

WHMIS Participant Workbook



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WHMIS

Participant Workbook

October 2023



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P17-5E
ISBN 978-0-660-09599-85
DSS Catalogue Number CC273-2/17-5E-PDF

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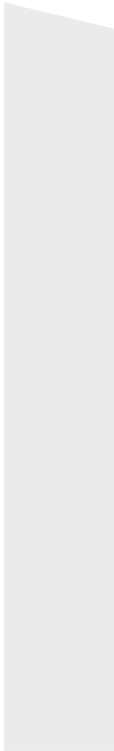
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1. WHMIS: participant workbook

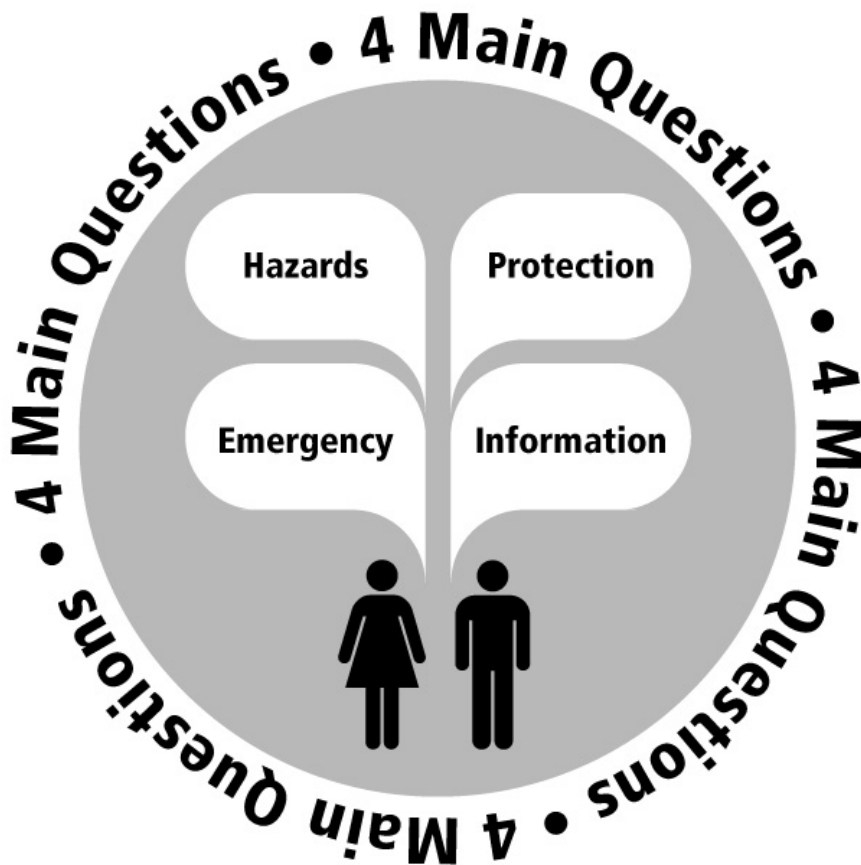
Objective

This workbook is part of your education and training that will introduce you to the Workplace Hazardous Materials Information System (WHMIS), and the changes which occurred when WHMIS was aligned with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

This education and training will emphasize the information that workers need to know in order to work safely with chemicals.

By the end of your education and training, you should be able to answer these four main questions:

- What are the hazards of the product?
- How are you protected from those hazards?
- What do you do in case of an emergency?
- Where can you get further information?



Scope

With WHMIS aligning with GHS in 2015, workers saw new hazard classes and categories, symbols, labels and safety data sheets. There was a new vocabulary to learn such as “signal word”.

This course provides:

- An overview of WHMIS
- The main components of the WHMIS system
 - Labels
 - Safety data sheets (SDSs)
 - Hazard classes/categories
 - Summary of each hazard class, including pictograms (symbols)
- Guidance for workplace-specific training requirements
- Participant activities
- Assessment tools, including quizzes and a final test for documentation of learning

The kit is organized using a module system, allowing the trainer to customize the course by using the sections that are most relevant to your needs.

Target audience

The kit provides an introduction to WHMIS in the workplace for workers and provides trainers with tools and guidance for this task.

This course is intended for all organizations that need to educate their workforce regarding WHMIS after alignment with GHS. The course places more emphasis on the common hazard classes and workplace scenarios that are likely to be encountered by most businesses.

2. Introduction to WHMIS

- Introduction
- What is GHS?
- WHMIS
- What is covered by WHMIS?
- Why is it important to work safely with hazardous products?

Introduction

Many countries have regulatory systems for chemical classification and hazard communication. In Canada, this system is called WHMIS (Workplace Hazardous Materials Information System). If hazardous products are used in your workplace, you should already be familiar with WHMIS. While the systems found in different countries often had similarities in terms of both content and purpose, there were always some differences in how products were classified, labelled, etc. This variation caused confusion about the classification of a product and consequently, how to handle the product safely.

What is GHS?

GHS stands for the Globally Harmonized System of Classification and Labelling of Chemicals.

GHS is a worldwide system that defines and classifies the hazards of products and communicates health and safety information on labels and safety data sheets.

The goal is to harmonize or unify hazard communication by using the same set of rules for classifying hazards and the same format and content for labels and safety data sheets around the world. GHS was in development for many years and was developed by an international team of hazard communication experts.

There are two main components that are key:

- Standardized **classification** of hazardous products into hazard classes and categories according to the specific rules.
- Standardized **communication** of hazard and precautionary information using labels and safety data sheets (SDSs). Suppliers are required to attach proper labels to products that are covered by that jurisdiction's legislation, and provide current SDSs to customers.

Creating a global information system such as GHS provides many benefits, including:

- Providing improved, consistent hazard information
- Encouraging safe handling and use of hazardous products
- Promoting better emergency response
- Promoting regulatory efficiency and compliance with hazard communication requirements
- Facilitating trade between countries
- Reducing costs (once transition has completed)
- Reducing the need for chemical testing and evaluation

Why learn about WHMIS?

Learning about WHMIS will give you the knowledge to protect yourself and others from the hazards of exposures to chemicals and materials. The topics included are the basics of WHMIS, WHMIS hazard classes and their pictograms, labels and safe use and handling tips.

WHMIS

In Canada, if a workplace uses chemicals, there must already be a WHMIS program in place and workers must be knowledgeable about it.

WHMIS ensures that workers are informed about the hazardous products in the workplace and are trained to understand and work safely with these products. The key components of WHMIS are labels, safety data sheets, and training/education for workers. **GHS does NOT replace WHMIS.** WHMIS has been updated to align with GHS elements, including

- New classification rules and hazard classes
- New hazard pictograms
- New supplier label requirements
- New format for safety data sheets

What did NOT change

It is important to stress that GHS did not replace the workplace management of hazards in areas such as education and training, control measures, personal protective equipment programs, etc. Good chemical management is considered a part of a workplace WHMIS program and that expectation continues. All of these initiatives remain the same.

Aspects of Canada's WHMIS program that are unchanged include:

- Worker education and training. These elements are the cornerstone of WHMIS, and include:
 - General or generic education (learning about WHMIS)
 - Workplace-specific training (applying the system to the workplace and ensuring workers understand how to apply the knowledge to their situation)
 - Making sure that education and training is effective and documented. Workers should be able to answer these questions:
 - What are the hazards of the product?
 - How do I protect myself from those hazards?
 - What do I do in case of an emergency?
 - Where can I get further information?
- Requirement for workplace labels (where product is transferred to other containers, supplier label is damaged, etc.).

- Requirement for safety data sheets to be readily available and accessible for workers (e.g., can be available electronically or in binders, must be in an accessible location and not locked away). The SDS will look similar to the material safety data sheet (MSDS) but there are sections with new or different information.
- The WHMIS rules surrounding confidential business information continue to apply.
- Continue to include some hazards that are currently not in the GHS system, were in the previous WHMIS system - such as biohazardous infectious materials.
- Workplace responsibilities for workers, supervisors, employers.

What is covered by WHMIS?

When any product meets the classification criteria (as established by Health Canada), it is considered a hazardous product according to the WHMIS legislation. As a hazardous product, a supplier must label the product or container, and they must provide a SDS to their customers.

Exclusions

Like previous WHMIS legislation, the alignment with GHS excluded some types of products from labelling and SDS requirements. These products are regulated by other laws. Three examples of excluded products include:

- consumer products
- explosives
- pesticides such as insecticides, herbicides, fungicides, and other pest control products

We mention these exclusions because you may have to work with some of these products in your workplace. You will receive training about how to work safely with them as part of a comprehensive health and safety program.



Toxic



Flammable



Corrosive



Explosive

Why it is important to work safely with hazardous products?

Injuries or illness caused by exposures are preventable. Improper handling and storage, or not understanding the hazards or toxicity of a product, can lead to serious physical harm. Some chemicals can cause immediate damage after a short exposure. Others may cause damage that is not apparent until days, months, or years have passed. When proper precautions are not used, products can be spread to other areas, such as washrooms, cafeterias, vehicles and even workers' homes. You, as a worker, must understand the hazards of the materials you use, and be able to take the necessary precautions to protect your health and safety.



Participant activity

Indicate the correct response(s).

True or False GHS is a system that promotes clear and consistent hazard communication globally.

True or False WHMIS ceased to exist after GHS was introduced.

With WHMIS aligned to GHS there are:

- New hazard classes
- New pictograms
- New label and SDS requirements
- All of the above

In your words, why is it important to work safely with hazardous products at your workplace?

3. Roles, responsibilities and the law

This section provides a brief overview of the workplace responsibility system, the three basic workers' rights and groups of people who directly affect or influence how WHMIS is safely applied to the workplace. It also indicates what types of products are covered by WHMIS and what are the exclusions.

Saskatchewan established the first occupational health and safety act in 1972. The act was revised in 1977, 1993 and 2013 to bolster worker involvement and improve protection for health and safety.

A set of principles called the internal responsibility system (IRS) were used in the 1972 original legislation. In Saskatchewan, we refer to the IRS as the workplace responsibility system (WRS).

The WRS is still the cornerstone of health and safety legislation. It means that it's everyone's responsibility to work together to identify and control hazards in the workplace. Everyone needs to take the time to ensure health and safety is part of all work at the workplace. Persons with the most authority in the workplace have the greatest responsibility for health and safety.

Employers have a legal and moral responsibility to provide a safe and healthy workplace.

Supervisors have a duty and responsibility to ensure workers they supervise follow the rules in the legislation and the employer's health and safety system.

Workers must work safely by following the legislative requirements and the employer's health and safety system. When you put all these responsibilities/requirements together, along with the OHCs and reps, you have the WRS.

For the WRS to succeed, worker participation is essential. They participate through the OHCs and representatives as selected by workers. Another important way workers participate in their health and safety is by talking to their supervisor.

Competent refers to when someone has been properly trained, equipped and experienced to perform a task. For the WRS to function properly, a workplace must have competent management, supervision and workers who work safely.

The legislation provides every worker (including managers and supervisors) with three fundamental occupational health and safety rights. Saskatchewan was the first to uphold these rights into health and safety legislation.

With WHMIS, the right to know is an essential part of making the WRS work. Workers have the right to know about workplace hazards, including hazardous products, and how to control those hazards.

Workers must be:

- Informed about the hazards at work;
- Trained to recognize those hazards;
- Trained to protect himself or herself; and
- Informed about his or her rights under the law.

Workers share the responsibility with the employer for maintaining a healthy and safe workplace and have the right to participate in making health and safety decisions.

Workers also have the ability to raise health and safety concerns with their supervisor. This is extremely important for workers to participate at this level.

WHMIS is the law in every workplace

WHMIS is a coordinated system of federal, provincial and territorial laws which apply to every workplace in Canada.

The federal laws do four main things:

1. Create WHMIS hazard classes and pictograms.
2. Describe the rules for classifying products as hazardous products.
3. Require suppliers to attach labels to chemical products that are hazardous products.
4. Require suppliers to provide SDSs to customers.

WHMIS is the law in your workplace

Federal laws are the *Hazardous Products Regulations* (SOR/2015-17) and the *Hazardous Products Act*. The *Hazardous Products Regulations* allow suppliers and employers to apply for trade secret information.

All Canadian jurisdictions, including Saskatchewan, have adopted similar WHMIS regulations for employers. These laws were built on consensus between businesses, labour and government.

In Saskatchewan, WHMIS requirements are found in *The Saskatchewan Employment Act* and *The Occupational Health and Safety Regulations, 2020*.

Workers share the responsibility with the employer for maintaining a healthy and safe workplace and have the right to participate in making health and safety decisions.

Workers also have the ability to raise health and safety concerns with their supervisor. This is extremely important for workers to participate at this level.

These Acts and regulations can be found online.

These regulations require your employer to:

- Obtain current SDSs for all WHMIS hazardous products.
- Make sure current SDSs are made readily available to you.
- Ensure that hazardous products are properly labelled.
- Educate you about WHMIS.
- Provide training on the hazards of WHMIS products in your workplace and on the necessary precautions.

