

Section 1.2; WHMIS; Rationale

The workplace has become more complicated and dangerous. This places the uninformed worker at great risk. As is continuously stated in this document, the safety of the student is our prime concern and providing and providing awareness and training in the area of WHMIS must be part of our core mandate.

Section 1.2a; Introduction to WHMIS

WHMIS: What Does It Mean?

The Workplace Hazardous Materials Information System - WHMIS - is a major response to Canadian worker's right to know more about safety and health hazards of materials used in the workplace.

WHMIS legislation provides employees, employers and suppliers nationwide with specific vital information about hazardous materials (called **controlled products** in the legislation).

These pages are designed to provide basic information about the following key requirements of WHMIS:

- **Controlled product labeling** - which alerts workers to the identity and dangers of products and to basic safety precautions;
- **Material Safety Data Sheets (MSDS)** - technical documents which provide detailed hazard and precautionary information;
- **Worker education and training programs;**
- **Protection of confidential business information**

WHMIS: Background

Exposure to hazardous material can contribute to many serious health effects such as dermatitis, burns, kidney or lung damage, sterility, and cancer. Some materials can cause fires or explosions.

A federal impact analysis on the use of hazardous materials in the workplace estimated the social cost due to exposure to those materials in 1984 was about \$600 million. In British Columbia, from 1982 to 1986, workplace exposure to hazardous chemicals resulted in approximately 4,300 wage-loss disease claims, at an estimated compensation cost of \$26 million.

The purpose of WHMIS is to help reduce the likelihood of disease or injury in the workplace. It was developed through the collective efforts of labour, industry and federal, provincial and territorial regulatory agencies. From the beginning, the Workers' Compensation Board of BC has been active in formulating the system and producing the written materials for its implementation.

In the early 1980's, a recommendation for a uniform national information system was made to the Canadian Association of Administrators of Labour Legislation (CAALL) by Canadian regulatory agencies in occupational safety and health.

In 1983, a federal/provincial task force completed its report on the feasibility of labeling hazardous substances in the workplace. It recommended that a comprehensive national information delivery system on hazardous materials be established.

In 1983, government, industry and labour established a tripartite approach to WHMIS which has seen the development of WHMIS legislation and regulations and their implementation.

WHMIS: The Legislation

Legislation to implement WHMIS has been enacted on both the federal and provincial/territorial levels. **Federal** requirements deal with the importation and sale of controlled products; **provincial** legislation covers the storage, handling and use of controlled products in the workplace.

More specifically, the federal *Hazardous Products Act* and the *Controlled Products Regulations* establish the criteria for including products in WHMIS and require suppliers to provide appropriate labels and material safety data sheets as a condition of sale and importation of those products.

Federal legislation balances a worker's right-to-know about hazardous products with industry's need to protect confidential business information. A self-financing Commission established by the *Hazardous Materials Information Review Act* oversees that aspect.

Provincial legislation, through amendments to occupational safety and health regulations, covers the responsibility of the employer to provide:

- worker education on controlled products;
- workplace labeling and identification; and
- a material safety data sheet where the employer produces a controlled product.

The same requirements have been adopted for federally regulated workplaces through amendments to the *Canada Labour Code*.

Exemptions of Products From WHMIS

Partially Exempted

Some products already covered by other labeling legislation have been exempted from federal WHMIS requirements for labels and MSDS's. They include:

- some consumer products;

- cosmetics and drugs;
- explosives;
- pesticides;
- radioactive substances.

However, provincial WHMIS regulations require employers to educate workers in the safe handling of these products and to use workplace labeling when, for example, contents are transferred to new containers.

Completely Exempted

Some products are exempted from both federal and provincial WHMIS requirement; for example:

- wood and products made of wood;
- manufactured articles;
- tobacco and products made of tobacco;
- goods handled, offered for transport or transported under the *Transportation of Dangerous Goods Act*.

To protect workers from any hazards resulting from use of products which are completely exempt from WHMIS, general occupational safety and health information and training requirements apply.

In addition, hazardous wastes are exempted from WHMIS except that wastes must be identified at workplaces where they are produced and workers must be trained in safe procedures. General environmental regulations cover information requirements for wastes.

Parliament is reviewing the status of products exempted from WHMIS.

WHMIS - The Three Key Elements of Information Delivery

WHMIS is a communication system on the hazards of controlled products in the workplace - from the suppliers of controlled products to purchasers, from employers to workers through the three key elements of: **labelling, material safety data sheets and worker education.**

1 Labelling

All containers containing controlled products used in a workplace must be properly labelled. Labelling requirements start with the sale or import of a controlled product.

