

Dalhousie
University

WHMIS HANDBOOK

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1.

INTRODUCTION

Legislation which covers all Canadian workplaces, created WHMIS - the Workplace Hazardous Materials Information System. WHMIS aims to ensure that people have ready access to the information they need to work safely with chemicals. WHMIS applies whenever people work with chemicals in Dalhousie workshops, offices and laboratories.

WHMIS is concerned with those chemicals called CONTROL PRODUCTS which meet WHMIS criteria. Because the criteria considers both health and safety risks, most dangerous chemicals are included. Any chemical that does meet any WHMIS criteria and is therefore exempt from WHMIS, presents very low risks.

WHMIS does exempt some hazardous chemicals which are covered by other Federal and Provincial laws. However, Nova Scotia's Occupational Health and Safety Act, which underpins WHMIS in this province, applies even to these exempted products. In many cases, it is simplest to simply act as if WHMIS applies to any chemical used in any Dalhousie workplace.

Exempted Products:

- T Consumer Products
- T Cosmetics
- T Dangerous Goods in Shipment
- T Explosives
- T Food and Drugs
- T Hazardous Waste
- T Manufactured Articles
- T Pesticides
- T Radioactive Materials
- T Tobacco and Tobacco Products
- T Wood and Wood Products

WHMIS compliments Canada's Transportation of Dangerous Goods Act which regulates the shipment of dangerous chemicals in Canada. TDG and WHMIS use similar classification systems but labelling and vehicle placarding requirements in the two systems are different. Once we receive a chemical at Dalhousie, TDG no longer applies and WHMIS requirements take over.

2. RESPONSIBILITIES UNDER WHMIS

WHMIS places duties on all those involved with hazardous workplace chemicals including the supplier, the employer and the employees.

2.1 Supplier Duties

A supplier of a chemical product must compare the product's physical, chemical and toxic properties with a detailed set of WHMIS criteria. If the product meets one or more of the criteria, the product become subject to WHMIS requirements. The supplier must prepare and provide customers with a document called a Material Safety Data Sheet (MSDS) that gives information on the product's composition and hazards, as well as precautions that someone working with the product should take. The supplier must update an MSDS when the product changes, when new information becomes available or when the MSDS is 3 years old.

The supplier must also label the product in accord with the WHMIS protocol. The label presents the essential information that someone needs to know before beginning to work with a chemical. WHMIS allows the supplier some flexibility in choice of colour and label size.

Supplier Duties:

- T Classify products.
- T Label products with a WHMIS label.
- T Prepare and provide customers with MSDS's.
- T Update MSDS's at least every three years.

2.2 Employer Duties

The employer is required to train employees who work with chemicals, in how WHMIS operates and in how to safety work with the chemicals in use at the particular workplace.

In addition, the employer must ensure that containers of chemicals carry the supplier label. If the supplier label is destroyed, if chemicals are decanted into other containers or if controlled products are created in the workplace, the employer must see that the container is labelled. In these situations, WHMIS allows the use of a "workplace label" that is simpler and provides less detailed information than does a supplier label.

The employer must make sure that MSDS's are available in reasonable proximity to where people work with the chemical at all times when chemicals are in use.

Employer Duties:

- T Train employees in WHMIS.
- T Train employees in safe work practices.
- T Ensure products are labelled with supplier or workplace labels.
- T Provide employees with ready access to MSDS's.

2.3 Employee Duties

WHMIS requires the employee to participate in the training programs and to follow the safe work practices developed by the employer.

Employee Duties:

- T Participate in training
- T Follow prescribed work practices
- T Wear required protective equipment.

3.

WHMIS CLASSES

WHMIS classifies chemicals into 6 classes according to the chemical and physical or toxic properties of the product. Each class is represented by one or more symbols which give a snapshot view of the hazards that the chemical presents.