Workplace-specific training is the most important part of WHMIS training. Your employer must provide this training.

How your employer may organize site-specific WHMIS training is an included portion of this course.

Your legal responsibilities

Workers have specific responsibilities in WHMIS.

As a worker, you must:

- Take part in your education and training programs.
- Follow safe work procedures.
- Use your WHMIS training.
- Ask your employer where the SDSs are kept. Make sure they are current and readily available to you.
- Inform your employer about any hazards you see in the workplace.
- Inform your employer about deficiencies, such as labels on containers that are no longer readable, damaged or lost.

Supplier responsibilities

Suppliers (including manufacturers, importers and distributors) must:

- Classify products according to their hazards and the WHMIS criteria.
- Provide labels for the product or container.
- Provide a current SDS for WHMIS products sold to workplaces.

Who enforces WHMIS?

WHMIS is enforced by inspectors of Saskatchewan Occupational Health and Safety.

Inspectors may:

- Ask you specific questions about your knowledge of any part of the WHMIS program
- Ask you to show them a SDS for the product you work with
- Test your understanding of the content of the SDS or label
- See if you know about product hazards, safe work practices, or emergency procedures. Inspectors can also ask the manager or supervisor these questions, and about how well the WHMIS program is working.

Exclusions

Five categories of products are partially exempt from WHMIS requirements for labels and SDSs, but not WHMIS education and training requirements:

1. Consumer restricted products (those sold to the general public that are already labelled following the rules of the *Canadian Consumer Product Safety Act*).
2. Explosives (as defined by the *Explosives Act*).
3. Cosmetics, drugs, food or devices (as defined by the *Food and Drugs Act*).
4. Pest control products (for example pesticides as defined by the *Pest Control Products Act*).
5. A nuclear substance as defined by the *Nuclear Safety and Control Act*, that is radioactive.

Exempt from WHMIS requirements for labels and SDSs

Five categories of products are exempt from WHMIS requirements for labels and SDSs, but not WHMIS training requirements:

- Consumer restricted products (those products sold to the general public that are already labelled following the rules of the *Hazardous Products Act*)
- Explosives (as defined by the *Explosives Act*)
- Cosmetics, drugs, food or devices (as defined by the *Food and Drugs Act*)
- Pest control products (for example pesticides as defined by the *Pest Control Products Act*)
- Radioactive materials (as defined by the *Nuclear Energy Act*, formerly the *Atomic Energy Control Act*)

These Acts are available to view online.

Exclusions (continued)

Four categories of products are fully exempt from all WHMIS requirements:

1. Wood and products made of wood
2. Manufactured articles
3. Tobacco or products made of tobacco
4. Products being transported or handled pursuant to the *Dangerous Goods Transportation Act* and the *Transportation of Dangerous Goods Act*

Hazardous wastes do not require SDSs and WHMIS labels, but the wastes still need to be labelled as hazardous waste and workers need to be educated and trained on safe handling procedures.

We mention these exclusions because...

You probably have some of these products at your workplace. These products use different labels, symbols or other ways to tell people about their hazardous properties.

If any of these categories of products are used in your workplace, your employer is required to give you information on the hazards and how to work safely with them. You must be provided this information before you start using these products. They can usually get an SDS from the supplier.

An example

A can of spray paint or WD-40® that you can buy in a retail store (for use at home or work) will have a consumer label on the can.

Be sure to follow any instructions on the packaging, can or box.

You are not required to have an SDS for these products, but it is a good idea to get the SDS so that you have more information about how to work safely with the product and any health, fire or reactivity hazards it may have. You can often get a SDS for the product by contacting the manufacturer.

4. Components Of the hazard classification and labelling system

This section provides an overview of the framework used for classification and introduces the elements that define the hazard classification system.

Before GHS, a product that would be classified as toxic under WHMIS in Canada might be labelled harmful in Europe and Australia. This same product would be moderately toxic in China, hazardous in New Zealand and non-toxic in India. While each country had good intentions, the use of so many different words and hazard levels for the same product is confusing (and potentially dangerous) for anyone trying to figure out what the hazards are and what precautions are needed. The purpose of aligning with GHS is to correct this inconsistency worldwide by using a common hazard classification system.

It is important to understand the basic elements. These terms are used repeatedly throughout this session and are key concepts for labels and safety data sheets (SDSs).

A) Elements

The elements that will be discussed in this section are:

- Hazard groups
- Hazard classes
- Hazard categories
- Pictograms
- Signal words
- Hazard statements
- Precautionary statements

Hazard groups

WHMIS now identifies two major groups of hazards: physical and health.

Each hazard group includes hazard classes that have specific hazardous properties.

For example, under the physical hazards group, there are hazard classes that are based on the physical or chemical properties of the product, such as flammable, oxidizing, and corrosive.

The health hazard group includes hazard classes that are able to cause a health effect, such as being an irritant to eyes, or being acutely toxic (poisonous).

It is not uncommon for a chemical to belong to more than one hazard group. For example, benzene has both hazardous physical and health properties.

Benzene is classified as:

- Flammable liquid - Category 2
- Carcinogenicity - Category 1
- Germ cell mutagenicity - Category 1
- Specific target organ toxicity - Repeated exposure - Category 1
- Aspiration hazard - Category 1
- Serious eye damage/eye irritation - Category 2
- Skin corrosion/irritation - Category 2

Hazard classes

Each hazard group is divided further into hazard classes. Under WHMIS there are currently:

- 19 physical hazard classes
- 12 health hazard classes

There are also two environmental classes defined by GHS, but these classes are not mandatory in Canada. However, these classes will be introduced in this kit, as the classes and pictograms may be identified on products.

Each of these hazard classes will be discussed in more detail later. The following table shows the hazard classes that belong under each hazard group:

Table 1: Hazard groups and classes

Physical hazards group	Health hazards group	Environmental group*
Explosives*	Acute toxicity	Hazardous to the aquatic environment
Flammable gases	Skin corrosion/irritation	Hazardous to the ozone layer
Flammable aerosols	Serious eye damage/eye irritation	
Oxidizing gases	Respiratory or skin sensitization	
Gases under pressure	Germ cell mutagenicity	
Flammable liquids	Carcinogenicity	
Flammable solids	Reproductive toxicity	
Self-reactive substances and mixtures	Specific target organ toxicity - single exposure	
Pyrophoric liquids	Specific target organ toxicity - repeated exposure	
Pyrophoric solids	Aspiration hazard	
Self-heating substances and mixtures	Biohazardous infectious materials	
Substances and mixtures which, in contact with water, emit flammable gases	Health hazards not otherwise classified	
Oxidizing liquids		
Oxidizing solids		
Organic peroxides		
Corrosive to metals		
Combustible dusts		
Simple asphyxiants		
Pyrophoric gases		
Physical hazards not otherwise classified		

* Note: WHMIS has not adopted the explosive hazard class nor the environmental hazard classes. However, you may see these classes identified or the pictograms on products used in your workplace.

Hazard categories

Each hazard class contains at least one category. Categories may be further broken down into sub-categories or types.

The category identifies the degree of hazard for the product. Category 1 is always the greatest level of hazard (i.e., most hazardous). A category 2 or 3 within the same hazard class would have a lower degree of hazard associated with it. Some hazard classes have only one category (e.g., corrosive to metals), others may have two categories (e.g., carcinogenicity (cancer)) or three (e.g., oxidizing liquids). There are a couple of hazard classes with many categories (e.g., organic peroxides, acute toxicity). Categories may also be identified with alphabetical references (e.g., A is a greater hazard than B, etc.)

Let's use flammable liquids as an example:

Flammable liquid is a hazard class in the physical hazards group. Within the flammable liquid class there are four categories – each category is defined with different flashpoint ranges and/or boiling point cut-off values.

- Category 1: flash point <23 deg C and initial boiling point \leq 35 deg C
- Category 2: flash point <23 deg C and initial boiling point >35 deg C
- Category 3: flash point \geq 23 deg C and \leq 60 deg C
- Category 4: flash point >60 deg C and \leq 93 deg C

Category 1 has the lowest flashpoint and boiling point, making it the most hazardous category for handling and storage.

The objective is not to remember how many categories are in each hazard class. The key point to remember is that **a category 1 in any hazard class has the greatest hazard.**

This numbering system gives you clues about the precautions and control measures that will be required to prevent exposure. Learn to look for this information on labels and safety data sheets. If you are unsure about something, ask your supervisor.

Note: The gases under pressure class contains four categories which are not used to indicate the degree of hazard. The categories (i.e., compressed gas, liquefied gas, refrigerated liquefied gas, and dissolved gas) are used to indicate the type of hazard present.

Similarly, while the reproductive toxicity class uses categories 1 and 2 (which are ranked as above), the additional class of effects on or via lactation is considered to be a separate hazard (which is not ranked).

Hazard pictograms

Hazard pictograms are used to represent the hazard classes. Each hazard class or category has an assigned hazard pictogram. Pictograms have a distinctive square on point border which is solid red in colour. Inside this border is a symbol that represents the potential hazard (e.g., fire, health hazard, corrosive, etc.). Together, the symbol and the border are referred to as a pictogram. The biohazardous infectious material symbol remains the same round black circle as previously used in WHMIS 1988.

The pictogram provides an image that immediately shows a worker what type of hazard is present. This way, even with a quick glance, someone can realize that, for example, the product is a danger to health, corrosive, or may be a fire hazard.



The table below shows hazard pictograms. The bold type is the name given to of the picture, the words in the brackets describe the hazard. The hazard classes and the pictograms assigned to them will be discussed in more detail later.

Table 2: pictograms – names and descriptions

	Explosive g bomb (for explosive, unstable hazards)		Flame (for flammable hazards)		Flame over circle (for oxidizing hazards)
	Gas cylinder (for gases under pressure)		Corrosion (for corrosive damage to materials as well as skin, eyes)		Skull and crossbones (very toxic material that can cause illness/death with small amounts and short exposures)
	Health hazard (for materials that can cause serious health effects)		Exclamation mark (for materials that can cause health effects less serious than those using the health hazard pictogram)		Environment* (for materials that can cause damage to the aquatic environment or the ozone layer)
	Biohazardous infectious materials (for organisms or toxins that can cause diseases in people or animals)				

* The GHS system also defined an environmental hazards group. This group (and its classes) was not adopted in WHMIS. However, you may see the environmental classes listed on labels and SDSs. Including information about environmental hazards is allowed by WHMIS.



Flame pictogram is used to indicate the following hazard classes:

- Flammable gases
- Flammable aerosols
- Flammable liquids
- Flammable solids
- Self-reactive substances and mixtures
- Pyrophoric liquids
- Pyrophoric solids
- Pyrophoric gases
- Self-heating substances and mixtures
- Substances and mixtures which, in contact with water, emit flammable gases
- Organic peroxides

Hazard statements

Each hazard class and category has an assigned hazard statement. Hazard statements are brief, standardized sentences that describe the hazard of the product. The statements are short, but describe the most significant hazard concerns with the product.

Tip!

The wording of the hazard statement helps to describe the degree of the hazard.

For example:

- “May cause cancer” is considered a stronger warning statement (more hazardous) than “suspected of causing cancer.”

Examples of hazard statements include:

- Extremely flammable gas
- Contains gas under pressure; may explode if heated
- Fatal if inhaled
- Causes eye irritation
- May cause cancer

Signal words

A signal word is another part of the hazard communication system. A signal word is another prompt to alert you about the degree of hazard associated with the product.

There are only two signal words, danger or warning. Danger is used for high-risk hazards, while warning is used for less severe hazards. Some of the hazard class/categories do not have a signal word assigned to them. If a signal word is assigned with a hazard class or category of a product, it must be shown on the label.

Precautionary statements

Precautionary statements provide advice on how to minimize or prevent exposure to the product. These statements can include instructions about storage, handling, first aid, personal protective equipment and emergency measures. As with hazard statements, precautionary statements are standardized.



Examples of precautionary statements include:

- Keep container tightly closed
- Wear protective gloves/protective clothing/eye protection/face protection
- If exposed or concerned, get medical advice/attention
- Fight fire remotely due to the risk of explosion
- Protect from sunlight

Putting these elements together

Together, the pictogram, signal word, hazard statement and the hazard class/category name provide the user with information about the hazards associated with that chemical. As shown in Table 3, skin corrosion/irritation category 1 uses the higher level warnings (corrosion pictogram, danger (signal word) and a stronger worded hazard statement (causes severe skin burns and eye damage).