When a supplier produces or imports a product for distribution and sale in Canada, that supplier must prepare a **supplier label**.

Suppliers generally transport products in single containers, multicontainers or in bulk shipments.

- For shipments of *single containers*, the supplier must apply the applicable WHMIS label.
- For *multicontainer shipments*, the supplier must apply labels to the inner as well as outer containers, unless there is a written agreement with the purchaser to apply the supplier's labels to inner containers.
- For *bulk shipments*, the supplier must send either a supplier label or alternative labelling instructions to the employer for use when the product is received.

NOTE: During transportation, additional labels may be required under the *Transportation of Dangerous Goods Act and Regulations*. With a multicontainer shipment, the supplier need not provide a WHMIS label to the outer container if a TDG label is provided on that container and all inner containers bear WHMIS labels.

Employers are responsible for checking that supplier labels have been applied to controlled products received at the workplace. Improperly labelled products must not be used or handled for any purpose other than temporary storage.

- For *multiple container shipments*, where the employer has agreed in writing, supplier labels are applied by the employer.
- For *bulk shipments*, the employer must post or apply the supplier label. Where the supplier sends labelling instructions, the employer must apply, at a minimum, a workplace label.

Workplace labels are required on containers of controlled products in cases where the product is produced on site or transferred from the original supplier's container. Workplace labels must contain 3 categories of information:

- The product name
- Safe handling information
- Reference to MSDS

Hazard symbols and using warning hatch-marks are optional.

A simple means of identifying the product is all that is required for use in a laboratory, or if an employee transfers the product to a container and uses it for only one shift.

If a controlled product is transferred to a system (piping, reaction vessel), the contents of the system must be properly identified.

When hazardous wastes which contain a controlled product are produced, their location must be identified with clearly marked signage.

Worker must be instructed on how to read and understand labels and indentifiers.

Labels must be easy to read and cannot be defaced.

2 [Material Safety Data Sheets \(MSDS\)](#)

The second element of WHMIS is Material Safety Data Sheets. An MSDS is a technical document which provides information on potential hazards, precautions and emergency information about a controlled product. MSDS's supplement the alert information provided on labels.

The *minimum requirements* for an MSDS are:

- Nine content sections as shown on the [MSDS Sample](#)
- No section may be left blank
- Data sheets cannot be more than 3 years old.
- All hazardous ingredients must be disclosed. In the case of proprietary ingredients, access to information to medical personnel for emergency treatment must be made available.

Suppliers must have MSDS's available in both official languages for the controlled products they sell or import. Information must be current and be prepared no more than 3 years from date of sale.

A copy of the current MSDS must be sent to the purchaser on or before the date of sale of the first purchase of a controlled product.

Employers must ensure that MSDS's are received for all controlled products purchased. The employer must contact the supplier for an updated MSDS when the preparation date on workplace data sheet is 3 years old.

If the employer produces a controlled product for use at the workplace, the employer must develop an MSDS for that product, and make it available to workers.

Copies of supplier and employer MSDS's must be readily accessible to employees during each workshift. Workers must be trained to understand the basic requirements of an MSDS as well as the applicable information in it.

3 **Worker Education**

The third element of WHMIS is worker education. Employers must establish education and training programs for workers. Training must include:

- How WHMIS works
- The hazards of controlled products
- Procedures for safe storage, use and disposal
- Emergency procedures.

Workers require training if they use or work near controlled products.

Section 1.2b; Definitions and Symbols

WHMIS Hazard Symbols, Classes and Divisions;

Eight hazard symbols are used to depict the WHMIS hazard classes. More than one symbol may be used when a controlled product (a substance which can be included in one or more of the six WHMIS hazard classes) has more than one hazardous characteristic. For example, acetone is both flammable and is a material which can cause other toxic effects, therefore two symbols are required.

The eight symbols used for the different types of hazardous materials are:

[Class A: Compressed Gas](#)

[Class B: Flammable and Combustible Material](#)

[Class C: Oxidizing Material](#)

[Class D, Division1: Poisonous and Infectious Material - Immediate and Serious Toxic Effects](#)

[Class D, Division2: Poisonous and Infectious Material - Other Toxic Effects](#)

[Class D, Division3: Poisonous and Infectious Material - Biohazardous Infectious Material](#)

[Class E: Corrosive Material](#)

[Class F: Dangerously Reactive Material](#)



Class A: Compressed Gas

This class includes compressed gases, dissolved gases and gases liquified by compression or refrigeration .

Class A materials:

- pose an explosion danger because the gas is being held in a container under pressure;
- may cause its container to explode if heated (such as what would happen in a fire);
- may also cause its container to explode if dropped.

