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## **Workplace Hazardous Materials Information System**

### **Introduction**

The Workplace Hazardous Materials Information System (WHMIS) is a comprehensive, national system for safe management of hazardous chemicals, which is legislated by both federal and provincial law.

The ultimate goal of the WHMIS program is to create a safer workplace by providing workers with the knowledge and tools to enable them to work safely.

As per WHMIS requirements, a Joint Health and Safety Committee must be assigned. The Committee will consist of all Area Supervisors and the Co-ordinator of Operations. The Joint Health and Safety Committee must report to the Board of Directors.

All employees are required to attend WHMIS training, and afterwards are expected to apply the knowledge and principles learned to insure a safe work environment for everyone.

workplace where it will be used. In other cases, the label may be a **workplace label**, the label placed on a hazardous material which has been produced in the workplace. **Workplace labels** are also used on a hazardous material which has been transferred from its original container into a smaller container after arrival. Both **supplier labels** and **workplace labels** are required to present certain kinds of information for the benefit of workers who use the materials or come into contact with them on the job.

### Supplier Label:

Those who supply a hazardous material, either by importing it or producing it or selling it in Canada, must affix a **supplier label** to the container. Where containers are crated inside a larger package for shipping, the supplier may supply the labels separately for the employer to attach once the shipment is received and broken down.

The receiving employer must make sure the **supplier labels** are in place, and the labels must meet the specifications of WHMIS. These requirements include use of distinctive WHMIS border around the **supplier label**, the proper hazard symbol or symbols, and certain types of information presented in both English and French.

TOLUENE SULPHONIC ACID 70%, LIQUID ACIDE SULFONIQUE TOLUÈNE À 70%, LIQUIDE	
<b>RISK PHRASE(S)</b> Highly irritating to skin, eyes and nose. <b>HEALTH HAZARD DATA:</b> Strong Acid/Treat as per sulphuric acid. <b>EFFECTS OF OVEREXPOSURE: ACUTE</b> OVEREXPOSURE: Skin and eye. <b>PRECAUTIONARY MEASURES</b> <b>SPECIFIC PERSONAL PROTECTIVE EQUIPMENT</b> EYE: Face shield and goggles. GLOVES: Rubber. <b>OTHER CLOTHING AND EQUIPMENT:</b> Rubber apron, rubber boots. <b>FIRST AID MEASURES:</b> EYE: Flush with copious quantities of water for 15 minutes. Consult physician. SKIN: Flush with water as per sulphuric acid. <b>NOTATION:</b> Treat as per sulphuric acid. Consult physician.	<b>RISQUE(S) POSSIBLE(S)</b> Extrêmement irritant pour la peau, les yeux et le nez. <b>EXPOSITIONS POSSIBLES AUX LIÈS DANGERS POUR LA SANTÉ</b> Acide fort: Traiter comme pour l'acide sulfurique. <b>EFFETS D'UNE SUR-EXPOSITION</b> SUR-EXPOSITION ACUTE: Peau et yeux. <b>MEASURES DE PRÉCAUTION</b> <b>ÉQUIPEMENT DE PROTECTION SPÉCIFIQUE:</b> YEUX: Écran facial et lunettes. GANTS: En caoutchouc. <b>AUTRES VÊTEMENTS ET ÉQUIPEMENT:</b> Tablier en caoutchouc, bottes en caoutchouc. <b>PREMIERS SOINS:</b> YEUX: Rincer à grande eau pendant 15 minutes. Consulter un médecin. PEAU: Rincer à l'eau comme pour l'acide sulfurique. <b>NOTATION:</b> Traiter comme pour l'acide sulfurique. Consulter un médecin.
<b>REFER TO MATERIAL SAFETY DATA SHEET FOR FURTHER INFORMATION</b> <b>POUR PLUS D'INFORMATIONS, CONSULTER LA FICHE SIGNALÉTIQUE</b> ABC Company Anytown, Ontario Telephone 123-4567	

A **supplier label** contains seven separate pieces of information:

- i) *product identifier* (the name of the material);
- ii) *supplier identifier* (the name of the supplier of the material);

- iii) *MSDS statement* (a statement which says that a material safety data sheet for that material is available in the workplace);
- iv) *hazard symbol* (one or more of the 8 WHMIS hazard symbols) which apply to the material;
- v) *risk phrases* (brief description of the hazard and the effects of harmful exposure on the body);
- vi) *precautionary measures* (brief instructions for safe use of the material); and
- vii) *first aid measures* (how to treat persons who have been exposed to the material).