Table 3: Elements of a label used to indicate the level of hazard

Class/category	Skin corrosion/irritation - Category 1	Skin corrosion/irritation - Category 2
Pictogram		
Signal word	Danger	Warning
Hazard statement	Causes severe skin burns and eye damage.	Causes skin irritation.
Precautionary statements (These statements are examples. Suppliers may customize the statements to match the hazards of their product).	<p>Do not breathe dusts or mists. Wash thoroughly after handling.</p> <p>Wear protective gloves/protective clothing/eye protection/face protection.</p> <p>If swallowed: Rinse mouth. Do not induce vomiting.</p> <p>If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].</p> <p>Wash contaminated clothing before reuse.</p> <p>If inhaled: Remove person to fresh air and keep comfortable for breathing.</p> <p>Immediately call a poison centre/doctor/...</p> <p>Specific treatment (see: on this label).</p> <p>If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p> <p>Store locked up.</p> <p>Dispose of contents/container to (see: on this label).</p>	<p>Wash... thoroughly after handling.</p> <p>Wear protective gloves.</p> <p>If on skin: Wash with plenty of water... Specific treatment (see: on this label). If skin irritation occurs: Get medical advice/attention.</p> <p>Take off contaminated clothing and wash it before reuse.</p>

B) Labels

There are different ways to label a hazardous product. In most cases, you will see supplier labels. You may also make workplace labels. Both of these types of labels are described below.

Supplier labels

Labels are a critical component of the hazard communication system as they alert the person handling a product about the major hazards, and outline the basic precautions (safety steps) that should be used.

Supplier labels will look different with the alignment to GHS and will have a few new requirements over what WHMIS formerly required. With the new system, once a chemical is classified a specific signal word, hazard statements, precautionary statements, and pictogram(s) are required (prescribed) for each hazard class and category.

The elements we just discussed such as the pictograms, signal words, hazard statements and precautionary statements will be grouped together on a label. The label will also include the product name and the supplier identification. Labels must be available in both English and French. There is no set format for a label, however. To find the label, look for the pictogram(s), signal word, and hazard statements.

A supplier label will have the following elements:

1. **Product Identifier** – name of the product
2. **Pictogram(s)** – the symbol that represents the hazard class. In some cases, no pictogram is required.
3. **Signal word** – a word used to alert the reader to a potential hazard and to indicate the severity of the hazard.
4. **Hazard statement(s)** – an assigned statement that describes the hazard(s)
5. **Precautionary statements** – standardized phrases that describe measures to be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product or resulting from improper handling or storage of a hazardous product.
6. **Initial supplier identifier** – the name, address and telephone number of either the Canadian manufacturer or the Canadian importer.

1 Product identifier (name)

2 Pictogram(s)

3 Signal Word

4 Hazard Statements

5 Precautionary Statements

6 Supplier Identifier

Hazardous ingredients may or may not be listed on the label. Suppliers have this choice.

Workplace label

A workplace label is used, for example, when you transfer a product to a new container. A workplace label may also be used when a product is made and used on site or when the supplier label is missing or not readable.

A workplace label must have:

- product name (matching the SDS product name)
- safe handling precautions, which may include pictograms or other supplier label information
- a reference to the SDS (if available)

Alternative identification

Other ways to identify hazardous products may be used in the workplace in some situations. This alternative identification may include warning signs, symbols, placards and coding systems. They can be used as long as everyone in the workplace has had the appropriate education and training about the identification system.

Other means of identification are generally used:



- In a laboratory when transferring products to other containers
- By a worker when they are transferring to a container that they will have control of for the entire work shift, and it will be finished by the end of that shift
- When a product is inside a system such as a pipe, vessel, or tank car

What should a worker do?

- Always check to see if there is a label on the product that you are going to be using.
- Read, understand and follow the instructions on the label and SDS. Ask the supervisor if you are unsure of any aspect of its use or storage.
- Ask for a new label when the old one cannot be seen or read properly.
- Do not use a product that is not labelled.
- Receive WHMIS education and training.

Participant activity

Using the sample label, locate each label element and then connect it to the correct description.

<p>Product Identifier</p> <p>Pictogram</p> <p>Signal word</p> <p>Hazard statement(s)</p> <p>Precautionary statements</p> <p>Initial supplier identifier</p>	<div style="text-align: center; border-bottom: 1px solid black; margin-bottom: 10px;"> Product K1 / Product K1 </div> <div style="display: flex; justify-content: center; gap: 20px;">   </div> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top; padding-right: 10px;"> <p>Danger</p> <p>Fatal if swallowed. Causes skin irritation.</p> <p>Precautions: Wear protective gloves. Wash hands thoroughly after handling. See label for more information. Do not eat, drink or smoke when using this product.</p> <p>Store locked up. Dispose of contents/containers in accordance with local regulations.</p> <p>IF ON SKIN: Wash with plenty of water. If skin irritation occurs: Get medical advice or attention. Take off contaminated clothing and wash it before reuse. IF SWALLOWED: Immediately call a POISON CENTRE or doctor. Rinse mouth.</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Danger</p> <p>Mortel en cas d'ingestion. Provoque une irritation cutanée.</p> <p>Conseils : Porter des gants de protection. Laver les mains soigneusement après manipulation. Ne pas manger, boire ou fumer en manipulant ce produit.</p> <p>Garder sous clef. Éliminer le contenu/réceptacle conformément aux règlements locaux en vigueur.</p> <p>EN CAS DE CONTACT AVEC LA PEAU : Laver abondamment à l'eau. En cas d'irritation cutanée : Demander un avis médical/consulter un médecin. Enlever les vêtements contaminés et les laver avant réutilisation. EN CAS D'INGESTION : Appeler immédiatement un CENTRE ANTIPOISON ou un médecin. Rincer la bouche.</p> </td> </tr> </table> <p style="font-size: small; margin-top: 10px;">ABC Chemical Co., 123 Anywhere St., Mytown, ON N0N 0N0 (123) 456-7890</p>	<p>Danger</p> <p>Fatal if swallowed. Causes skin irritation.</p> <p>Precautions: Wear protective gloves. Wash hands thoroughly after handling. See label for more information. Do not eat, drink or smoke when using this product.</p> <p>Store locked up. Dispose of contents/containers in accordance with local regulations.</p> <p>IF ON SKIN: Wash with plenty of water. If skin irritation occurs: Get medical advice or attention. Take off contaminated clothing and wash it before reuse. IF SWALLOWED: Immediately call a POISON CENTRE or doctor. Rinse mouth.</p>	<p>Danger</p> <p>Mortel en cas d'ingestion. Provoque une irritation cutanée.</p> <p>Conseils : Porter des gants de protection. Laver les mains soigneusement après manipulation. Ne pas manger, boire ou fumer en manipulant ce produit.</p> <p>Garder sous clef. Éliminer le contenu/réceptacle conformément aux règlements locaux en vigueur.</p> <p>EN CAS DE CONTACT AVEC LA PEAU : Laver abondamment à l'eau. En cas d'irritation cutanée : Demander un avis médical/consulter un médecin. Enlever les vêtements contaminés et les laver avant réutilisation. EN CAS D'INGESTION : Appeler immédiatement un CENTRE ANTIPOISON ou un médecin. Rincer la bouche.</p>
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There are several products in your workplace that have the flame pictogram. Rank the hazard represented by each product based on the pictogram, signal word and hazard statement:

- _____ Flame. Warning. Flammable liquid and vapour.

- _____ (No pictogram). Warning. Combustible liquid.

- _____ Flame. Danger. Extremely flammable liquid and vapour.

- _____ Flame. Danger. Highly flammable liquid and vapour.

C) Why learn about SDSs?

The Workplace Hazardous Materials Information System, or WHMIS, requires suppliers to provide their customers with information about the hazards and safe use of their products. The SDS is the main source of this information.

Your employer will receive these SDSs when they purchase the hazardous products.

Stop and think. Do you know about the hazards of the products that you are currently working with? Why is this information important?

IMPORTANT: To complete your WHMIS instruction, your employer must also provide education and training on the hazards and safe work practices for WHMIS products used at your workplace.

Products

WHMIS establishes rules for classifying products into hazard classes and categories.

Suppliers must attach labels and provide SDSs for those products that meet one or more of the classification criteria according to the *Hazardous Products Act* and regulations.

When a product meets one or more of the classification criteria, it is known as a hazardous product.

Safety data sheets

(SDSs) The SDS

The SDSs are produced by the supplier of the product and provide more detailed information about the product. They are an important resource for workplaces and workers. Employers and workers use the information on the SDS to protect themselves from hazards, and for safe handling and emergency measures.

In Canada, the GHS formatted SDS replaces the material safety data sheets (MSDSs) used under WHMIS. The GHS SDS has a standard 16-section format with specific information requirements.

Some important points to note about the SDS:

- The SDS has 16 sections and will typically be anywhere from two to 10 pages in length.
- There is a set format for the SDS. The information must always be in the same section, regardless of which supplier created the SDS.
- SDSs must be readily available to everyone in the workplace. SDSs may be stored in a binder or they may be stored electronically on a computer. Employers must train employees on how to understand the SDS as well as how/where to access the SDSs at the workplace.
- In Canada, the SDS (and label) must be updated when significant new data becomes available.

A new requirement is that the WHMIS classification must appear in section 2 of the SDS, along with the required label elements.

Let's take a quick look at the sections and type of information that is available on the SDS.

Table 4: Information on an SDS

	SDS section # and heading	Information contained in section
1	Identification	Product identifier (i.e., product name) Other means of identification Recommended use/restrictions on use Canadian supplier information (name, address and a phone number) Emergency telephone number and any restrictions on the use of that number, if applicable
2	Hazard identification	Hazard classification (class, category) of product Label elements - Pictogram or the name of the pictogram, signal word, hazard statement(s), precautionary statement(s) Other hazards which do not result in classification (e.g., molten material)
3	Composition/Information on Ingredients	When a hazardous product is a material or substance: <ul style="list-style-type: none"> - Chemical name - Common name and synonyms - Chemical abstract service (CAS) registry number and any unique identifiers - Chemical name of impurities, stabilizing solvents and/or additives** For each material or substance in a mixture that is classified in a health hazard class***: <ul style="list-style-type: none"> - Chemical name - Common name and synonyms - CAS registry number and any unique identifiers - Concentration NOTE: Confidential business information rules can apply
4	First aid measures	First aid measures by route of exposure: inhalation, skin contact, eye contact, ingestion Most important symptoms: and effects (immediate and delayed effects) Immediate medical attention and special treatment, if necessary
5	Firefighting measures	Suitable extinguishing media Unsuitable extinguishing media Specific hazards arising from the hazardous product if involved in fire Special protective equipment and precautions for firefighters
6	Accidental release measures	Personal precautions, protective equipment and emergency procedures Methods and materials for containment and clean up
7	Handling and storage	Precautions for safe handling Conditions for safe storage (including incompatible materials)

SDS section # and heading		Information contained in section	
8	Exposure controls/personal protection	Control parameters (occupational exposure guidelines or biological exposure limits) Engineering controls Individual protection measures (e.g., personal protective equipment, general hygiene considerations) (eye/face, skin, respiratory)	
9	Physical and chemical properties	Appearance (physical state, colour, etc.) Odour Odour threshold pH Melting point/freezing point Boiling point/boiling range Flashpoint Evaporation rate Flammability (solid, gas) Upper/lower flammable/explosive limit	Vapour pressure Vapour density Relative density Solubility Partition coefficient: - n-octanol/water Auto-ignition temperature Decomposition temperature Viscosity
10	Stability and reactivity	Reactivity Chemical stability Possibility of hazardous reactions Conditions to avoid Incompatible materials Hazardous decomposition products	
11	Toxicological information	Concise but complete description of the various toxic health effects and the data used to identify those effects, including: - Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact) - Symptoms related to the physical, chemical and toxicological characteristics - Delayed and immediate effects, and chronic effects from short-term and long-term exposure - Numerical measures of toxicity	
12	Ecological information****	Measurements of impact on aquatic life, soil, air (such as toxicity, persistence)	
13	Disposal considerations****	Safe handling and precautions of waste residue Methods of disposal	

SDS section # and heading		Information contained in section
14	Transport information****	UN number UN proper shipping name Transport hazard class(es) Packing group Environmental hazards Transport in bulk Special precautions
15	Regulatory information****	Safety, health and environmental regulations specific to the product
16	Other information	Date of the latest revision of the SDS

* The supplier that must be identified on an SDS is the initial supplier identifier (i.e., the name, address and telephone number of either the Canadian manufacturer or the Canadian importer). There are two exceptions to this requirement. In a situation where a hazardous product is being sold by a distributor, the distributor may replace the name, address and telephone number of the initial supplier with their own contact information. In a situation where an importer imports a hazardous product for use in their own work place in Canada (i.e., the importer is not selling the hazardous product), the importer may retain the name, address and telephone number of the foreign supplier on the SDS instead of replacing it with their own contact information.

**These impurities and stabilizing products are those that are classified in a health hazard class and contribute to the classification of the material or substance.

***Each ingredient in the mixture must be listed when it is classified in a health hazard class and is present above the concentration limit that is designated for the hazard class in which it is classified or is present in the mixture at a concentration that results in the mixture being classified in any health hazard class.