3.1 Compressed Gas

Cylinders store compressed gases under pressure. Because gas leaking from a cylinder, a valve or a regulator can cause injury or damage, WHMIS treats all compressed gases as controlled products. Gases which are also flammable, toxic or have other hazardous properties will also be found in other classes.



Typical compressed gases are oxygen which is used in health care and welding, and ammonia which is used in some large scale refrigeration systems.

3.2 Flammable and Combustible Materials

WHMIS groups together into a single class all those chemicals which pose a fire hazard. There are 6 subdivisions to the flammable and combustible materials class. Chemicals covered by any of the subdivisions all carry the same stylized flame symbol.



3.2.1 Flammable Gases

All gases such as hydrogen and butane which can form ignitable mixtures in air, are classed as flammable gases. Cylinders of these gases carry both the compressed gas and the flammable material symbols.

3.2.2 Flammable Liquids

All those liquids which present an extreme fire hazard are called flammable liquids. A spark or other ignition source can easily ignite flammable liquids at or below room temperature.

Gasoline is a typical flammable liquid. Even at temperature as low as -40 C, gasoline gives off enough vapour to form a vapour/air mixture that will burn.

3.2.3 Combustible Liquids

Although they are more difficult to ignite, when a combustible liquid is heated, it gives off enough vapour to form a vapour/mixture that will burn. Combustible liquids are those liquids which present a fire risk when the liquid is heated to temperatures between room temperature and about 100° F.

Diesel fuel and many other more difficult to ignite liquids are combustible liquids. Many commercial and industrial liquid products that are based upon petroleum or other organic solvents are combustible liquids.

3.2.4 Flammable Solids

WHMIS regulates all those solids that ignite through friction such as white phosphorus, or that can be readily ignited and burn vigorously such as magnesium and a number of other finely divided metals.

3.2.5 Flammable Aerosols

Aerosol products containing flammable ingredients or that use a flammable propellant such as propane, butane and dimethyl ether, present a workplace fire hazard. All such products which pass a flame projection or flash back test are included in the flammable aerosol subdivision.

3.2.6 Reactive Flammable Materials

WHMIS places a few particularly dangerous materials in the subdivision. Included are chemicals that are spontaneously combustible under normal conditions of use or chemicals which, when in contact with water, become flammable or give off a flammable gas.

This group includes such chemicals as aluminum alkyls, metallic sodium and lithium aluminum hydride. All of these chemicals are uncommon outside of the laboratory.

3.3 Oxidizing Materials

Fire is really a chemical reaction involving the fuel and oxygen. Some chemicals called oxidizers, can provide oxygen that can increase the risk that a fire will break out. Once a fire is underway, oxidizers can cause the fire to burn more intensely.

Oxidizing materials are not particularly common in the shop or office. However, they are found fairly often in laboratories where researchers commonly use oxidizers generally, and a family of oxidizers are called organic peroxides.

The symbol carried by all oxidizing materials resembles the flammable materials symbol in that it also depicts a flame. But the flame rests on an "O" which signifies that oxidizers contribute oxygen.



3.4 Poisonous and Infectious Materials

WHMIS considers all the toxic effects of chemicals in this class. Because there are a variety health hazards that need to be considered, WHMIS deals with the health hazards in 3 subdivisions

3.4.1 Materials Causing Immediate and Serious Toxic Effects

Materials included in this subdivision are generally those highly toxic chemicals which cause death within a short period following exposure. At high enough doses, almost any chemical can have serious and even fatal consequences. But the massive doses of weakly toxic chemicals that would be needed to produce death are unlikely in the workplace. But those chemicals, such as many cyanides, which are sufficiently toxic to cause death following a workplace exposure are placed in subdivision A. Other chemicals for which higher doses are needed to produce lethality, are placed in subdivision B.



Subdivision A	- Very Toxic material
Subdivision B	- Toxic material

All the chemicals that meet the criteria for inclusion in the Materials Causing Immediate and Serious Toxic Effects, regardless of whether they fall into the Very Toxic or Toxic subdivisions, carry the skull and crossbones symbol.