The employer is responsible for seeing **supplier labels** are not removed or altered or destroyed and that the material is not used without the correct label attached.

### Workplace Label:

These labels must be placed on hazardous materials produced in the workplace or on material decanted from its original container into another container at the workplace. But the new container need not be labelled if it will be used only by the person who filled it, and during the same shift. The **workplace label** contains less information than the supplier label. It need not display a hazard symbol and is required to give only three of the seven kinds of information:

- i) product identifier,
- ii) safe handling instructions, and
- iii) MSDS statement.

Materials produced in the workplace which are being readied for sale do not need **workplace labels** because they will be covered by **supplier labels** when they are shipped.

<b>TOLUENE SULPHONIC ACID 70%, LIQUID</b> USE ONLY WITH FACE SHIELD, GOGGLES, RUBBER GLOVES, RUBBER APRON AND RUBBER BOOTS REFER TO MATERIAL SAFETY DATA SHEET FOR FURTHER INFORMATION
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Piping systems used to transfer a hazardous material must use colour coded identifiers or tags or placards or other suitable means to let workers know what is contained in the pipes. Similar rules apply to bulk hazardous material—

## **Workplace Hazardous Materials Information System**

### **Introduction:**

The Workplace Hazardous Materials Information System (WHMIS) is a comprehensive, national system for safe management of hazardous chemicals, which is legislated by both federal and provincial law.

WHMIS legislation provides that workers must be informed about the hazards in the workplace and receive appropriate training to enable them to work safely. To accomplish this, WHMIS requires all suppliers to label and prepare Material Safety Data Sheets (MSDS) for products they make, import, package, or process that meet the hazard criteria set out in the Controlled Product Regulations (CPR) under the federal Hazardous Protection Act (HPA). The buyers of these controlled products must make sure that these products are correctly labeled and the MSDS are available. Employers must set up worker education programs that instruct employees about the contents and significance of labels and MSDS and how to work safely with hazardous materials.

WHMIS delivers the necessary information by means of:

1. cautionary labels on containers of controlled products
2. the provision of an MSDS for each controlled product
3. an employee education program

The ultimate goal of the WHMIS program is to create a safer workplace by providing employees with the knowledge and tools to enable them to work safely.

### **WHMIS Legislation and Exemptions:**

Both Federal and Provincial legislation govern WHMIS.

#### **A. Federal Legislation:**

The Federal Legislation was enacted through Bill C-70, which covers the following:

1. the labeling and other information requirements of WHMIS to suppliers of hazardous material and establishes the criteria for determining which substances are deemed hazardous

For this purpose the Hazardous Products Act (HPA) was amended to apply to WHMIS labeling and MSDS provisions to materials which fall into one or more of the classes of hazardous materials. The materials included in these classes are known as "controlled products".

The Controlled Product Regulation (CPR) prescribes:

- a. the detailed scientific criteria for determining whether or not a product falls into one or more of the classes of controlled products
- b. the information which must be disclosed on labels and MSDS
- c. the conditions under which certain controlled products are exempted from the requirements covering labels and MSDS

The Ingredients Disclosure List (IDL) was established to be used by suppliers when preparing MSDS. If a substance contains an ingredient appearing on this list in concentrations at or above the level shown for that ingredient the ingredient must be named on the MSDS together with its percentage concentration in the substance.

2. it allows manufacturers to protect legitimate confidential business information or "trade secrets", without compromising the information system. The Hazardous Material Information Review Act (HMIRA) performs this function. The regulations made under the HMIRA establish the criteria against which the validity of claims for trade secret protection will be decided.
3. It applies WHMIS to employers and employees in workplaces under the Federal Labour jurisdiction by amending Part IV of the Canada Labour Code. The Canada Labour Code is managed by Labour Canada, and does not apply to Ontario workplaces unless they come under the federal labour jurisdiction.