When handling Class A materials you should:

- handle with care, do not drop container;
- keep container away from potential sources of ignition;
- store the container in designated areas.

Examples of Class A materials: gas cylinders for oxyacetylene welding or water disinfection.



Class B: Flammable and Combustible Material

This class includes solids, liquids and gases capable of catching fire or exploding in the presence of a source of ignition.

Class B materials:

- will burn and are therefore potential fire hazards.
- may burn at relatively low temperatures; flammable materials catch fire at lower temperatures than combustible materials.
- may burst into flame spontaneously in air or may release a flammable gas on contact with water;
- may cause a fire when exposed to heat, sparks, or flames or as a result of friction;

When handling Class B materials you should:

- keep the material away from heat sources and other combustible materials;
- never smoke when working with or near the material;
- store the containers in designated areas.

Examples: white phosphorus, acetone and butane. *Flammable* liquids such as acetone are more easily ignited than *combustible* liquids such as kerosene.




Class C: Oxidizing Material

This class includes materials which provide oxygen or similar substances and which increase the risk of fire if they come into contact with flammable or combustible materials.

Class C materials:

- pose a fire and/or explosion risk in the presence of flammable or combustible material;
- may cause fire when they come in contact with combustible materials such as wood;
- may react violently or cause an explosion when they come in contact with combustible materials such as fuels;
- may burn skin and eyes upon contact.

When handling Class C materials you should:

	<ul style="list-style-type: none"> • wear the proper protective equipment, including eye, face, and hand protection and protective clothing; • keep the material away from combustible materials; • keep the material away from sources of ignition; • never smoke when working with or near the material; • store the containers in designated areas. <p>Examples: sodium hypochlorite, perchloric acid, inorganic peroxides.</p>	
Class D: Poisonous & Infectious Materials		
	<p>Class D, Division 1: Poisonous & Infectious Materials - Immediate and Serious Toxic Effects</p> <p>This division includes materials causing immediate and serious toxic effects. These materials can cause the death of a person exposed to small amounts.</p> <p>Class D, Division 1 materials:</p> <ul style="list-style-type: none"> • are a potentially fatal poisonous substance; • may cause permanent damage if inhaled or swallowed or if they enter the body through skin contact; • may burn eyes or skin upon contact. <p>When handling Class D, Division 1 materials you should:</p> <ul style="list-style-type: none"> • handle the material with extreme caution; • avoid contact with the skin or eyes by wearing the proper protective equipment, including eye, face, and hand protection and protective clothing; • avoid inhaling by working in well-ventilated areas and/or wearing respiratory equipment; • wash and shower thoroughly after using; • store the containers in designated areas. <p>Examples: sodium cyanide, hydrogen sulphide.</p>	



Class D, Division 2: Poisonous & Infectious Materials - Other Toxic Effects

This division includes materials causing immediate eye and/or skin irritation as well as those which can cause long-term effects in a person repeatedly exposed to small amounts.

Class D, Division 2 materials:

- are poisonous substances that are not immediately dangerous to health;
- may cause death or permanent damage as a result of repeated exposures over time;
- may be a skin or eye irritant;
- may be a sensitizer, which produces a chemical allergy;
- may cause cancer;
- may cause birth defects or sterility.

When handling Class D, Division 2 materials, you should:

- avoid contact with the skin or eyes by wearing the proper protective equipment, including eye, face, and hand protection and protective clothing;
- avoid inhaling by working in well-ventilated areas and/or wearing respiratory equipment;
- store the containers in designated areas.

Examples: acetone (irritant), asbestos (carcinogen), toluene diisocyanate (sensitizer).



Class D, Division 3: Poisonous & Infectious Materials - Biohazardous infectious material



This division includes materials which contain harmful microorganisms.

Class D, Division 3 materials:

- may cause a serious disease resulting in illness or death.

When handling Class D, Division 3 materials, you should:

- take every measure to avoid contamination;
- handle the material only when fully protected by the proper, designated equipment;