****Sections 12 to 15 require the headings to be present, but under Canadian regulations, the supplier has the option to not provide information in these sections.

Who uses SDSs?

SDSs are used by a wide range of people, including safety professionals, engineers, emergency responders and doctors.

Some sections of the SDS can be technical to read. If you do not understand the information, ask for help. Ask your supervisor, a health and safety professional, health and safety committee or representative, union, or a medical professional.

How to read and use the SDS – a worker's guide

The SDS provides the user with lots of information. It is not meant to be overwhelming. Remember that the main focus is to help you learn about:

- The hazards of the product (e.g., hazard pictograms, signal words, hazard statements)
- How to work safely with the product (in more detail than the label provides)
- First aid measures
- Emergency measures

Where do you find this information on the SDS? Fortunately, the standardized format means that once you become familiar with the content for each section of the SDS, you know where to look, regardless of which supplier wrote the SDS.

You can think of the SDS as having four main purposes. It provides information on:

- a) Identification:** for the product and supplier
- b) Hazards:** health, physical (fire and reactivity), and environmental, if provided.
- c) Prevention:** steps you can take to work safely, and reduce or prevent exposure or an emergency.
- d) Response:** appropriate responses in various situations (e.g., first aid, fire, accidental release)

Let's look at Table 4 again and identify which sections provide the information for these four purposes.

- a. Identification:**
 - Section 1 contains the product and supplier identification information. Confirm that you are reading the SDS that matches your product by comparing the product name, the supplier, and other identifiers.
 - Section 3 confirms the ingredient identity, where required, and indicates if there are any trade secrets.
- b. Hazards:**
 - Section 2 summarizes the hazards of the product (e.g., hazard class or category). It will also show the label elements. It may list other hazards which did not result in classification, but of which you should be aware.
- c. Prevention:**
 - Section 7 outlines storage and handling precautions when you are working with the product.
 - Section 8 lists protection measures such as personal protective equipment, and exposure guidelines.
 - Section 13 may list safe handling for waste and disposal advice.

d. Response:

- Section 4 provides first aid and treatment information in the event of exposure.
- Section 5 outlines steps to take in the event of a fire.
- Section 6 gives precautions during accidental release or spills.

These sections provide more detailed information that backs up and adds to the hazard identification information given in Section 2:

- Section 9 lists the physical and chemical properties.
- Section 10 outlines stability and reactivity data.
- Section 11 provides more details about the health hazards (its toxicity).
- Section 12 may list any information about potential effects on the environment.

The remaining sections provide information on other laws that apply to the product or its ingredients and information about the SDS (e.g., who wrote it):

- Section 14 provides information about the product's hazards during transport.
- Section 15 may list other laws that apply. (not mandatory)
- Section 16 will have other information such as the date the SDS was written, who wrote it, and references.

Always carefully read the SDSs for the products that you use. If you are unsure or unclear about what it means, talk to your supervisor before handling the product.

A few things to note:

- Make sure that the product is being used in the intended manner; otherwise, the advice provided on the SDS and label may not apply, or the protective measures listed may not be adequate. Section 1 of the SDS should describe the typical use of the product and may indicate restrictions. Ask your supervisor or a health and safety professional for advice if the way you use the product does not match the SDS.
- Section 2 will summarize the hazards related to the product, precautions to take, and what to do in an emergency. Understand that the SDS covers information about the potential hazards, but may not be specific about the required safe work procedures needed for your workplace (e.g., the SDS may not specify what type of respirator must be used, just that one is needed). More information can be found in chemical management or chemical safety publications. These decisions may require the help of a safety professional or someone with chemical safety knowledge.

Hazard analysis

Hazard analysis is the systematic examination of identifying potential loss exposure. This approach is critical in knowing which hazards exist at the workplace and what we can do to eliminate or reduce the risk from those hazards.

An important step in the hazard analysis process is developing appropriate procedures or practices that control hazards so workers do not become injured or ill.

Here is a simple hazard analysis approach:

- Inventory tasks performed at the workplace.
- Identify the hazards for each task and then assess the risk for each task (preferable).
- Develop a plan to eliminate the hazard or a plan to reduce the risk of each hazard. Create guidelines, procedures or practices with safety built right in and communicate through orientation or training for each guideline, procedure or practice.
- Implement and follow up to ensure everything is working as it should be.

Worker involvement in this entire process is key to getting it correct from start. Workers also can become a big part in the communication, implementation and follow-up.

As a first step in hazard control, determine if the hazard may be controlled at its source (where the problem is created) by eliminating the hazard. If this does not work, try to put controls between the source and the worker. **The closer a control is to the source of the hazard, the better the hazard can be controlled.** If this is not possible, hazards must be controlled along the path – that is, between the source and the worker. As a last resort, the hazards must be controlled at the worker level. Hazards which are controlled at the worker level are highly dependent upon the individual worker, e.g., ill-fitting PPE, or PPE that is worn correctly or not at all or a procedure which is read but not comprehended.

When considering hazard control, recognize more than one control may be needed in order to reduce the risk of the hazard harming a person, e.g., when welding, adequate ventilation is a control for welding fumes as well as a welding shield and PPE to protect from sparks.

Hierarchy of hazard control

1. Elimination – First, try eliminating the hazard. Getting rid of a hazardous product, substance, tool or process is the best way to protect workers.
2. Substitution – If elimination is not practical, try replacing a hazardous substance or process with one less dangerous. For example, a hazardous chemical can be replaced with a less hazardous one, i.e., substituting bleach with a diluted vinegar/water solution.
3. Engineering/design – This control involves redesign, isolation or automation to reduce the risk of exposure to a hazard. Some examples of engineering include: improving the ventilation, creating a separate room to perform a dangerous task, or using a machine to do a job that would be hazardous for a person to do.
4. Administrative – If the above controls are not practicable, administrative controls may be implemented. These include training, improving work practices and procedures, new policies, scheduling, planning or variety of other managerial concerns that change how a job is done.
5. Personal protective equipment – Finally, if all other control strategies fail to meet the safety needs for a particular task, PPE may be implemented. Although this control is a last resort, there are some activities where a job cannot be performed without the use of PPE, e.g., welding, rescue. The key is not to jump through the hierarchy of controls without carefully evaluating each option.

Participant activity: Finding your way around a SDS

Let's go through a SDS and learn where to look for information. Using the SDS in Appendix B, or an SDS provided by your trainer, go through the questions listed with the class, record the answers and include the section where that information was found.

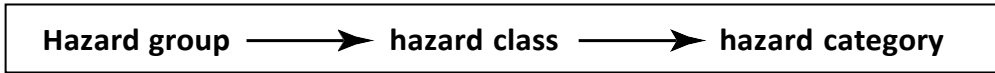
Question	Answers	SDS Ssection
What is the product name?		
What are the hazardous ingredients?		
What are the main hazard(s) of this product?		
What are the label elements? (e.g., pictogram, hazard class and category, signal word, hazard statement, precautionary statements).		
What are the symptoms of breathing this product?		
What are the first aid measures for eye contact?		
What should be done if the material spills?		
What are the key handling requirements for this product?		

Question	Answers	SDS section
List the recommended protective measure(s).		
Which engineering control is recommended?		
What colour is the product?		
Are there any special conditions to note or avoid?		
Name the incompatible materials listed for this product.		
What are the routes of exposure for this product?		
List some symptoms of acute (short-term) exposure.		

D) Hazard classes/categories

Review of hazard classification

As mentioned earlier, there are two main hazard groups: physical and health. Within each of these groups are classes of hazards and within each class, there are categories. The class defines the nature of the hazard (e.g., flammable), while the category defines the severity of the hazard (e.g., very flammable).



Determining the hazard class or category is the responsibility of the manufacturer or supplier of a product.

Employers should review the information provided on the labels and the safety data sheet. From this information, and other chemical safety information sources, employers are required to make sure the right handling, storage and control steps are in place to prevent or reduce hazards. Employers must make sure that workers know about these steps, and that workers have had the appropriate training in safe work and storage procedures for each product used in the workplace.

Workers have the responsibility to follow the safe work and storage procedures that they have been trained for.

Working with multi-hazard products

It is not uncommon for a product to have characteristics that fall into more than one hazard class. For example, acetone can be classified into multiple classes, including:

- flammable liquids
- serious eye damage/eye irritation
- specific target organ toxicity – single exposure



Regardless of how many classes are listed for a product, you approach using it in the same way- make sure that you review the SDS and label to be aware of all potential hazards. The SDS and label will provide guidance on the appropriate handling, storage, controls and so on that will be required.

There are precedence guidelines that suppliers may use that determine how information should be presented to users when multiple hazards are present. The rules of precedence try to reduce confusion by having two (or more) competing or repetitive messages. Only the most protective wording is used in these situations. For example, you will not see a label with both of the signal words danger and warning on it. It will use danger. Once you read the rest of the label and the SDS, you will understand the full message.

Also, some hazards associated with a product may not use a pictogram.

Participant activity

Review questions

- True or False The rules of precedence for information on a label means that sometimes a product's label will have less protective wording.
- True or False It is important to consider other health and safety hazards beyond the hazard pictogram or hazard class/category.
- True or False If a product has significant physical hazards, such as being corrosive or flammable, and steps are taken to control it, then workers do not need to be concerned about adverse health effects.

5. Hazard review

In this section, we will take a more detailed look at the hazard classes and provide some useful tips for working with products in the various hazard classes. The hazard information will be summarized and presented in two ways.

- The hazards by pictogram summary groups similar classes/hazards primarily by the hazard pictogram. For each of the 10 hazard pictograms, the classes/categories that use that pictogram will be listed. Information covers topics such as recognizing the hazard and key handling and storage measures.
- The hazard class summary discusses each hazard class and outlines the hazard categories within each class. In addition, the hazard pictogram(s), signal words and hazard statements are included for each class. Key precautions are summarized for each class.











The participant workbook contains nine common hazard classes: flammable aerosols, gases under pressure, flammable liquids, oxidizing liquids, corrosive to metals, acute toxicity, skin corrosion/irritation, serious eye damage/eye irritation and carcinogenicity. If you work with products in other hazard classes, your instructor will provide you with handouts.

Education and training for some of these hazard classes may be beyond the scope of this course. Employers must provide worksite specific training.

Hazards by pictogram summary

Classes using the same hazard pictograms are grouped together to help general understanding. Note the classes for example, combustible dusts and simple asphyxiants that do not require the use of a pictogram. Physical hazards not otherwise classified, and health hazards not otherwise classified require the use of a pictogram that is representative of the hazard present.

Table 5: Hazard pictograms and the hazard classes that use that pictogram

 <p>Explosives** Self-reactive substances and mixtures (Type A, B) Organic peroxides (Category A, B)</p>	 <p>Flammable liquids Flammable solids Flammable aerosols Flammable gases Pyrophoric liquids Pyrophoric solids Pyrophoric gases Self-heating substances and mixtures Substances and mixtures which, in contact with water, emit flammable gases Self-reactive substances and mixtures (Types B-F) Organic peroxides (Types B-F)</p>	 <p>Oxidizing gases Oxidizing liquids Oxidizing solids</p>
 <p>Gases under pressure</p>	 <p>Corrosive to metals Skin corrosion/irritation - skin corrosion (Cat. 1, 1A, 1B and 1C) Serious eye damage/eye irritation - serious eye damage (Cat. 1)</p>	 <p>Acute toxicity - oral, dermal, or inhalation (Cat. 1, 2 and 3)</p>
 <p>Respiratory or skin sensitization - Respiratory sensitizer (Cat. 1, 1A and 1B) Germ cell mutagenicity Carcinogenicity Reproductive toxicity STOT* – single exposure (Cat. 1 and 2) STOT* – repeated exposure Aspiration hazard</p>	 <p>Acute toxicity - oral, dermal, inhalation (Category 4) Skin corrosion/irritation - skin irritation (Category 2) Serious eye damage/eye irritation - eye irritation (Category 2 and 2A) Respiratory or skin sensitization - skin sensitizer (Category 1, 1A and 1B) STOT* - single exposure (Category 3) Hazardous to the ozone layer**</p>	 <p>Hazardous to the aquatic environment**</p>
	<p>Biohazardous infectious materials</p>	

* STOT = specific target organ toxicity

** The explosive hazard class and the environmental classes have not been adopted by WHMIS.

Exploding bomb pictogram



Because of the high risk of significant personal injury and extensive property damage for incidents involving these products, proper training and appreciation of the hazards is essential.

Products with this pictogram should only be used by individuals who are thoroughly trained and aware of the hazards and how to control them. This level of training is beyond the scope of this kit.

What hazard classes use this pictogram?

While the explosive class has not been currently adopted by WHMIS, you may see the class identified. The hazard categories address explosives in terms of unstable explosives, mass explosion hazard, severe projection hazard, fire, blast or projection hazard and may explode in fire.