3.4.2 Materials Causing Other Toxic Effects

As well as short term poisoning, chemicals can cause other effects. Prolonged exposure to chemicals at exposure levels that are below those which cause short term symptoms can also be harmful to health. WHMIS places chemicals which irritate the skin and eyes and chemicals which present a long term health risk, in a separate class.

Containers of these chemicals are marked with the WHMIS "T" symbol. Some people refer to the symbol as "a T over a period" to reinforce the idea that many of the criteria that place chemicals in this division, deal with long term hazards.



Contact with many chemicals, including some chemicals as familiar as vinegar, cause skin and eye irritation. As a consequence, when they are sold for industrial or commercial use, these chemicals carry the WHMIS T symbol. People working with these chemicals need to consult the MSDS to find out whether a product is classed as causing "other toxic effects" because it causes irritation or because it poses a long term health risk.

Toxic Effects Included Among "Other Toxic Effects"

Skin and eye irritation and chronic toxic effect:

mutagenicity	-	causing genetic damage
sensitization	-	causing skin or respiratory allergies
carcinogenicity	-	causing cancer
teratogenicity	-	causing birth deformities
embryotoxicity	-	causing fetal death
reproductive toxicity		

Again, this division is divided into 2 subdivisions to reflect the differing risks presents by highly toxic and less toxic chemicals:

Subdivision A	-	Very Toxic material
Subdivision B	-	Toxic material

3.4.3 Biohazardous Infectious Materials

Few people outside a research or clinic laboratory of a hospital are likely to encounter a material classed as a Biohazardous infectious agent. Materials which fall into this class include viruses and bacteria which can cause infection in people. Also included are the toxins that some of these viruses and bacteria produce.



Containers of biohazardous infectious materials carry the internationally recognized three broken rings symbol.

3.5 Corrosive Materials

WHMIS groups together chemicals which can corrode metal or destroy skin into a corrosive materials class. Included in the class are many of the common acids such as sulfuric acid, (used in automotive batteries) hydrochloric (muriatic) acid and others. Lye (also called caustic soda or sodium hydroxide) is another corrosive chemical that is present in many commonly used products such as household oven cleaner.



The symbol demonstrates the corrosivity of these chemicals in attacking metal and human skin.

3.6 Dangerously Reactive Materials

The last WHMIS class brings together all those chemicals which present a hazard as a result of their tendency to undergo violent reaction. The chemical reaction can sometimes lead to a fire or an explosion. This class also includes a few chemicals such as sodium cyanide which can react with water to produce a toxic gas.



Dangerously reactive chemicals are not common outside of the laboratory.

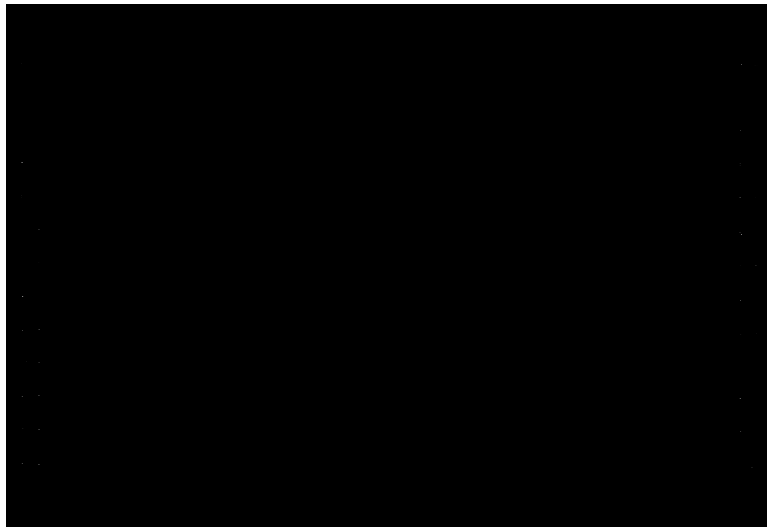
4.