	<ul style="list-style-type: none"> • handle the material in designated areas where engineering controls are in place to prevent exposure. <p>Examples: cultures or diagnostic specimens containing salmonella bacteria or the hepatitis B virus.</p>	
	<p>Class E: Corrosive Material</p> <p>Class E materials are acid or caustic materials which can destroy the skin and/or eat through metals.</p> <p>Class E materials:</p> <ul style="list-style-type: none"> • cause severe eye and skin irritation upon contact; • cause severe tissue damage with prolonged contact; • may be harmful if inhaled. <p>When handling Class E materials, you should:</p> <ul style="list-style-type: none"> • keep containers tightly closed; • avoid contact with the skin or eyes by wearing the proper protective equipment, including eye, face, and hand protection and protective clothing; • avoid inhaling by working in well-ventilated areas and/or wearing respiratory equipment. <p>Examples: muriatic acid, lye.</p>	
	<p>Class F: Dangerously Reactive Material</p> <p>Class F materials can undergo dangerous reaction if subjected to heat, pressure, shock or allowed to contact water.</p> <p>Class F materials:</p> <ul style="list-style-type: none"> • are very unstable; • may react with water to release a toxic or flammable gas; • may explode as a result of shock, friction or increase in temperature; • may explode if heated when in a closed container; 	

	<ul style="list-style-type: none"> • may undergo vigorous polymerization. <p>When handling Class F materials, you should:</p> <ul style="list-style-type: none"> • keep material away from heat; • open containers carefully, do not drop them; • store the material in a cool, flame-proof designated area. <p>Examples: plastic monomers such as butadiene and some cyanides.</p>	

Section 1.2c; MSDS (material Safety Data Sheet)

WHMIS - Sample Material Safety Data Sheet (MSDS)

Material Safety Data Sheets (MSDS) are technical documents which provide additional information on controlled products. Attached is a sample MSDS for CHLORINE, with explanations for each section.

Note: the attached sample is for explanation only, and is not meant to be used in the place of a current MSDS.

All MSDS's must contain the following nine categories of information:

[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 Properties \(Health Effects\)](#)

[Section 7: Preventive Measures](#)

[Section 8: First Aid Measures](#)

[Section 9: Preparation Data](#)





Section 1: Product Identification

This section *identifies the material* by brand name, chemical name, or generic name, as well as other names by which the product is known. *Identity of the manufacturer and supplier* are also listed. The *intended use* of the product, for which the information supplied is solely applicable, is also given.

Manufacturer's Name		Suppliers's Name	
Name of Chemical Manufacturing Company		Name of Company Supplying the Chemical	
Street Address		Street Address	
Some Street		Another Street	
City	Province	City	Province
Vancouver	BC	Toronto	Ont
Postal Code	Emergency Tel:	Postal Code	Emergency Tel:
V1V 1V1	(604) 555-5555	T1T 1T1	(416) 555-5555
Chemical Name		Chemical Family	Chemical Formula
Chlorine		Halogen	Cl ₂
Product Use			
Pulp bleaching, water treatment, manufacture of plastics, organic and inorganic chlorides, refrigerants, pharmaceuticals.			

Section 2: Hazardous Ingredients *Chlorine*

All potentially *hazardous ingredients* of the material and the approximate *amount (percent) of each ingredient* of the material must be listed in this section. When a material contains ingredients that are registered as a trade secret, a registration number assigned by the Hazardous Materials Information Review Commission will appear in place of the ingredients. In the event of a medical emergency the company must disclose the identity of the ingredients to a medical professional.

Hazardous Ingredient	w/w%	CAS Number	PINumber
Chlorine	99.5	7782-50-5	1017
			

The [CAS registry number](#) is a number assigned to each chemical by the Chemical Abstracts Service (CAS) to provide a single unique identifier. A unique identifier is necessary because products with the same chemical make-up can have many different names.

The [product identification number \(PIN\)](#) is used in Canada by fire fighters and other emergency response personnel for identification of materials during transportation.

The applicable [WHMIS hazard symbols](#) are shown. More than one symbol may be used when a [controlled product](#) has more than one hazardous characteristic. Click on the symbol for further explanations.

Section 3: Physical Data *Chlorine*

This section describes the physical properties of a material.

Physical State	Odour and Appearance		Odour Threshold
Gas at room temperature	amber liquid or greenish-yellow gas, penetrating odour		0.2 - 0.4 ppm
Vapour Pressure	Vapour Density (air=1)		Evaporation Rate
4800 mm Hg at 20°C	2.49		not applicable; gas
Boiling Point	Freezing Point		Critical Temperature
-34°C	-101°C		144°C
pH	Specific Gravity	Solubility in Water	Coeff of Water/Oil Distr.
5.5 @ 0.7% Solution	1.41 (liq. at 20°C)	0.7% at 20°C	not available

The *physical state*, *appearance* and *odour* of the material may aid in its identification.

The **odour threshold** is the level, in parts per million, at which the odour becomes noticeable. Compare this to the exposure limit; if it is well below, for example, odour can be used to warn of a problem with your air purifying respirator. Odour, however, must not be used to determine safe/unsafe conditions (the presence of other odours may confuse the sense of smell, workers may become used to the odour, or the chemical may numb the sense of smell).