#### B. Provincial Legislation:

It applies WHMIS to non-federal workplaces and is governed by the Occupational Health and Safety Act (OHSA). The Ontario Ministry of Labour administers the OHSA.

This Act outlines the role of the employer, the supervisor, and the employee in the workplace. It places duties on these groups to ensure that the work site is made a safe and healthy place to work. The Act gives the worker the right to refuse unsafe work, the right to know about hazards on the job and the right to representation on a Joint Health and Safety Committee.

To implement WHMIS in Ontario, the legislature amended the Occupational Health and Safety Act (OSHA). The Act sets out the employer duties and also covers hazardous physical agents such as noise, vibration and radiation so that the supplier and employer provide appropriate information regarding the device which emits hazardous physical agents.

The bill also includes the requirement for workplace inventories. The employer is required to develop and maintain an inventory of hazardous materials and hazardous physical agents in the workplace.

**C. Exemptions from WHMIS Legislation:**

The following products are exempt from the WHMIS legislation:

- Wood or wood products
- Tobacco or tobacco products
- Manufactured articles
- Products being transported if handled in accordance with the requirements of the Transportation of Dangerous Goods Act

**Hazardous Materials Categories:**

**Class A – Compressed Gas**

A substance that at room temperature is in the gaseous state and kept under pressure.

i.e. Oxygen



**Class B – Flammable and Combustible Material**

A solid, liquid, or gas that will ignite and continue to burn if exposed to a flame. This class includes:

- Flammable gas
- Flammable liquid
- Combustible liquid
- Flammable solid
- Flammable aerosol
- Reactive flammable material



**Class C – Oxidizing Material**

This is a substance that will cause another substance to burn.



**Class D – Poisonous and Infectious Material**

This class is divided into three categories:

1. Materials causing immediate and serious toxic effects: These are materials, which cause harmful effects, including death within a short period of time after exposure.
2. Materials causing other toxic effects: These are materials, which cause harmful effects days, months, or years after one or more exposures. Materials which can cause cancer are included here.



3. Biohazardous infectious material: Any organism or its toxins that may cause serious infectious disease.



Class E – Corrosive Material

A substance that will erode steel or aluminum or destroy animal tissues.



Class F – Dangerously Reactive Material

A material, which will react with water, to produce a poisonous gas or which will undergo a reaction when the container is heated, pressurized or agitated.



Labels:

The label is the first hazard warning sign and it must be clearly identifiable and easy to read. In most cases of hazardous materials, the label will be a supplier label (i.e. processor chemistry boxes and bottles). A workplace label may be used on a hazardous material, which has been transferred from its original container into a smaller container.

A. Supplier Label Requirements:

Any container of hazardous material, which falls within the criteria of the Controlled Products Regulation and is not exempt, brought into a Canadian workplace, must carry a supplier label. The supplier labels must not be removed under any circumstances. It must use the distinctive WHMIS border and must demonstrate the proper hazard symbol or symbols. All required information must be in English and French. There is no specific rule for the size, shape, or color but it must contrast with the background color of the container. The following seven pieces of information must be present on the label:

- i. PRODUCT IDENTIFIED: This may be the name, common name, chemical name, generic name, trade name, brand name, code name, or code number. The same name must appear on the MSDS
- ii. SUPPLIER IDENTIFIED: the name of the supplier
- iii. MSDS STATEMENT: i.e. "see material safety data sheet"
- iv. Hazard symbol: one or more of the eight hazard symbols which apply to the product
- v. RISK PHRASES: descriptions of the effects which may result from exposure
- vi. PRECAUTIONARY MEASURES: how to avoid the risks associated with the product
- vii. FIRST AID MEASURES: how to treat a person who has been overexposed to the product

**B. Workplace Label Requirements:**

These labels must be placed on hazardous materials decanted from original containers into another container at the workplace. The new container does not have to be labeled if it is to be used immediately by the person that decanted it, during the same shift. There are no specific requirements on the color, size, or shape, other than it must be distinctive and easily seen. The following three pieces of information must be present on the label:

- i. product identifier
- ii. safe handling instructions
- iii. MSDS statement

**Material Safety Data Sheets (MSDS):**

The MSDS provides details regarding health risk of exposure, the safest method of use, storage and disposal, protective measures, and emergency procedures. The employer must have an MSDS for each hazardous material used and these sheets must be made available to all employees.