Note that two other hazard classes use the explosive hazard pictogram.

- The first two categories of self-reactive substances and mixtures (Type A and B) (e.g., most hazardous) will use this pictogram. Self-reactive substances are sensitive to temperature and temperature changes. The hazard with these products is that heating (even slight heating), such as may occur through improper handling or storage conditions, may cause an explosion (Type A) or a fire/explosion (Type B). Handling, storage and control measures for these will be discussed in the section for the self-reactive substances class.
- The other hazard class is organic peroxides. The first two categories under organic peroxides (Type A and B) (e.g., most hazardous) are an explosion (Type A) or a fire/explosion hazard (Type B) if heated. Organic peroxides are highly reactive materials and tend to ignite easily and burn rapidly. Organic peroxides are very unstable and are generally sensitive to light (e.g., have to be stored in darkness). Some are sensitive to temperature changes or friction (e.g., shaking or bumping a container that holds organic peroxide material). Organic peroxides tend to react explosively with metals. Handling, storage and control measures for these will be discussed under the organic peroxides hazard class.

Flame pictogram



What are flammable hazards?

Flammable hazards are products that can ignite easily and burn rapidly. For a fire to occur, three elements must be together at the same time and in the right proportions: fuel, oxygen, and heat (e.g., an ignition source such as a spark). It is very important for fire prevention and when working safely with flammable products to make sure that these three elements are not present together in the right amounts at any time.

For example, vapours from a flammable liquid can mix with air and be exposed to the right amount of heat to ignite and burn. In the workplace, controlling the fuel (e.g., flammable product), keeping quantities low and eliminating sources of ignition are the main ways that allow flammable products to be handled safely.

Which hazard classes use the flame pictogram?

In most workplaces, you will see this pictogram used for the following hazard classes:

- Flammable gases
- Flammable aerosols
- Flammable liquids
- Flammable solids

There are other hazard classes that use the flammable hazard pictogram, but these products are rarely used.

- Pyrophoric gases - these products react with air to cause a fire
- Pyrophoric liquids - these products react with air to cause a fire
- Pyrophoric solids - these products react with air to cause a fire
- Self-heating substances and mixtures (e.g., spontaneous combustion) - these materials react with air, can self-heat and catch fire (no ignition source required)
- Substances and mixtures which, in contact with water, emit flammable gases. These materials react with water and release flammable gases
- Self-reactive substances and mixtures* - these products can react strongly to conditions such as shock, pressure, temperature, light, or contact with another product
- Organic peroxides* - very unstable and reactive product

* Note that the most hazardous categories (Types A, B) within these classes will use the explosion pictogram alone or with the flammable pictogram.

Are there other hazards associated with flammable materials?

Fire and explosion are the main concerns, but other issues may be present. If a product is classified as flammable, the supervisor and workers must understand specifics of what the hazards are and how to use it safely.

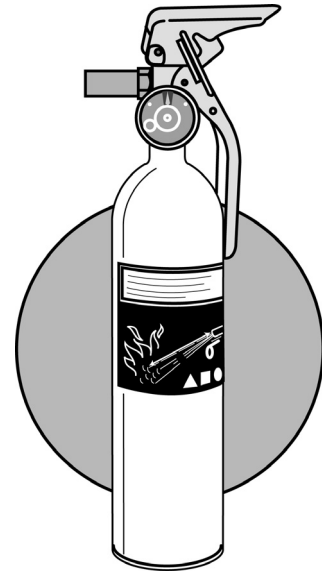
Other concerns with flammable hazards include:

- **Health hazards** – Flammable products can be a health hazard (e.g., toxic, corrosive, irritant, etc.) at air concentrations well below the levels needed to be a fire hazard.
- **Accumulation of static charge** – Static electricity is the electric charge generated when there is friction between two things made of different materials or substances. This charge can occur when flammable liquids are poured, pumped, filtered, agitated, stirred or flow through pipes, as these actions can act as an ignition source. The release of the charge can ignite flammable products.
- **Asphyxiation** - The vapours from flammable liquids are usually heavier than air and will accumulate near the ground. These heavy vapours can displace the air in a space (take the place of air or oxygen), and become an asphyxiation (suffocation) hazard.
- **Toxic byproducts from burning** - When flammable products burn, toxic gases and vapours are produced, such as carbon monoxide, hydrogen cyanide and nitrogen oxides.
- **Flashback** - Since the vapour of most flammable liquids is heavier than air, the vapours can spread a considerable distance along the ground or floor and be ignited by a distant spark or flame or source of heat. Once vapours from a flammable liquid have ignited, the flames may flashback, meaning that the flames travel back to the container or source of the flammable liquid and an explosion or fire can result.
- **Hot work** - Working with ignition sources near flammable products is known as hot work. Welding and cutting are examples.

Key handling information for flammable products

- Check the label and SDS for information about the hazards and the necessary precautions for the flammable product you are using.
- Minimize the risk of fire/explosion by preventing the release of flammable products into the air.
- Use flammable products only in well-ventilated areas.
- Use the smallest amount of flammable material necessary for the job.
- Eliminate ignition sources and combustible materials from the area where flammable products are used (e.g., including oily rags, cardboard boxes). Make sure that there is no smoking, hot work, or hidden sources of ignition (e.g., pilot lights in a furnace or hot water tank). Dispose of combustible material appropriately (e.g., oily rags are in approved containers).
- Do not heat containers or cylinders containing flammable products.
- In some cases, non-sparking ventilation systems and equipment (such as non-sparking tools) may be necessary.
- Ground and bond containers or cylinders during transfer operations to prevent buildup of static charge. Be sure that you understand how to do this properly.
- Use equipment designed for flammable storage – e.g., flammable storage fridge, flammable cabinets, or flammable safety cans.
- Be aware of incompatible materials such as oxidizers and avoid contact. Check the SDS for specific information and recommendations.

- Be aware of conditions to avoid with the flammable product being used. Some products using this hazard pictogram may be reactive to air or water. Others may be sensitive to temperature, pressure, friction, sunlight.
- Avoid spilling material and contaminating your skin or clothing.
- Keep work areas clean and tidy. Wipe up spills and keep surfaces clean to prevent contact with skin or incompatibles. Prevent accumulation of dust or other residues on ledges or other surfaces.
- Do not smoke, eat or drink in work areas. Wash hands thoroughly after handling. Wash hands before eating, drinking, smoking or going to the toilet.
- Remove contaminated clothing and leather shoes or boots since they can be a severe fire hazard. Wash contaminated items, where appropriate, immediately and thoroughly in water before re-wearing or discarding.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary to act:
 - Make sure that appropriate fire extinguishers are available.
 - Be aware of at least two different exit paths in the event of fire.
 - Make sure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, non-sparking tools, etc.). Avoid using combustible materials such as paper towels or sawdust to clean up or absorb spills.
- If personal protective equipment is required, the employer must make sure that workers are thoroughly trained in its selection, fit, use and maintenance. Refer to the SDS for guidance on selection.



Key storage information for flammable products

- Keep away from incompatible materials. Check SDS for incompatibles.
- Use equipment designed for flammable storage – e.g., flammable storage fridge, flammable cabinets, or flammable safety cans.
- Always keep the lids on containers holding flammable products to prevent the release of vapours.
- Store in a cool, dry, well-ventilated area, away from direct sunlight and exit paths. Post warning signs.
- Keep away from potential ignition sources such as heat, sparks or open flames. No smoking near flammable storage.
- Avoid storing large quantities, if possible.
- Inspect containers and storage area regularly for signs of leakage or damage. Contain spills or leaks by storing in trays made from compatible materials.
- Ensure that appropriate firefighting and spill cleanup equipment is readily available.
- Avoid storing flammable products in basements. Ground floor storage is preferred as it provides easier access for emergency situations.
- Follow bylaws and regulations such as fire codes and health and safety regulations that apply to the workplace in your jurisdiction.

Flame over circle pictogram



What are oxidizing hazards?

The pictogram for oxidizing products is an o with flames on top of it. The o is for oxygen and the flames show that oxidizers are significant fire hazard if they are not handled properly. There are three types of oxidizing product: oxidizing gases, oxidizing liquids and oxidizing solids.

The basic components for a fire are a source of fuel (such as combustibles), a source of oxygen, and a spark or source of ignition.

With most fires, the source of oxygen comes from the air (air has about 21 per cent oxygen). With oxidizers, these products readily give off oxygen or other oxidizing substances (such as bromine, chlorine, or fluorine) and this is a significant fire/explosion risk. Oxidizers do not burn by themselves but oxidizers can:

- greatly increase the development of a fire and make it more intense (burns hotter and faster than the fire would under normal fire conditions),
- cause substances that do not normally burn in air to burn rapidly,
- cause some combustible materials to burn spontaneously without the presence of obvious ignition sources such as a spark or flame.

Examples include:

- oxidizing gases: oxygen, ozone
- oxidizing liquids: nitric acid, perchloric acid
- oxidizing solids: potassium permanganate, sodium chlorite.

Which hazard classes use the flame over circle pictogram?

The oxidizer hazard pictogram is used for three different oxidizer hazard classes:

- Oxidizing liquids
- Oxidizing solids
- Oxidizing gases

Although the three classes of oxidizer may have different physical states, they share the characteristics of oxidizers and they all pose fire hazards if appropriate handling and storage needs are not followed.

Are there other potential hazards associated with oxidizers?

The primary hazard of oxidizing products is fire and explosion. In addition to property damage, if an oxidizer product contaminates the skin or clothing, there is a high risk of very significant personal injury in the event of a fire.

Other concerns with oxidizing hazards include:

- **Health hazards** - Oxidizing products can have other hazardous properties as well so carefully read the label and SDS for other potential hazards (e.g., health, corrosivity, reactivity).
- **Incompatible materials** - Oxidizers are very reactive. Never return unused product to the original container, even if it does not appear to be contaminated.

Key handling information for oxidizers

- Check the label and SDS for information about the hazards and necessary precautions for the oxidizing material you are using.
- Eliminate ignition sources and combustible materials. Promptly remove combustible wastes, including wood, paper and rags, from work areas. Ensure that there is no smoking.
- Keep away from incompatible materials – particularly greases, lubricants, cleaning solvents, paints, or thinners.
- Keep valves and fittings free from oil and grease.
- Use only in well-ventilated areas.
- Keep containers tightly closed when not in use.
- Avoid spilling material and contaminating your skin or clothing. Immediately report leaks, spills or failures of the safety equipment (e.g., ventilation system). In the event of a spill or leak, exit the area immediately.
- Keep work areas clean and tidy. Wipe up spills and keep surfaces clean to prevent contact with skin or incompatibles. Prevent accumulation of dust or other residues on ledges or other surfaces.
- Do not smoke, eat or drink in work areas. Wash hands thoroughly after handling. Wash hands before eating, drinking, smoking or going to the toilet.
- Remove contaminated clothing and leather shoes or boots since they can be a severe fire hazard. Wash contaminated items, where applicable, immediately and thoroughly in water before re-wearing or discarding.
- Maintenance personnel need to know the hazards and any special procedures and precautions needed before work begins.
- Be very cautious about mixing oxidizers with water. Follow the chemical supplier's directions. Some oxidizers will generate large amounts of heat when they are mixed with water.
- Never return unused material to the original container.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that appropriate fire extinguishers are available.
 - Be aware of at least two different exit paths in the event of fire.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly. Follow first aid instructions listed on the SDS or label.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, non-sparking tools, etc.). Avoid using combustible or reactive materials such as paper towels or sawdust to clean up or absorb spills.
- If personal protective equipment is required, the employer must ensure that workers are thoroughly trained in its selection, fit, use and maintenance. Refer to the SDS for guidance on selection.
- Fire resistant or flame-retardant clothing may be required.

Key storage information for oxidizers

- Keep away from incompatible materials. Check SDS for incompatibles.
- Store in a cool, dry, well-ventilated area and away from direct sunlight and exit paths. Post warning signs. Be aware of any other special storage conditions.
- Keep away from potential ignition sources such as heat, sparks or open flames. No smoking near the oxidizer storage area.
- Avoid storing large quantities if possible.
- Inspect containers and storage area regularly for signs of leakage or damage. Contain spills or leaks by storing in trays made from compatible materials.
- Store in containers that the chemical supplier recommends. Normally these are the same containers in which the material was shipped.
- Empty containers may contain hazardous residue. Store separately. Keep closed.
- Do not use wooden pallets or other combustible pallets for storing containers of oxidizing materials. Walls, floors, shelving, and fittings in storage areas should be constructed of non-combustible materials.
- Ensure that appropriate firefighting and spill cleanup equipment is readily available.
- Follow bylaws and regulations such as fire codes and health and safety regulations that apply to the workplace in your jurisdiction, including the disposal of empty containers.

Gas cylinder pictogram



What are gases under pressure?

Thousands of products are available which contain gases and mixtures of gases that are stored under pressure in cylinders.