The **vapour pressure** is the pressure of vapour in equilibrium with its liquid form. Vapour pressure is a measure of the tendency of a material to form a vapour. The higher the vapour pressure, the higher the potential vapour concentration.

The **vapour density** is the density of the vapour compared to the density of an equal amount of air. If the vapour density is greater than 1, the vapour is heavier than air and thus can accumulate at ground level.

The **evaporation rate** is the rate at which liquid changes to a vapour, and is not applicable for gases. Evaporation rate is a measure of how quickly the material becomes a vapour at a specified temperature, usually normal room temperature. Generally, the rate is given in comparison to a chemical which evaporates quickly, such as butyl acetate. For example, acetone evaporates at a rate of 7.7 times that of butyl acetate, and the evaporation rate would be written as: EVAPORATION RATE: (butyl acetate=1) 7.7 at 20°Celsius.

The **boiling point** is the temperature at which the material changes from a liquid to a gas, at normal atmospheric pressure.

The **freezing point** is the temperature at which liquid materials becomes solid, at normal atmospheric pressure. This information is important for storage and handling purposes. For example, a frozen material may burst a container. Also, a change of physical state could alter the hazardous nature of the material.

The **volatility** of a material refers to the ease with which it evaporates. If the volatility is 100% all of the material will evaporate if given enough time.

The **specific gravity** is the density of liquid materials compared to the density of an equal amount of water. When the specific gravity of a substance is greater than 1.0 it will sink in water, when less, it will float. This information is important in planning spill clean-up and fire fighting procedures.

The **coefficient of oil/water distribution** is the ratio of the solubility of the chemical in an oil to its solubility in water. It also indicates how readily a chemical can be absorbed into or stored in the body.

The **solubility** of a material represents the ability of the material to dissolve in water or another liquid. The information is also important in planning spill clean-up and fire fighting procedures.

pH is a measure of the acidity or basicity (alkalinity) of a material when dissolved in water. Materials with pH values of 0-2 or 11.5-14 are classed as corrosive.

Section 4: Fire and Explosion Data *Chlorine*

This section describes the materials fire and explosion capabilities, and the procedures to follow in the event of a fire or explosion. Whether or not a material is flammable is stated, and/or under what conditions flammability should be a concern. The type of *fire-extinguishers* to be used when the material is present will be stated, along with any special procedures that need to be followed during a fire.

The *flash point* and *method of ignition* is stated. The lower the flash point of a material, the greater the potential fire hazard.

<u>Flammability</u> - If yes, under which conditions?	
Yes [] No [X] Chlorine will support the burning of most combustible materials.	
Means of Extinction	
Use extinguishing media appropriate for surrounding fire.	
Special Procedures	
Use water spray to keep fire-exposed containers cool and continue until well after fire is out. Do not spray water directly on a chlorine leak, however, if it is necessary to stop the flow of gas, use water spray to direct escaping gas away from individuals effecting the shut-off. Firefighters MUST use self-contained breathing equipment, eye protection and full protective clothing when fighting fires in which chlorine is involved.	
<u>Flashpoint and Method</u>	<u>Auto Ignition Temperature</u>
Non-flammable	Not Applicable
<u>Upper Explosion Limit (% by volume)</u>	<u>Lower Explosion Limit (% by volume)</u>
Not Applicable	Not Applicable
Hazardous Combustion Products	
Toxic substances are formed when combustibles burn in chlorine. Chlorine reacts explosively, or forms explosive compounds, with many chemicals, such as acetylene, turpentine, ether, ammonia gas, and hydrogen.	

Sensitivity to Impact	Sensitivity to Static Discharge
Not Sensitive	Not Sensitive

The **flammable or explosive range** of chlorine is not applicable, since chlorine is non-explosive. The **lower explosive limit (LEL)** of a material is of particular importance, because if this percentage is low, it will take only a small amount of a flammable or combustible liquid vaporized in air to form an ignitable mixture. It also should be noted that if the concentration of vapour in the vapour-air mixture is greater than the **upper explosive limit (UEL)**, introduction of air (by ventilation or other means) will produce a mixture within the flammable range before a safe concentration of vapour (below the LEL) can be reached. The explosive-limits range itself is also important; the larger the range the greater the potential hazard.

Whether or not the material is **sensitive to mechanical impact** is stated. This information indicates whether or not the material will burn or explode on shock (e.g. dropping a container of the material) or friction (e.g. scooping up spilled material).

The **sensitivity** of the material **to static discharge** indicates how readily the material can be ignited by static electricity, such as an electric spark.