SUPPLIER LABEL

Containers of controlled products that are sold for use in Canadian workplaces must carry a supplier label that contains 9 required elements.

The WHMIS Label Must Be:

- T Bilingual
- T Enclosed in the distinctive WHMIS border and must include:
 - name of the product
 - suppliers name and address
 - symbols as indicated by the product's classification
 - risk phrases which give a very concise statement of the hazards
 - precautionary measures
 - first aid measures
 - statement indicating that an MSDS is available



5.

WORKPLACE LABEL

If the supplier label is destroyed or chemicals are transferred from the supplier container to another, a workplace label is required. Because it assumes that people in the workplace are familiar with the chemicals they are using, WHMIS sets less stringent requirements for an acceptable workplace label.

Workplace Label Requirements:

■	T	Name of the chemical
	T	Safe handling information and
	T	Reference to the MSDS

The requirement to label containers also extends to the laboratory when people create new chemicals or chemical mixtures. In some cases, the container size makes it impossible to affix a label that meets all the requirements for a workplace label. In such cases, a system must be created that ensures that everyone who works in the laboratory can identify the contents and knows what precautions are needed to prevent injury or over-exposure, and how to respond to an accident.

6.

MATERIAL SAFETY DATA SHEET

While the label presents the essential information that one needs to work with a chemical, the Material Safety Data Sheet provides additional background information and the manufacturer's suggestions on the precautions that should be considered when people use the product. WHMIS gives the supplier flexibility in the form and layout of the MSDS but the regulations require that 9 topics be covered.

The required topics and the type of information that must be presented in each are:

6.1 Product Information

This section provides the basic information about the product and the supplier.

■	T	Product name
	T	Supplier's name and address
	T	Emergency phone number

6.2 Hazardous Ingredients

The MSDS must identify all the ingredients that meet WHMIS criteria and provide some data on the short term toxicity of either the product or the ingredients.

For Each Hazardous Ingredient :

■	T	Name
	T	Concentration or concentration range
	T	Chemical Abstracts Registry Numbers
	T	LD50 (Lethal Dose 50% - the dose which kills half of the animals in a toxicity test).

6.3 Physical Data

The MSDS provides a range of technical data which allows people to assess how the chemical behaves under differing situations and plan safe work procedures.

- T Physical state
- T Appearance and odour
- T Vapour density, per cent volatile and evaporation rate for products with volatile components
- T Boiling and freezing points and PH (if appropriate) for liquids
- T Specific gravity
- T Coefficient of oil/water separation
- T Water solubility

6.4 Fire and Explosion Data

The MSDS provides information on which the workplace can plan fire prevention and which emergency responders may need in the event that a fire occurs.

Fire Data:

- T Indication of whether the product is flammable and the conditions under which a fire might occur
- T Means of extinction
- T Flash point (the temperature at which enough of the material evaporates to form an ignitable mixture with air)
- T Flammable limits (concentration range over which the vapour/air mixture will burn)
- T Auto ignition temperature
- T Hazardous combustion products
- T Explosion data
- T Sensitivity to impact
- T Sensitivity to static electric ignition

6.5 Reactivity Data

WHMIS requires that the supplier provide information about the possible hazardous chemical reactions that might occur. Many of our laboratory chemicals are highly reactive. Even some of the trades or custodial chemicals can react with other chemicals or can react if exposed to heat or mixed with catalysts or activators.

Reactivity Data:

- T Stability
- T Sensitivity to shock or temperature or pressure changes
- T Reactivity
- T Incompatibility - chemicals which, if allowed to contact the product, could create a reaction hazard
- T Hazardous decomposition products

6.6 Toxicological Properties

WHMIS requires the supplier to describe how people might come into contact with the product and what the short and long term effects would be if someone was over-exposed.