There are four different hazard categories of gases under pressure:

- compressed gas,
- liquefied gas,
- refrigerated liquefied gas, and
- dissolved gas.

Compressed gas (non-liquefied gas):

Non-liquefied gases are also known as compressed, pressurized or permanent gases. These gases do not become liquid when they are compressed at normal temperatures, even at very high pressures. Examples are oxygen, and nitrogen.

Liquefied gas and refrigerated liquefied gas:

Liquefied gases are gases which can become liquids at normal temperatures when they are inside cylinders under pressure. The second category are those gases that are made partially liquid because of their low temperature. Initially the cylinder is almost full of liquid, and gas fills the space above the liquid. As gas is removed from the cylinder, enough liquid evaporates to replace it, keeping the pressure in the cylinder constant. Examples: anhydrous ammonia, chlorine, propane, nitrous oxide and carbon dioxide.

Dissolved gas:

Acetylene is the only commonly used dissolved gas. Acetylene is chemically very unstable and at atmospheric pressure, acetylene gas can explode. However, acetylene is routinely stored and used safely in cylinders because the acetylene cylinders are packed with an inert, porous filler. The filler is saturated with acetone or other suitable solvent. When acetylene gas is added to the cylinder, the gas dissolves in the acetone to create a stable solution.

Which hazard classes use this pictogram?

Only gases under pressure use this pictogram.

Are there other potential hazards associated with gases under pressure?

There are many other hazards associated with gases under pressure.

- **Health** - Many gases under pressure have other properties, such as being toxic, flammable, corrosive or reactive. If these properties meet the criteria for other classes, they will also use the hazard pictogram for that class (e.g., flammable gas).
- All compressed gases are hazardous because of the high pressure inside the cylinder. Gas can be released deliberately by opening the cylinder valve, or accidentally from a broken or leaking valve. Even at a low pressure, gas can flow rapidly from an open or leaking cylinder. Damaged cylinders can rocket or spin out of control causing significant injury and damage. This type of incident is often caused when an uncapped or unsecured cylinder has been knocked over, breaking the cylinder valve.
- **Asphyxiation (suffocation)** - Inert gases such as argon, helium, neon and nitrogen are not toxic and do not burn or explode but they can cause injury or death by asphyxiation if they displace the oxygen in a space. For example, a litre of liquid nitrogen forms 700 litres of nitrogen gas at room temperature.
- **Frostbite** - Gases escaping from a cylinder may be very cold and cause frostbite. Severe frostbite can lead to serious permanent damage to unprotected skin or eyes. Some gases may be labelled as cryogenic which means the escaping gas is capable of causing frostbite.

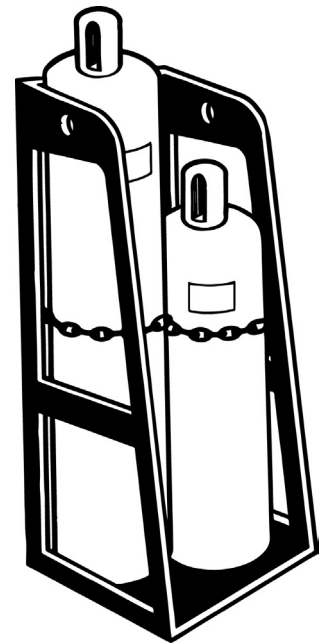
Key handling information for gases under pressure

- Understand all of the hazards associated with the product, and how to use it safely. Consult the safety data sheet for information about the hazards and necessary precautions for the gas you are using.
- Prevent the release of gas into the workplace. Use compressed gases only in well-ventilated areas. Close all valves when cylinders are not in use.
- Use the smallest practical cylinder size for a particular job.
- Keep away from flames and heat sources. No smoking.
- Inspect all cylinders and valves for damage and proper labels. Make sure cylinders are not giving off odours or making hissing sounds. Never open a damaged valve.
- Secure cylinders to a wall or rack in an upright position. Leave the cylinder cap in place until the cylinder is secured and ready for use.
- Use the appropriate regulator. Make sure that equipment is compatible with cylinder pressure and contents. Do not use homemade adaptors or force connections between cylinder valve and gas handling equipment. Never tamper with safety devices in cylinders, valves or equipment.
- Do not apply any lubricant, jointing compound or tape to cylinder valves, fittings or regulator threads. Keep dirt, rust, oil or grease away from all cylinders or fittings.
- Do not drop or bang cylinders against each other. Move cylinders using a hand truck or cart designed for the purpose.
- Maintenance personnel must be aware of the possible hazards and any special procedures and precautions before they begin to work.

- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that appropriate fire extinguishers are available. Be aware of at least two different exit paths in the event of fire.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
- Avoid direct skin contact with extremely cold liquids or compressed gases escaping from the cylinder. Never wear watches, rings or bracelets because they can freeze to exposed skin if splashed by a cold gas. When using gases that are harmful by skin contact (e.g., frostbite), wear protective gloves, aprons or other clothing depending on the risk of skin contact.
- Always wear eye protection when working with gases under pressure. Wear chemical safety goggles – safety glasses may not provide enough protection. In some cases, a faceshield will also be necessary.
- If personal protective equipment is required, the employer must ensure that workers are thoroughly trained in its selection, fit, use and maintenance. Refer to the SDS for guidance on selection.

Key storage information for gases under pressure

- Store compressed gas cylinders in cool, dry, well-ventilated areas, away from incompatible materials and ignition sources. Ensure that the storage temperature does not exceed 52°C (125°F). No smoking. Keep away from exits. Post warning signs.
- Store compressed gas cylinders in the upright position and securely fastened in place with cylinder valve protection cap in place.
- Avoid storing large quantities if possible. Do not keep cylinders longer than the supplier recommends.
- Properly and promptly dispose of “empty” or unlabelled cylinders.
- Ensure that appropriate firefighting equipment is readily available.
- Follow bylaws and regulations such as fire codes and health and safety regulations that apply to the workplace in your jurisdiction.



Corrosion pictogram



What are corrosive products?

Any product that can chemically damage or destroy steel or aluminum is considered corrosive to metals.

This pictogram is also used to indicate two health hazard classes for products that can cause destructive, irreversible damage to the skin and eyes. The two hazard classes are:

- Skin corrosion/irritation - skin corrosion (Cat. 1, 1A, 1B and 1C)
- Serious eye damage/eye irritation - serious eye damage (Cat. 1)

Corrosive products such as strong acids and strong bases can attack (corrode) metal or our skin/eyes. Common acids include hydrochloric acid, nitric acid and sulfuric acid. Common bases are sodium hydroxide (caustic soda) and ammonia. Check the labels and read the SDS (Section 10: Stability and reactivity) for additional information.

What hazard classes use this pictogram?

This pictogram is used by the corrosive to metals hazard class (physical hazard group) to indicate products that can cause corrosion or damage to metal containers and structures upon contact.

This pictogram is also used by two health hazard classes for products that can cause destructive, irreversible damage to the skin and/or eyes.

This pictogram indicates that the damage caused by exposure to the corrosive material is very significant and likely irreversible. Lower hazard categories (e.g., skin or eye damage that will heal/be reversible) for the two health classes will use the exclamation mark pictogram or no pictogram in some cases.

Are there other potential hazards associated with corrosive products?

- Containers can become weak and eventually leak or collapse, spilling the contents into the workplace. Corrosives can also damage metal equipment and building components which may lead to injuries and collapse of structures.
- Many corrosive products, both liquid and solid, generate large amounts of heat when they are mixed with water. For example, a glass of water thrown into a bucket of concentrated sulfuric acid is converted instantly to steam, which will eject the entire contents of the bucket into the air. If the corrosive requires dilution with water, always add the corrosive to water (do not add water to a corrosive), slowly, in small amounts, with frequent stirring. Always use cold water.
- Corrosive products often have additional hazards such as reactivity, flammability, and toxicity.
- Corrosives are incompatible with many other chemicals and may result in toxic or explosive products if they contact each other. The SDS for a corrosive will explain which metals or other products, such as plastics or wood, it will attack (check Section 10: Stability and reactivity). Pay attention to using the proper containers.

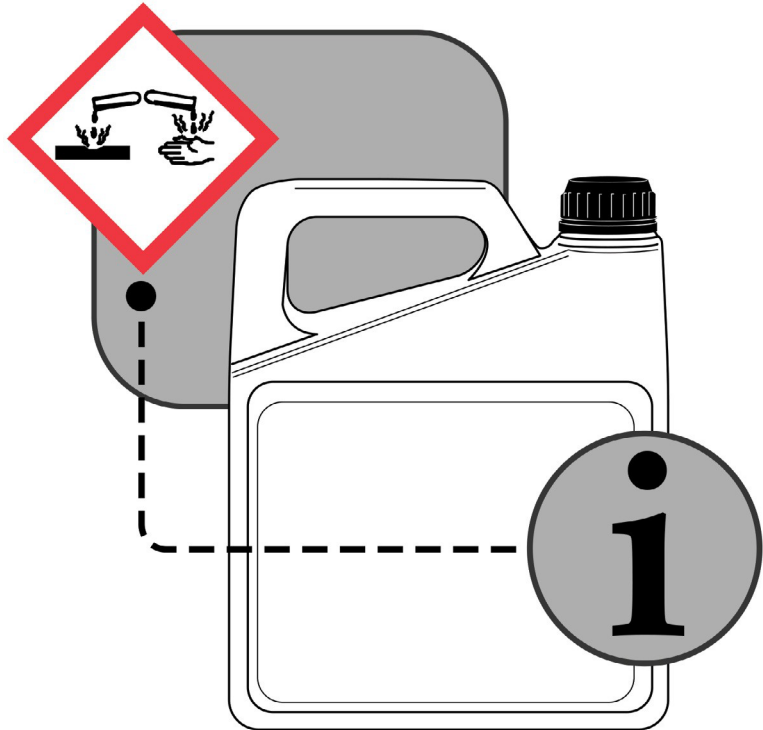
Key handling information for corrosives

- Understand all of the hazards associated with the product and how to use it safely. Consult the SDS for information about the hazards and necessary precautions for the corrosive product you are using.
- Inspect containers of corrosive product for damage or leaks before handling.
- Do not add water to corrosive products because this can cause a violent reaction. If it is absolutely necessary to mix a corrosive with water, do so by slowly adding the corrosive to cold water, in small amounts, and stir frequently.
- Prevent the release of corrosive product (dust, mist, gas or vapour) into the workplace.
- Use corrosive products only in well-ventilated areas. Use the smallest amount necessary.
- Dispense corrosives carefully and keep containers closed when not in use. Use corrosion-resistant equipment such as pumps, scoops or shovels.
- Use only the types of resistant containers recommended by the manufacturer or supplier.
- Move containers of corrosive products with caution. Move large drums using drum cradles. Carboy caddies and safety bottle carriers are available for smaller, common container sizes.
- Avoid direct contact with corrosive products. Clean up any spills and buildups of corrosives promptly and safely. Immediately report leaks, spills or failures of the safety equipment (e.g., ventilation system). In the event of a spill or leak, exit the area immediately.
- Do not smoke, drink, chew gum or eat in areas where these products are used. Wash hands before eating, drinking, smoking or going to the toilet. Avoid touching your skin with contaminated hands. Clean your skin thoroughly at the end of the work day. Remove and clean contaminated clothing before wearing it again, or discard it.
- Do not reuse empty containers. Hazardous corrosive residue could remain inside.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area and know how to use them. These devices must be tested regularly.
 - Flush contaminated eyes or skin with water for at least 20-30 minutes, sometimes longer, in case of accidental contact. Call immediately for emergency medical assistance.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, non-sparking tools, etc.). Avoid using combustible or reactive materials such as paper towels or sawdust) to clean up or absorb spills.
 - Ensure that appropriate fire extinguishers are available. Be aware of at least two different exit paths in the event of fire.
- Wear the appropriate personal protective equipment as specified by your employer for the job. This equipment may include respiratory protection, goggles, face shield and chemical protective clothing like an apron and gloves made from corrosion-resistant material.
- If personal protective equipment is required, the employer must ensure that workers are thoroughly trained in its selection, fit, use and maintenance. Refer to the SDS for guidance on selection.



Key storage information for corrosives

- Inspect containers and storage area regularly for signs of leakage or damage. Store in the original, labelled, shipping container.
- Store containers at a convenient height for handling, below eye level if possible. High shelving increases the risk of dropping containers and the severity of damage, injury and/or exposure if a fall occurs.
- Keep the amount of these products in storage as low as possible.
- It is good practice to use a first in/ first out policy and to mark the date that the container was received and the date it was first opened.
- Store in containers that the chemical supplier recommends (usually the same container in which the material was shipped).
- Store away from incompatible materials and in a cool, dry, well-ventilated area and out of direct sunlight. Store corrosive on plastic trays. Keep away from incompatible materials. Check the SDS for specific information. Post warnings signs.
- Use proper corrosive storage cabinets for large quantities of corrosive products. These units have corrosion-resistant interiors and hardware (e.g., door hinges and shelf brackets). Flammable storage cabinets are not corrosion-resistant.
- Ensure that appropriate firefighting and spill cleanup equipment is readily available.
- Empty containers may contain hazardous residue. Store separately. Keep closed.
- Follow bylaws and regulations such as fire codes and health and safety regulations that apply to the workplace in your jurisdiction.