Section 5: Reactivity Data *Chlorine*

This section gives the conditions that the material will react under, and what hazardous reactions will be created when it reacts. It also lists [incompatible](#) materials.

Chemical Stability - (if no, under which conditions?)
Yes [X] No [] Dry chlorine is stable in steel containers at ambient conditions.
<u>Incompatibility</u> with other substances - (If yes, which ones)
Strong oxidizer. Avoid contact with reducing agents, combustible materials. Chlorine may react violently or explosively with ammonia, acetylene, ether, turpentine and other hydrocarbons, hydrogen, titanium, aluminum and other metals.
<u>Reactivity</u>, and under what conditions?
Wet chlorine (>150ppm H ₂ O) corrosively attacks most common metals. Chlorine reacts with CO to form toxic phosgene; SO ₂ to form suluryl chloride; water to form hydrochloric and hypochlorous acid. Chlorine reaction to some organic compounds can be explosive.
Hazardous Decomposition Products
None

Section 6: Toxicological Properties (Health Hazard Information) *Chlorine*

This section gives information on the health hazards relating to the material, including the *route of entry* the material uses to enter the body. Exposure limits are stated, along with the known effects of exposure.

<u>Route of entry</u>		
<u>Ingestion</u> [X]	<u>Skin Absorption</u> []	Eye Contact [X]
<u>Inhalation</u> Acute [X]	<u>Inhalation</u> Chronic [X]	Skin Contact [X]
Effects of <u>Acute Exposure</u> to Material		
LIQUID: burns skin, eyes, mucous membranes. GAS: eye and respiratory irritation, dyspnea, retching, vomiting, pulmonary edema. A few deep breaths at 1000 ppm Cl ₂ may cause death, 30 ppm causes intense coughing.		
Effects of Chronic Exposure to Material		
Prolonged or repeated exposures above 5 ppm may cause damage to respiratory tract.		
Lethal Dose/Concentration (Specify Species and Route)		
<u>LD₅₀</u> : not available	<u>LC₅₀</u> : 293 ppm (Rat - 1 hr. inhalation)	
<u>Irritancy</u>		Synergistic Material
Severe skin, eye, respiratory		Not Available

Exposure Limits (ACGIH/TLV's)		
TWA = 0.5 ppm	STEL = 1 ppm	IDLH = 30 ppm
Sensitizing capability	Carcinogenicity	Reproductive Effects
Not a sensitizer	No evidence	Insufficient data

Section 7: Preventive Measures *Chlorine*

This section provides information on ways of controlling/preventing hazardous conditions. It lists the personal protective equipment that must be used when handling the material and the engineering controls that must be in place. The procedures to be followed in the event of a leak and/or spill, normal handling procedures and equipment, storage requirements and shipping information is also given.

Personal Protective Equipment
Eye wash stations and chemical safety showers must be immediately available. If routine respiratory protection is required, institute a complete respiratory protection program. Emergency or planned entry into unknown or IDLH concentration requires positive pressure self-contained or air-supplied with full facepiece.
Engineering Controls (Specify: e.g. Ventilation, Enclosed Processes)
Provide general and local exhaust ventilation to meet TLV.
Leak and Spill Procedures
Chlorine gas may be absorbed in alkaline solution (caustic soda, soda ash, hydrated lime); control pH>10. Dispose of residue in accordance with Environmental Regulations.
Handling Procedures and Equipment
Regularly inspect and test piping and containment for chlorine service. Consult Chlorine Institute guidelines.
Storage Requirements
Store in ventilated areas of low fire potential, away from incompatible materials. Protect containers from weather and physical damage.
Special Shipping Information
Must meet Transport Canada Dangerous Goods Regulations (SOR/85-77) Class 2.3 - Poison gas

Section 8: First Aid Measures *Chlorine*

This section describes the actions to be taken in case of overexposure to the material. The purpose of first aid is to minimize injury and future disability. In serious cases, first aid may be necessary to keep the victim alive.

One needs to be aware of this first aid information *before* one starts working with the material. First aid procedures should be periodically reviewed and everyone should know the location of the facilities and equipment for providing first aid (*e.g. the eyewash unit and the first aid station*). For every first aid station there should always be at least two trained first aiders (their certificates should be posted at the station), to deal with emergency situations.

Get medical assistance for all exposures except minor inhalation or minor skin contact.
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INHALATION: Remove victim to fresh air. Restore or support breathing as required. Trained person may administer oxygen until breathing is eased. Keep victim warm and at rest.
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SKIN: Remove contaminated clothing under safety shower. Flush skin thoroughly with water (30 minutes). Do not attempt to neutralize with chemicals. Use cold packs to reduce pain.
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EYE: Flush with copious amounts of water (30 minutes). Do not attempt to neutralize with chemicals. Use cold packs to reduce pain.
--

Section 9: Preparation Data *Chlorine*

This section states the MSDS author, date and phone number. MSDS's must not be more than 3 years old. Note: If an MSDS sheet does not list the date it was prepared, it is not valid in Canada.