Every MSDS must be current (meaning less than three years old). Styles of the MSDS layout may vary, but all must contain the following nine pieces of information.

1. hazardous ingredients	-names and concentration of any ingredients which fall under any of the eight hazard classes
2. preparation information	-name and telephone number of the person who prepared the form
3. product information	-name and address of producer or supplier -what the product is used for
4. physical data	-properties of the material explaining how it will behave -categories include: physical state, odour, appearance, specific gravity, freezing and boiling points, vapour density and pressure, evaporation rate
5. fire or explosion hazard	-the likelihood of the material burning or exploding
6. reactivity data	-stability and possible reaction conditions
7. toxicological properties	-adverse health effects from exposure
8. preventive measures	-instructions for safe use, handling, storage
9. first aid	-instructions for initial treatment upon exposure



There should also be a section for additional information. This space may contain any relevant information the manufacturer may feel would be useful including additional toxicological information or scientific investigation.

### **Health Effects of Toxic Chemicals:**

There are many materials used in the workplace that can be hazardous. However, in order for them to affect your health, they must contact the body or be absorbed into the body. When assessing the potential health effects from working with a particular material it is necessary to understand the difference between "toxicity" and "hazard".

#### **A. Toxicity**

Toxicity is the ability of a substance to produce an unwanted effect when the chemical has reached a sufficient concentration at a certain site in the body. The more toxic a material is the smaller the amount of it necessary to be absorbed before harmful effects are caused. The toxicity of a chemical is generally measured by experiments on animals. If it is measured in terms of the amount of material necessary to cause death in half of the test population, these values are called LD50 (lethal dose), or LC50 (lethal concentration). They are usually given in weight of material per kg of body weight or airborne concentration of material per set time period. The problem then becomes one of "mouse to man" correlation. This phrase is used to express the fact that mice cannot be thought of as "small humans". Their systems cope differently with exposure and their susceptibility may not be the same as humans for a given chemical (in some cases it may be more, in others it may be less). For this reason, an additional safety factor of 10 is built in to all dose estimates. The term hazard then refers to the probability that this concentration in the body will occur.

Toxicity is an inherent property of the material. A material may be very toxic, but not hazardous, if it is handled properly and is not absorbed into the body. On the other hand, a material may have a very low toxicity, but be very hazardous.

In order for toxicants to affect the human system either they must cause damage to external tissues, such as the skin or eyes, or they must be able to enter the body by some mechanism. It also must be noted that any substance can become toxic if the dose is increased beyond the body's tolerance limits. Therefore toxicity is a function of the strength of the dose and the length of the exposure.

#### **Exposure: Acute versus Chronic**

Exposures can be classified as chronic or acute. In chronic exposures, the dose is delivered at some frequency (i.e. daily, weekly...) over a period of time. In acute exposures, the dose is delivered in a single

event and absorption is rapid. Usually a chronic exposure occurs at low concentrations and acute exposure at high concentrations.

Some materials may only cause harm if given acutely, not having any effect in the long term. Others may exhibit an effect in the short term, but may cause problems after prolonged exposure.

Acute effects occur immediately. They are sudden and dramatic and result from the direct action of the substance on the cells of the body. Chronic effects are more serious and are usually not reversible. They usually are a result of the body's defense systems trying to compensate for the long-term effect of the substance.

#### Latency

Latency refers to the time period between initial exposure and the onset of the disease state. The latency period does not refer to the total duration of exposure, but to the elapsed time between exposure and onset of symptoms.

#### Cell - DNA Damage

DNA is found within the nucleus of the cell. It contains the genetic blueprint for the reproduction and specialized function of the cell. Damage to the DNA may cause abnormal growth and/or function.

Many chemicals and physical agents are known as suspected carcinogens, mutagens, or teratogens.

- Carcinogen – a substance or physical agent that can cause cancer in humans
- Mutagen – a substance or physical agent that can alter the genes.
- Teratogen – a substance capable of causing changes to the developing fetus

All three of these substances can cause abnormalities in the DNA.