Skull and crossbones pictogram



What is acute toxicity?

These products are fatal, toxic or harmful if inhaled, following skin contact, or if swallowed.

Acute toxicity refers to effects occurring following skin contact or ingestion exposure to a single dose, or multiple doses given within 24 hours, or an inhalation exposure of four hours.

Acute toxicity could result from exposure to the product itself, or to a product that, upon contact with water, releases a gaseous substance that is able to cause acute toxicity.

Toxicity of a material does not change, but the risk of exposure from using it can be controlled and minimized through proper handling and storage practices.

For example: A highly toxic chemical can have a low health hazard if it is used with proper precautions and care. On the other hand, it is possible that a chemical of low toxicity may present a high health hazard if it is used inappropriately. These differences make proper handling and control measures very important.

Which hazard classes use this pictogram?

The only class that uses this pictogram is acute toxicity.

There are many categories within the acute toxicity class. There are categories used to describe the different ways the product can enter the body (oral (ingested/eaten), dermal (skin), or inhalation (breathed in)).

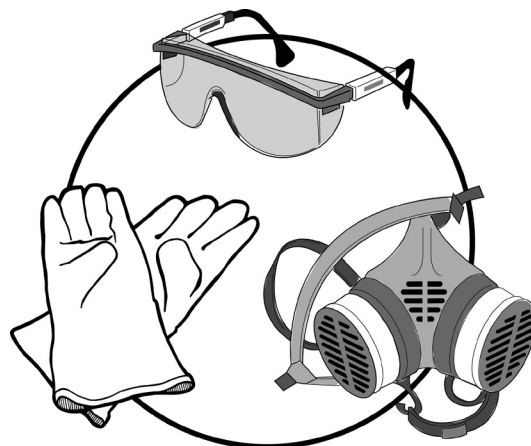
Are there other hazards associated with acute toxicity?

- Other health hazards - It is not uncommon for toxic products to have other health hazards associated with it besides acute toxicity.
- A toxic product may also have other properties such as being corrosive, flammable or reactive. Always read the label and the SDS to be sure you understand what is in the product and how to work with it safely.

Key handling information for acute toxicity hazards

- Consult the label and SDS for information about all of the hazards and potential routes of exposure and be aware of the necessary precautions for the product you are using.
- If it is not possible to eliminate the toxic product, evaluate whether it is feasible to substitute a less hazardous product (e.g., products that are acute toxicity category 3 or 4 are less toxic than acute toxicity category 1 or 2).

- Avoid generating or releasing toxic product into the air (e.g., as vapours/mists/aerosols/dusts). Keep containers tightly closed when not in use.
- Reduce the amount that is used. Do not stockpile.
- Work with the smallest amount possible.
- Use only in well-ventilated areas.
- Maintain good housekeeping (e.g., clean surfaces, no accumulation of dust).
- Avoid dry sweeping of solid products. Use a pre-wetting technique or vacuum equipped with high efficiency filter(s) instead.
- Inspect containers of toxic product for damage or leaks before handling. Open containers slowly and carefully to prevent spillage and dispersal into the air.
- Never eat, drink, smoke or chew gum in work areas where toxic products are used.
- Wash hands regularly throughout the day, including before washroom breaks, before lunch or coffee breaks, or any other instances where an employee leaves the area.
- Report spills, leaks or problems with control measures immediately.
- Maintenance personnel need to know about the possible hazards of the products they might be exposed to.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE etc.).
 - Be aware of the typical symptoms of an overexposure and appropriate first aid procedures. Any signs of illness should be reported immediately to the supervisor.
 - Ensure that appropriate medical response is available (e.g., antidotes, copy of SDS for emergency physician, firefighter, etc)
- If personal protective equipment is required, the employer must ensure that workers are thoroughly trained in its selection, fit, use and maintenance. Refer to the SDS for guidance on selection. Emergency respiratory protection may be required in some situations.



Key storage information for acute toxicity hazards

- Store in a cool, dry, well-ventilated area, away from direct sunlight and exit paths. Post warning signs. Be aware of any other special storage conditions.
- Avoid storing large quantities if possible.
- Inspect containers and storage area regularly for signs of leakage or damage. Contain spills or leaks by storing in trays made from compatible materials.
- Keep containers closed and sealed with tight-fitting lids.
- Empty containers may contain hazardous residue. Store separately. Keep closed.
- Store containers at a convenient height for handling, below eye level if possible. High shelving increases the risk of dropping containers and the severity of damage, injury and/or exposure if a fall occurs.
- Ensure that appropriate firefighting and spill cleanup equipment is readily available.
- Follow bylaws and regulations such as fire codes and health and safety regulations that apply to the workplace in your jurisdiction.

Health hazard pictogram



What types of health hazards are covered by this pictogram?

This pictogram is used for products that cause chronic health effects and those products with targeted health effects.

Chronic health effects occur from exposure to a product over a period of time, often measured in days, months or years. Long-term health effects such as carcinogenicity (cancer-causing) or respiratory sensitization are included under this pictogram. In addition, this pictogram is used for products which can cause targeted health impacts on a specific organ system (such as the kidneys, nerves or liver) that develop after a single exposure or after repeated exposure.

Chronic toxicity is different than acute toxicity. Acute toxicity refers to immediate health effects as a result of exposure to a toxic product. Chronic toxic effects tend to develop over time, often as a result of long-term exposure to a particular product. As an example, smoking a single cigarette is unlikely to cause a lasting toxic effect but smoking many cigarettes over time is linked with numerous adverse health effects. Chronic toxicity can also refer to a persistent adverse health effect that occurred as a result of a short-term exposure to a toxic product. For some chronic toxicity hazards, there is no known safe amount to which a person can be exposed.

Which hazard classes use this pictogram?

This pictogram is used by a number of hazard classes in the health hazard group. If you see this pictogram on a product, it indicates that regular exposure could result in serious health issues. The health impacts will not be obvious right away. Always read the SDS and compare it with the label for the product. Understand how to use the product safely. Ask questions if you are not sure.

The hazard classes that use this hazard pictogram are:

- **Respiratory or skin sensitization - Respiratory sensitizer (Category 1, 1A and 1B)** - A respiratory sensitizer is a product that may at first cause a person to experience symptoms similar to a cold or allergies, such as hay fever. With continued exposure, the symptoms progress and can resemble asthma, with symptoms such as chest tightness, shortness of breath, difficulty breathing and/or coughing. A severe attack could result in death without proper medical attention.
- **Germ cell mutagenicity** - This hazard class includes products that can cause permanent changes (mutations) to the cells that can be passed on to future generations.
- **Carcinogenicity** - This hazard class includes products that can cause cancer.
- **Reproductive toxicity** - This hazard class addresses products that have a negative impact on sexual function and fertility in adult males and females. It also addresses developmental toxicity in the developing fetus. There is an additional category which includes product that may impact children who are breastfeeding, but the health hazard pictogram is not used for this category.

- **Specific target organ toxicity - single exposure (STOT – single) (Cat. 1 and 2)** - This hazard class covers products that can have an impact on specific organs or systems in the body (e.g., liver, kidneys, blood) following a single exposure. Category 3 under STOT – single does not use the health hazard pictogram; instead, it uses the exclamation mark. This category is for products that cause respiratory tract irritation or narcotic effects (such as drowsiness or dizziness).
- **Specific target organ toxicity - repeated exposure (STOT – repeated)** - This hazard class covers products that can have an impact on specific organs or systems in the body (e.g., liver, kidneys, blood) following prolonged or repeated exposures.
- **Aspiration hazard** - This hazard class is for liquids or solids that can enter the lungs, either through swallowing or from vomiting. Once the product enters the lungs, it can cause serious injury, such as chemical pneumonia (which can also be fatal). The primary factor that determines the risk of aspiration is viscosity or whether the liquid is thin (more like water) or thick (more like honey). Low viscosity hydrocarbons (e.g., thin like turpentine and gasoline) can enter the lungs easily.

Are there other hazards associated with health hazards?

In addition to chronic toxicity hazards, remember that a product may have additional hazardous properties such as being acutely toxic (i.e., can have immediate toxic effects) or it may have other hazardous properties such as being corrosive or flammable.

Always check the product's SDS and label on the containers to ensure that you know what is being used and the full range of potential hazards associated with a product.

Key handling information for health hazard products

- Check the SDS for information about the hazards and necessary precautions for the product being used.
- If it is not possible to eliminate the chronic toxicity hazard, evaluate whether it is possible to substitute with a less hazardous product.
- Prevent uncontrolled release of the chronic toxicity hazard (e.g., dust, mist, vapour) into the air.
- Use only in well-ventilated areas.
- Reduce the amount that is used. Do not stockpile.
- Work with the smallest amount possible.
- Avoid repeated or long-term skin contact with product or with contaminated equipment or surfaces.
- Keep work surfaces clean. Wipe up spills. Prevent accumulation of dust or other forms of residue. Prevent contamination of surfaces that unprotected personnel may use.
- Inspect all containers for damage or leaks before handling. Keep containers tightly closed when not in use or empty.
- Do not reuse empty containers – hazardous residue could remain inside.
- Immediately report leaks, spills or failures of the safety equipment (e.g., ventilation system). In the event of a spill or leak, exit the area immediately.

- Never eat, drink, smoke or chew gum in work areas where chronic toxicity hazards are used.
- Maintenance personnel need to know the possible hazards of the products they might be exposed to.
- Wash hands regularly throughout the day, including before washroom breaks, before lunch or coffee breaks or any other instances where an employee leaves the area.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE etc.).
 - Be aware of the typical symptoms of an overexposure and appropriate first aid procedures. Any signs of illness should be reported immediately to the supervisor. In event of a possible exposure, get medical attention. Symptoms can be delayed.
- If personal protective equipment is required, the employer must ensure that workers are thoroughly trained in its selection, fit, use and maintenance. Refer to the SDS for guidance on selection. Emergency respiratory protection may be required in some situations.

Key storage information for health hazard products hazards

- Inspect containers and storage area regularly for signs of leakage or damage. Store in the original, labelled, shipping container.
- Keep amount in storage to an absolute minimum.
- Keep products hazards cool and dry, in a well-ventilated area and away from direct sunlight. Post warning signs. Restrict access to authorized personnel only.
- Keep products away from incompatible materials. Check the SDS for specific information.
- Store the product on shelves closest to floor level (avoid storage above eye level). Do not store on high cabinets or shelves.
- Keep containers closed. Keep in closed containers with tight-fitting lids.
- Empty containers may contain hazardous residue. Store separately. Keep closed.
- Ensure that appropriate firefighting and spill cleanup equipment is readily available.
- Follow bylaws and regulations such as fire codes and health and safety regulations that apply to the workplace in your jurisdiction.

Exclamation mark pictogram



What kind of health effects are covered by this pictogram?

This pictogram refers to health hazards such as skin irritation or sensitization and eye irritation.

Which hazard classes use this pictogram?

The health impacts covered by this pictogram may not be obvious to the worker right away, but the effects are generally reversible and of relatively short duration with proper medical treatment (and when further exposure is prevented). Always read the SDS and compare it with the label for the product. Understand how to use the product safely. Ask questions if you are unsure.

The hazard classes that use this hazard pictogram are:

- **Respiratory or skin sensitization - skin sensitizer (Category 1, 1A and 1B)** - Skin sensitization is an allergic-type skin response involving symptoms such as itching, swelling, blisters and redness. Often an individual does not show any symptoms after the first exposure, but with subsequent exposures, the skin reacts. Products such as latex (e.g., in gloves) and nickel are common skin sensitizers.
- **Specific target organ toxicity - single exposure (Category 3)** - This category includes products that can cause irritating effects on the respiratory tract such as coughing and throat irritation.
- **Skin corrosion/irritation - skin irritation (Category 2)** - This category includes products which can cause reversible damage such as redness or inflammation after exposure.
- **Serious eye damage/eye irritation - eye irritation (Category 2 and 2A)** - This category includes irritant products causing reversible effects within 21 days of exposure, or products that are severe skin irritants.
- **Acute toxicity - Oral, Dermal, Inhalation (Category 4)** - A product in this category fits the defined LD₅₀ or LC₅₀ values. It is used for products that are known to be harmful if swallowed, if inhaled, or when they come in contact with the skin.

* Note: the exclamation mark may also be used to indicate products that contribute to the depletion of the ozone layer. Recall that classification and labelling of the environmental hazard group is not mandatory in Canada. However, suppliers may indicate these hazards on labels and SDSs if they choose to.