Prepared by	
Company Name	
Date	Phone Number
99/01/01	(604) 555-5555

Section 1.2d; Terms and Definitions

A

Acid:

A corrosive chemical with a pH value less than 7.

Acute exposure:

A single exposure to a substance or multiple exposures occurring within a short time, usually 24 hours or less.

Autoignition temperature:

The temperature at which the vapour from a liquid will ignite without a source of ignition such as spark or flame.

B

Biohazardous:

A material that contains bacteria, parasites or viruses that can cause disease in humans.

C

CAS Registry Number:

The *CAS registry number* is a number assigned to each chemical by the Chemical Abstracts Service (CAS) to provide a single unique identifier. A unique identifier is necessary because products with the same chemical make-up can have many different names.

Carcinogen:

A substance or agent capable of producing cancer in mammals.

Caustic:

A corrosive chemical with a pH value more than 7. (May also be called "Base" or "Alkali".)

Chronic Toxic Effect:

An adverse effect to the health of a person or test animal that develops:

- 1 over time, following a single exposure to a toxic substance; or
- 2 from prolonged or repeated exposure to a toxic substance under conditions that do not produce that effect from a single exposure.

Combustible:

In general, materials that will burn are called combustibles. A combustible liquid has a [flash point](#) greater than 37.6°C (100°F) but less than 93.3°C (200°F). A flammable liquid has a flash point below 37.6°C (100°F). Since flammable liquids have flash points close to or below room temperature (16 to 25°C) they are considered more hazardous than combustible liquids.

Controlled Product:

A substance which can be included in one or more of the six WHMIS hazard classes.

Corrosive:

A corrosive is a substance that will burn or destroy some materials, including human tissue.

D

Dermal:

Used on or applied to the skin.

E

Evaporation Rate:

The evaporation rate of a material is given in reference to a standard chemical, usually butyl acetate, which evaporates fairly quickly. *Butyl acetate* has an evaporation rate of *one*. Toxic or flammable chemicals with an evaporation rate close to or greater than one may pose health or fire hazards.

Exposure Limit:

A maximum limit of exposure to an air contaminant. Three types of limits in common use are:

- 1 **Exposure Limit - TWA** - The time-weighted average concentration for a normal 8-hour work day or 40-hour work week to which nearly all workers can be repeatedly exposed without adverse effects.
- 2 **Exposure Limit - STEL** - The short-term exposure limit, i.e. the maximum concentration to which workers can be periodically exposed for a period up to 15 minutes without suffering from irritation, chronic or irreversible tissue change, or narcosis of sufficient degree to increase accident proneness, or impair ability for self-rescue.
- 3 **Exposure Limit - C** - The ceiling concentration of an airborne substance that must not be exceeded at *any* time. This limit is applied to substances that are predominantly irritant or fast-acting and for which the TWA is inappropriate.

F

Flammable:

A flammable liquid has a [flash point](#) below 37.6°C (100°F). Since flammable liquids have flash points close to or below room temperature (16 to 25°C) they are considered more hazardous than combustible liquids. See also: [combustible](#).

Flash Point:

The flash point is the lowest temperature at which a flammable or combustible liquid will give off enough vapour to burn when it contacts an open flame or spark. The lower the flash point of a liquid, the greater the risk of fire.

G

H

Hazardous Combustion Products:

Some materials give off hazardous products when they burn.

Hazardous Decomposition Products:

When chemicals burn, react with oxygen in the air, or react with other workplace chemicals, they undergo various changes and may decompose to produce hazardous products.

I**Incompatible:**

Materials which could cause dangerous reactions from direct contact with one another are described as incompatible.

Ingestion:

The intake of a substance through the mouth.

Inhalation:

The breathing in of a substance.

Irritant:

A substance which, with sufficient contact, will cause reversible inflammation of the eye, skin, or respiratory system.

In vitro:

Refers to laboratory studies performed outside living organisms.

In vivo:

Refers to laboratory studies performed inside living organisms.

J**K****L****LC₅₀ of a Material:**

LC₅₀ lethal concentration is the amount of a material in air which causes death in 50% (one-half) of a group of test animals when given over a period of 4 hours or other specified time.

LD₅₀ of a Material:

LD₅₀ lethal dose is the dose of a material given on a single occasion which causes death in 50% (one-half) of a group of test animals.

