single or repeated overexposure to a controlled product over a long period of time -- with symptoms that develop over a long period of time. An example of this would be many exposures to low levels of carbon monoxide. If a person already has a predisposing condition of heart disease, these repeated exposures could make the heart condition worse.

SECTION 6 TOXICOLOGICAL PROPERTIES - CONTINUED

4. Exposure Limits

The most common exposure limits are called threshold limit values (TLV's). TLV's are standards set for the amount of airborne hazardous material (gas, vapour, dust) which can be in your breathing space of an 8-hour day and will not cause you health problems. Remember this is set for the average person. Some people, who are more sensitive to a particular hazardous material, could experience a reaction at or below the TLV.

There are three main types of TLV's:

1) TWA Time Weighted Average

The average concentration of a hazardous product over a normal 8-hour day or 40-hour week.

2) STEL Short-Term Exposure Limit

The maximum concentration to which workers can be periodically exposed for a period of up to fifteen minutes.

3) CLV Ceiling

The highest level a hazardous material can be at any time.

5. Irritancy of Product

- degree of irritant (burning, swilling, itching) of a hazardous product at the point of contact with your body (e.g. running eyes, swelling, rash).

- important when selecting skin, eye and breathing protective measures.

6. Sensitizing Capability of Product

- repeated exposure can cause a significant marked reaction (e.g. rash, hives) and may not necessarily be limited to the contact site.

- although skin sensitization is most common, respiratory sensitization (e.g. sore throat, cough) is also known.

- this information is important as once you become sensitized to a hazardous product, similar products can give you the same reaction.

SECTION 6 TOXICOLOGICAL PROPERTIES - CONTINUED

7. Carcinogenicity (Cancer-Causing)

This sub-section described the cancer-causing properties of the product. You will possibly see such phrases as "Recognized Carcinogenic", "probably Carcinogenic", "Suspect Carcinogenic" in this sub-section.

8. Teratogenicity (Abnormal Reproduction) and Embroyotoxicity (Embro Poisoning)

This sub-section tells the pregnant female that overexposure can be dangerous to her unborn child. Injuries can include death, malformation, growth retardation and others.

If the embryonic stage of the fetus is from two to eight weeks, the fetus is particularly at risk of injury at this time.

9. Reproductive Toxicity

This sub-section will tell you if overexposure to the substances can cause such problems as sterility.

Reproductive toxicity has effects not only on sterility but also those effects outlined in "Teratogenicity and Embryotoxicity".

10. Mutagenicity

The body reproduces according to the "blueprint" of the sets of chromosomes in our genes. Some hazardous materials can alter those "blueprints" and can effect the "reproductive cells" causing a genetic change (e.g. all descendants will now have six fingers on the right hand), or a change in the "non-productive cells" and are associated with such things as cancer.

11. Synergistic Material

This sub-section will tell you which materials should not be combined with this hazardous product as the two combined will produce a toxic effect that may not be present when the two substances are kept separate.

Example:

Bleach + Toilet Cleaner = Chlorine Gas

SECTION 7 PREVENTIVE MEASURES

In this section the kind of protective clothing and equipment needed to work safely with a material is specified. This information will include what to wear and when to wear it.

1. Personal Protective Equipment

   Includes:
   - skin
   - respiratory
   - eye
   - foot
   - clothing
   - other

2. Engineering Controls

   Information is this sub-section would include:
   - ventilation
   - process enclosure
   - equipment design

3. Leak and Spill Procedures

   Safe procedures in the event of a leak, spill or other release of the substance, including:

   - protective equipment for emergency workers
   - neutralizing, absorbing or other control materials
   - particular concerns (e.g. keep unwind)

4. Waste Disposal

   Provides appropriate information as related to:

   - waste container design
   - identifiers on containers consistent with WHMIS/TDG/HAZCOM/DOT HAZMAT
   - preferred or required disposal locations
   - safe handling procedures (e.g. "Do Not Burn")
   - agency to contact regarding disposal requirements

SECTION 7 PREVENTIVE MEASURES - CONTINUED

5. Handling Procedures and Equipment

   This sub-section will advise you on special handling procedures and equipment.

   Procedures must be the same as is on the label.

6. Storage Requirements

   This information will consist of:

   - temperatures
   - control of sources of ignition
   - separation of incompatible products
   - limits on shelf life
   - special instructions

7. Special Shipping Information

SECTION 8 FIRST AID MEASURES

This section is to provide information on the safe evacuation and immediate treatment of a person suffering from overexposure to a controlled product. This information is to be the same as that information on the label. All workers should know where first aid stations are, how to contact a first aid attendant and how to use the emergency shower/eye wash equipment.

SECTION 9 PREPARATION DATA OF MSDS

WHMIS/HAZCOM legislation requires that material safety data sheets are kept up-to-date and that they be no older than 3 years old, or when new information about the controlled product becomes available.