Toxicological Properties:

- T Route of entry into the body
- T Effects of acute (short term) exposure
- T Effects of chronic (long term) exposure
- T Legal exposure limit

6.7 Preventive Measures

One of the most useful sections of the MSDS is the preventive measures section. In this part of the MSDS, the supplier lists suggestions for the precautions which should be taken in storing, handling, using and disposing of the product. These suggestions need to be considered carefully. But the supplier cannot always know in detail how we are going to use the chemical. So you should review the information in this section with your supervisor and assess how appropriate the supplier's suggestions are in your particular work situation.

Preventive Measures:

- T Engineering controls - equipment needed to prevent over-exposure
- T Personal protective equipment - gloves, respirators, impervious clothing, etc.
- T Use and handling procedures
- T Storage requirements
- T Leak and spill procedures
- T Shipping information
- T Disposal practices

6.8 First Aid Measures

The MSDS provides first aid information similar to that presented on the product label. This information will allow people to help someone who has been made unwell by a chemical. In all but the most minor cases, the affected person should be treated at Dalhousie Health Services or the OEII. The medical personnel will need a copy of the MSDS, or at least label information, to effectively treat the victim.

6.9 Preparation

As people may need information that is not present on the MSDS and need to ensure that the MSDS is current, the regulations require the supplier to indicate who prepared the MSDS, when it was prepared and a phone number to contact the person who prepared the document. This is usually the last section of the MSDS but some suppliers choose to include Transport of Dangerous Goods and environmental information at the end of the MSDS.

7. SPECIAL PROVISION FOR LAB CHEMICALS

WHMIS contains some special provisions for laboratory chemicals. The provisions generally make it easier for suppliers of laboratory chemicals to comply with WHMIS. WHMIS exempts suppliers of lab chemicals from the full requirement for supplier labelling and the requirement to create an MSDS.

A Lab Chemical Is:

- T Provided by a laboratory supply house
- T Sold for use in laboratories
- T Packaged in containers of less than 10 kg.

7.1 Laboratory Chemical Labels

To meet the requirements of WHMIS, the supplier label should provide a product identifier, risk phrases that are appropriate to the nature of the chemical, precautionary measures, first aid measures where appropriate and a statement about the availability of an MSDS when one exists. But in practical terms, chemicals in the supplier's original container and labelled with the supplier's original label are normally satisfactory.

As indicated in section 5, working solutions, samples and similar containers of hazardous materials should carry workplace labels. When, as a result of container size, it is impossible to include all the workplace label information, the label should come as close as is possible to meeting the workplace label standard. As an absolute minimum, the container must carry a product identifier that is a name or a code that allows the contents to be quickly and unambiguously identified.

7.2 MSDS's for Laboratory Chemicals

Despite the exemption, suppliers of laboratory chemicals invariably do provide MSDS's. Some suppliers, however, do use the exemption to justify creating an MSDS that is somewhat less detailed than might otherwise be required. Because of the exemption, a laboratory supervisors have some flexibility on how they respond to the obligation to provide staff with chemical information. But in practical terms, there are few real alternatives to providing access to MSDS's.

From the laboratory supervisor's point of view, the only practical response is to ignore the laboratory chemical exemption and behave as if all the normal WHMIS requirements apply to laboratory chemicals.

WHMIS also contains some special provisions for dealing with unknowns, chemicals being assayed in quality control labs and similar situations. People involved in such specialized activities should contact the Dalhousie Safety Office.

8.

WHMIS AT DALHOUSIE

Complying with WHMIS is a major challenge for a large research and teaching university. For the most part, WHMIS was designed with the large industrial workplace in mind. As a result, the system is fairly easily integrated into the facilities management side of the operation where the number of chemicals in common use is fairly small and there is some central co-ordination over the purchase of chemicals. But it is much more difficult in the teaching, research and clinical units where large numbers of chemicals are used.