LEL or LFL:

Lower explosion limit (LEL) or lower flammable limit (LFL) of a vapour or gas; the lowest concentration of the substance in air that will produce a flash of fire when an ignition source is present. The *lower explosive limit (LEL)* of a material is of particular importance, because if this percentage is low, it will take only a small amount of a flammable or combustible liquid vaporized in air to form an ignitable mixture.

M

Material Safety Data Sheet (MSDS):

A technical document which provides detailed hazard, precautionary and emergency information on a [controlled product](#).

Mutagenicity:

The capability of a substance to cause damage to genetic material.

N

O

Oncogenic:

The ability to create tumors in tissue.

Odour Threshold:

This is the lowest concentration of the material in air which can be smelled by humans. This concentration is expressed in parts per million ([ppm](#)).

Oxidizer:

A substance which readily yields oxygen or equivalent to stimulate the combustion (oxidation) of organic matter.

P

pH:

An expression on a scale of 0 to 14 of the extent of acidity or alkalinity of a substance. Materials with pH 7 are neutral. Those below pH 7 are [acidic](#) and those above are [caustic](#).

PIN (Product Identification Number):

The *product identification number (PIN)* is used in Canada by fire fighters and other emergency response personnel for identification of materials during transportation.

ppm:

Parts per million; a unit often used for measuring the concentration of a gas or vapour in air; parts (by volume) of the gas or vapour in a million parts of air.

Q

R

Reactivity:

A description of the tendency of a substance to undergo chemical reaction with the release of energy. Undesirable effects - such as pressure buildup, temperature increase, formation of toxic, or corrosive, byproducts - may occur because of the reactivity of a substance to heating, burning, direct contact with other materials or other conditions in use or in storage.

Risk Phase:

A statement identifying a hazard that may arise from the nature of the controlled product.

Routes of Entry:

Before a chemical can cause a health effect, it must first contact and enter the body. The routes by which it enters are [inhalation](#), [ingestion](#), and by [skin absorption](#).

S

Sensitization:

It is possible to develop allergy-like reactions to some materials. In these cases, a person may become increasingly sensitive to a material after each exposure. Eventually, exposure to only small amounts of material may be needed to produce an allergic-type reaction of the skin or respiratory tract.

Skin Absorption:

The ability of a substance to enter the body through the skin.

Specific Gravity:

The weight of a material compared to the weight of an equal volume of water.

Supplier Label:

A label provided by the supplier with a distinctive border, typically displaying the product identification, hazard symbols, risk information, risk prevention information, first aid measures, MSDS reference and supplier identification.

Synergistic Materials:

Synergy means that some chemicals, if used together, amplify their effects.

T

TDG:

Refers to the *Transportation of Dangerous Goods Act* and pursuant regulations.

Teratogenic Effects:

Some chemicals may cause damage to a developing fetus. Information in this section of an MSDS is almost exclusively from animal studies, not human experience. In most cases the pregnant animal has to suffer severe poisoning before damage is seen in the developing fetus.

TLV:

Threshold Limit Value; the airborne concentration of a material to which nearly all persons can be exposed day after day, without adverse effects.

Toxicological Properties:

"Toxic" is another word for "poisonous". Toxicological properties refer to the health effects caused by exposure to too much of a chemical.

U

UEL or UFL:

Upper Explosive Limit or Upper Flammable Limit of a vapour or gas; the highest concentration of the substance in air that will produce a flash of fire when an ignition

source is present. It also should be noted that if the concentration of vapour in the vapour-air mixture is greater than the ***upper explosive limit (UEL)***, introduction of air (by ventilation or other means) will produce a mixture within the flammable range before a safe concentration of vapour (below the LEL) can be reached. The explosive-limits range itself (the range between the [LEL](#) and UEL) is also important; the larger the range the greater the potential hazard.

V

Vapour Density:

The weight of a vapour or gas compared to the weight of an equal volume of air. The vapour density of air is one. Gases with a vapour density greater than 1 are heavier than air and will settle near the ground and in low lying areas.

Vapour Pressure:

The pressure exerted by a saturated vapour above its own liquid in a closed container.

Volatility:

Refers to the ease with which a material evaporates.

W

WHMIS:

The Workplace Hazardous Materials Information System (WHMIS) is a nationwide system designed to provide information for workers on potentially hazardous materials in the workplace. The WHMIS legislation has been developed through the collective efforts of Industry, Labour and Governments and came into effect on October 31, 1988.

Workplace Label:

A label, produced by the employer for use in the workplace, which displays the product identifier, information for safe handling and a reference to the material safety data sheet.