Substances that enter the body may cause adverse health effects due to the following reasons:

- The material is so toxic it overpowers the body's defense mechanism
- The body's defense system is defective
- There is no defense for the substance
- The defense system reacts inappropriately and causes further damage via by-products, or re-routing

Some chemicals may also damage the cells of the reproductive organs. Certain chemicals may cause miscarriage or birth defects by attacking the genetic material of the cell or the systems that control function. Similar damage may also be caused in cancer. Most cancers are caused from abnormal cell growth which eventually results in cell and organ damage. (It must be noted that cancer does not usually develop after one exposure to a carcinogen, nor will every worker who is exposed to a carcinogenic substance go on to develop cancer. Every person is different in terms of susceptibility, genetic make-up, current health status, and lifestyle traits.

## **B. Routes of Entry**

There are three primary routes of entry in the body: ingestion, skin or eye absorption, and inhalation.

### **Ingestion**

This involves taking a material into the body by mouth (swallowing). Once swallowed, the substance can enter the digestive tract and may enter the blood stream and move onto other organs (i.e. liver). Ingestion of toxic materials may occur as a result of eating in a contaminated work area, or not washing your hands prior to eating or smoking.

### **Absorption**

Substances that contact the eye and the skin may be either absorbed into the body or cause local effects. For the majority of organic compounds, the contribution from skin absorption to the total exposure should not be neglected. The skin is the largest organ of the body and has the largest surface area that can come into contact with harmful substances. Some chemicals can penetrate the skin and enter the blood stream to cause end effects at different target organs.

### **Inhalation**

This involves taking a material into the body by breathing it in. In the lungs, very tiny blood vessels are in constant contact with the air we breathe in. As a result, airborne contaminants can be easily absorbed through this tissue. In the occupational environment, this is generally the most important route of entry. A substance may cause damage to the system itself, or it may pass through the lungs to other organs of the body via the blood stream.

### The Circulatory System

Once a substance has entered the circulatory system, it can be transported to any part of the body. Of major concern are the liver and kidneys because they try to remove the poisons and make the substance less harmful to the body, but in attempting to do so they may become overwhelmed and suffer damage. The kidneys act as a filter for the blood and can be seriously injured by toxic substances passing through them. The bladder is also vulnerable because the toxic wastes from the kidney are excreted to the bladder and are held there until excreted. It should also be noted that toxic substances might enter the circulatory system directly. An example of this would be a needle stick from a contaminated syringe.

### The Central Nervous System (CNS)

Another system that is at risk is the CNS. Some toxic chemicals may interfere with nerve impulses and result in tremors and loss of reflex or feeling. Others may interfere with the functioning of the CNS and disrupt the oxygen supply.

Therefore, hazardous materials may cause disease in the body at four main sites:

1. at the point of entry/contact
2. in the blood
3. in the CNS
4. in the organs

## Control of Hazards

### A. Source or Path Controls:

This type of control includes elimination or engineering controls.

#### i. Elimination/Substitution

Ideally, the toxic substance used or generated should be eliminated.

Since this is not always possible, substituting a less hazardous substance can often be effective in reducing work exposure to toxic substances.

#### ii. Engineering Controls

- a. isolation – Hazardous processes or equipment can be segregated into separate rooms or areas or put in enclosures so as not to contaminate the whole workplace
- b. design or change of process – Often simple considerations can significantly improve conditions (i.e. enclosed mixing tanks for chemistry)

- c. ventilation – Dilution of the contaminated air with uncontaminated air in a general area, room, or building for the purpose of health hazard, nuisance control, and/or heating and cooling.

**B. Worker Controls:**

Personal protective equipment may be used as required. Examples of this include goggles and gloves. Eating and drinking should be prohibited in areas where materials in use are toxic by ingestion. Good housekeeping practises must be adopted and maintained as they facilitate the removal of hazardous materials that might otherwise become airborne. Maintaining personal cleanliness will reduce skin contamination that may lead to skin absorption, dermatitis or ingestion. A lab coat should be worn to decrease the possibility of an individual carrying toxic material home on work clothing.

**Conclusion**

An informed employee can make a rational decision and it must be noted that while it is the employers obligation to provide training for the worker, the onus is then placed on the employee to apply the knowledge to create and maintain a safe and healthy work environment.