Despite the difficulty, the law is quite clear and Dalhousie is required to comply where people work with chemicals.

In a formal legal sense, WHMIS only applies where people encounter chemicals in the course of paid employment. But in programs where they routinely use chemicals, students need to be trained in chemical safety. Many of these students would be well served by formal WHMIS training.

As indicated earlier, WHMIS exempts suppliers of some hazardous materials that are subject to other laws. But Dalhousie, like other workplaces, needs to respond appropriately to the need for safety information. Providing an employee with an MSDS is often the simplest way to meet this obligation. Faced with frequent requests, most suppliers will supply MSDS's even for chemicals which are not subject to WHMIS. However, one must often contact the supplier as the MSDS may not always be available from the distributor or retailer. In practical terms, the Dalhousie Safety Office recommends that units which use chemicals maintain an inventory of all chemicals on hand, and ensure that an MSDS is readily available for each of these chemicals.

8.1 Training

WHMIS training is required by law for anyone who works with chemicals. Faculty, technical staff, clinicians, custodians and trades people are all subject to the WHMIS training requirement. The supervisor is responsible for ensuring that new employees are trained as soon as is practical after joining the University. Periodic refresher training is also highly recommended.

WHMIS training at Dalhousie is delivered in a variety of ways. Supervisors in units such as Custodial Services train the people they supervise. In other units, the Department or Faculty has identified people who offer training courses once or twice each year. Finally, the Safety Office also provides WHMIS training several times per year. Many of these programs are tailored to the needs of people who work in the many different work situations that exist across the University.

In most cases, the training programs involve an assessment of some type that provides the instructor with some assurance that participants have understood the material.

As WHMIS regulations are consistent from workplace to workplace and even from province to province, if you can demonstrate that you have been trained elsewhere, you may not be required to take WHMIS training at Dalhousie.

For information on up coming training programs, speak to your supervisor or call the Safety Office.

8.2 Material Safety Data Sheets

Staff and students in Dalhousie research laboratories must have ready access to MSDSs or equivalent information for every hazardous chemical in the laboratory. A laboratory can comply by having paper copies of MSDS on hand, by having computer access to MSDS or by a combination of the two. The MSDS or the computer must be within reasonable proximity of the laboratory, so that staff and students can gather information in both routine and emergency situations. The MSDS must also be available at all times when laboratory staff are working with chemicals. So for example, a binder of MSDS that is only available from a departmental library between 9:00 and 5:00, would not comply if chemicals are used outside these hours.

8.2.1 Electronic MSDS Systems

Both suppliers and users of chemicals are beginning to understand the opportunity that the growth of the computer presents in helping to manage chemical information. In response to these developments, a growing number of suppliers of laboratory chemicals have begun to offer electronic access to MSDS's. These systems operate around the clock. So, directly from the laboratory computer, researchers are increasingly able to retrieve and, if necessary, print a MSDS quickly and easily at any hour of the day or night. The researcher can now often locate a MSDS more quickly by searching a computer system than by manually searching through a binder of data sheets. And for laboratories with large chemical inventories, electronic systems can save countless hours that would otherwise have to be spent in gathering, filing and updating MSDS's.

Through its internal communications network, Dalhousie has for many years offered researchers access to a MSDS collection in a system maintained by the Killam Library. The Internet has now made even this local system redundant. Virtually every supplier of laboratory chemicals now offers web-based access to its MSDS collection.

Given that the Internet already gives better coverage than we can offer through a local system, the Safety Office has opted to discontinue the Library system. Instead, the Safety Office offers the researchers with quick links to some of the best MSDS collections on the Internet.

To Find a MSDS:

Go the Safety Office web site:

<http://www.dal.ca/safety>

Click on:

Chemical & Laboratory Safety

Scroll down to:

INTERNET MSDS COLLECTIONS

Choose the appropriate supplier.