Are there other hazards associated with products with this pictogram?

In addition to meeting the criteria for this hazard pictogram, remember that a product may have additional hazardous properties, such as being acutely toxic (i.e., can have immediate toxic effects) or it may have other hazardous properties, such as being corrosive or flammable.

Always check the product's SDS and the label on the containers to ensure that you know what is being used and the full range of potential hazards associated with a product.

Key handling information for products using the exclamation mark pictogram

- Check the SDS for information about the hazards and necessary precautions for the product you are using.
- If it is not possible to eliminate the product, evaluate whether it is possible to substitute with a less hazardous product.
- Prevent uncontrolled release (e.g., dust, mist, vapour) into the air or the environment.
- Use in well-ventilated areas.
- Prevent contamination of surfaces that unprotected personnel may use.
- Avoid repeated or prolonged skin contact with product or with contaminated equipment or surfaces.
- Keep work surfaces clean. Wipe up spills. Prevent accumulation of dust or other forms of residue.
- Inspect all containers for damage or leaks before handling.
- Never eat, drink, smoke or chew gum in work areas.
- Wash hands regularly throughout the day, including before washroom breaks, before lunch or coffee breaks, or any other instances where an employee leaves the area.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE etc.).
 - Be aware of the typical symptoms of an overexposure and appropriate first aid procedures. Any signs of illness should be reported immediately to the supervisor.
- If personal protective equipment is required, the employer must ensure that workers are thoroughly trained in its selection, fit, use and maintenance. Refer to the SDS for guidance on selection. Emergency respiratory protection may be required in some situations.

Key storage information for products using the exclamation mark pictogram

- Inspect containers and storage areas regularly for signs of leakage or damage. Store in the original, labelled, shipping container.
- Keep cool and dry in a well-ventilated area and away from direct sunlight. Keep containers closed.
- In general, store away from process and production areas and away from incompatible materials. Check the SDS for specific information pertaining to incompatible materials and conditions to avoid.

Environment pictogram



What are hazards to the environment?

This hazard pictogram is used for products that can have a negative effect on the aquatic environment. Recall that classification and labelling of this hazard group is not mandatory in Canada. However, suppliers may indicate these hazards on labels and SDSs if they choose to.

If the product only has this pictogram, the main concern is its toxicity for aquatic life. If the material has other pictograms, it is also hazardous to humans in the workplace (e.g., physical or health hazards).

Aquatic hazards may include acute hazards to the aquatic environment, which evaluates short-term toxic impacts on various aquatic life forms such as fish, crustaceans, algae and aquatic plants. It also includes long-term hazards to the aquatic environment, which evaluates long-term (chronic) negative impacts on aquatic life forms such as bioaccumulation (buildup of material in organism) and degradation (persistence, or how long it will remain in the environment). Examples of long-term impacts for the aquatic environment could include reduced spawning, genetic problems in offspring and behavioural changes.

Which hazard classes use this pictogram?

This pictogram covers acute (short-term) effects and chronic (long-term) effects on aquatic life.

Key handling and storage for environmental hazards

- Check the SDS for information about the hazards and precautions.
- Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, etc.). Contain spill quickly by diking with spill socks or suitable absorbent material (kitty litter, vermiculite, etc.). Do not leave spill site unattended.
- Dispose of product as hazardous waste properly, not by flushing down the drain.
- Prevent product from contaminating ground water, surface waters and sewer system. Protect floor drains, and cover the opening to sewer if able to do so and appropriate.
- Store the product in a secure, dry, well-ventilated location. Storage area should have sills and prevent leaks from escaping into sewers.
- Regularly inspect and maintain the equipment used for handling the substance.
- Use secondary containment for containers such as drip trays to contain leaks or spills. Empty trays regularly to avoid overflow. Monitor use of product. Unexpected increased use may indicate leakage.
- Isolate loading and unloading areas from surface water drainage systems. If not possible, protect drains using covers, sandbags, etc.
- Be aware of applicable legislation in your jurisdiction concerning materials that are hazardous to the environment (e.g., permits). Report leaks, spills to the people responsible for handling emergencies where you work.

Biohazardous infectious materials pictogram



What are biohazardous infectious materials?

These materials are organisms or the toxins they produce that can cause diseases in people or animals. Included in this class are bacteria, viruses, fungi and parasites. As these organisms can live in body tissues and fluids, they should be treated as toxic. Urine and feces should be treated as toxic only if they are visibly contaminated with blood.

Which hazard classes use this pictogram?

Only biohazardous infectious materials use this pictogram.

Where are biohazardous infectious materials found?

Biohazardous infectious materials are usually found in a hospital, health-care facility, laboratories, veterinary practices and research facilities. Workers in these places do not usually know which tissues or fluids contain dangerous organisms. For this reason, the workers assume that every sample is hazardous and proper protection is used all the time. Examples of biohazardous infectious materials include the AIDS/HIV virus, Hepatitis B and salmonella.

Materials in this class should only be used or handled by individuals who are trained and aware of the hazards and how to control them. This level of training is beyond the scope of this course.

Hazard class summary

There are 25 hazard classes used by GHS and six additional classes specific to WHMIS. There are too many to go through individually for a course like this and, in reality, very few people would work with all of them.

ALL of the hazard classes are included in the instructor manual. The hazard classes that are included in the participant workbook are highlighted below. If you find that different classes are required for your particular training course or workplace, your instructor will make copies of these hazard class summaries for you.

Physical hazards group	Health hazards group	Environmental hazards group*
Explosives*	Acute toxicity	Hazardous to the aquatic environment
Flammable gases	Skin corrosion/irritation	Hazardous to the ozone layer
Flammable aerosols	Serious eye damage/eye irritation	
Oxidizing gases	Respiratory or skin sensitization	
Gases under pressure	Germ cell mutagenicity	
Flammable liquids	Carcinogenicity	
Flammable solids	Reproductive toxicity	
Self-reactive substances and mixtures	Specific target organ toxicity - single exposure	
Pyrophoric liquids	Specific target organ toxicity - repeated exposure	
Pyrophoric solids	Aspiration hazard	
Self-heating substances and mixtures	Plus	
Substances and mixtures which, in contact with water, emit flammable gases	Biohazardous infectious materials	
Oxidizing liquids	Health hazards not otherwise classified	
Oxidizing solids		
Organic peroxides		
Corrosive to metals		
Plus		
Combustible dusts		
Simple asphyxiants		
Pyrophoric gases		
Physical hazards not otherwise classified		

*The explosive class and environmental hazard classes have not been adopted by WHMIS.

Physical hazards - flammable aerosols

A flammable aerosol is considered to be a product that contains one or more flammable components in an aerosol dispenser and that, when dispensed, is liable to ignite. Examples include spray paint, deodorants or adhesives. Often the propellant is a flammable product, such as propane, butane and isobutane. Sometimes the product suspended in the propellant is flammable as well (e.g., an adhesive).

Table 8: Flammable aerosols

Hazard category	Hazard communication elements	
1	Pictogram	
	Signal word	Danger
	Hazard statement	Extremely flammable aerosol
		Pressurized container: May burst if heated
2	Pictogram	
	Signal word	Warning
	Hazard Statement	Flammable aerosol
		Pressurized container: May burst if heated.

Key precautions

- Understand all of the hazards associated with the product and how to use it safely. Read the label and the SDS thoroughly.
- Store in a cool, dry area but protect from freezing. Keep out of direct sunlight. Do not store in areas with high temperatures, open flames or other ignition sources. Avoid basement storage, or spaces which also have a heat source, such as gas heaters, fireplaces or boilers. Store large quantities of flammable aerosols in a flammable storage cabinet and separate from other flammable or incompatible materials.
- Minimize the release of flammable aerosol into the workplace air.
- Keep away from heat sources or open flame. Remove combustible materials in the area. No smoking. Be aware of dangers such as flashback (flammable aerosol flashing back into the container and resulting in an explosion).
- Protect aerosol cans from damage, such as drops or punctures.
- Inspect the container before each use for signs of damage or corrosion. Do not use if damaged. Use open cans and older cans first.
- Use only in well-ventilated areas. Use only the smallest amount necessary for the job. Non-sparking ventilation systems and equipment may be required.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
- If personal protective equipment is needed, be sure you have the correct training in its selection, use, fit and maintenance.

Physical hazards - gases under pressure

This class covers different types of gases which are stored under pressure in a container. The gas may be compressed, liquefied, chilled or dissolved in a carrier material.

Table 10: Gases under pressure

Hazard category	Criteria	Hazard communication elements	
Compressed gas	Compressed gases are gases that are entirely gaseous at -50° C (i.e., it is a permanent gas). Examples: oxygen, nitrogen, helium and argon	Pictogram	
		Signal word	Warning
		Hazard statement	Contains gas under pressure; may explode if heated
Liquefied gas	This is a gas which, when packaged under pressure, is partially liquid at temperatures above -50°C. Examples: anhydrous ammonia, chlorine, propane	Pictogram	
		Signal word	Warning
		Hazard statement	Contains gas under pressure; may explode if heated
Dissolved gas	This is a gas that is dissolved in a liquid phase solvent. Example: acetylene	Pictogram	
		Signal word	Warning
		Hazard statement	Contains gas under pressure; may explode if heated
Refrigerated liquefied gas	A gas which when packaged is made partially liquid because of its low temperature. Examples: carbon dioxide, nitrogen, oxygen, LNG (liquefied natural gas)	Pictogram	
		Signal word	Warning
		Hazard statement	Contains refrigerated gas; may cause cryogenic burns or injury

Key precautions for gases under pressure:

- Understand all of the hazards associated with the product, and how to use it safely. Check the SDS for information about the hazards and necessary precautions for the type of pressurized gas being used.
- Prevent the release of gas into the workplace. Use only in well-ventilated areas and avoid confined spaces. An oxygen-deficient atmosphere can occur very quickly. Oxygen-monitoring systems may be necessary.
- Use the smallest possible quantity for the job.
- Avoid direct skin contact with extremely cold liquids or compressed gases escaping from the cylinder. Wear cold insulating gloves and either a face shield or eye protection, if recommended.
- Carefully check all connections before use and periodically during use, to be sure they are tight, clean, in good condition and not leaking.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary. If personal protective equipment is needed, be sure you have the correct training in its selection, use, fit and maintenance.

Cylinders

- Store compressed gas cylinders in cool, dry, well-ventilated areas, away from incompatible materials and ignition sources. Make sure that the storage temperature does not exceed 52°C (125°F).
- Do not allow flames to contact cylinders. No smoking.
- Secure cylinders to a wall or rack in an upright position. Leave the cylinder cap in place until the cylinder is secured and ready for use.
- Use the appropriate regulator. Ensure that equipment is compatible with cylinder pressure and contents. Do not use homemade adaptors or force connections. Never tamper with safety devices in cylinders, valves or equipment.
- Inspect cylinders for damage and proper labels. Never open a damaged valve. Ensure cylinders are not giving off odours or hissing sounds.
- Do not apply any lubricant, jointing compound or tape to cylinder valves, fittings or regulator threads. Keep dirt, rust, oil or grease away from all cylinders or fittings.
- Do not drop or bang cylinders against each other. Move cylinders using a hand truck or cart designed for the purpose.
- Report leaks immediately and evacuate if appropriate.
- Properly and promptly dispose of empty or unlabelled cylinders.
- Do not keep cylinders longer than the supplier recommends.

Cryogenics




- Prevent frostbite by never allowing cryogenic liquids to touch your skin. Never wear watches, rings or bracelets, because they can freeze to exposed skin if splashed by an ultracold gas.
- Always wear loose-fitting thermally insulated gloves when handling anything that may have been in contact with a cryogen.
- Wear eye protection and a face shield when working with a cryogen.
- Store cryogen containers in cool, dry, well-ventilated areas, away from incompatible materials and ignition sources.
- Ensure that pressure relief valves are working properly and are not frozen shut.
- Never tamper with safety devices on vessels, valves or equipment.
- Fill containers only with the liquids for which they were designed. Label each container. Fill vessels to the indicated level only. Do not overfill.
- Proceed slowly when filling a container or inserting objects into a cryogen to minimize boiling and splash.

Physical hazards - flammable liquids

For a fire to occur, three elements must come together at the same time and in the right proportions: fuel, heat (e.g., an ignition source such as a spark) and air/oxygen. A key to fire prevention and working safely with flammable products is to make sure that the three elements are not present together in the right amounts at any given time. In workplace settings, controlling the fuel (e.g., flammable product), keeping quantities low, and eliminating sources of ignition are ways to handle flammable products safely.

Flammable liquids are very common in the workplace. There are four categories of flammable liquids. A category 1 (extremely flammable liquid and vapour) is more hazardous than a category 4 (combustible liquid).

Table 11: Flammable liquids

Hazard category	Hazard communication elements	
1	Pictogram	
	Signal word	Danger
	Hazard statement	Extremely flammable liquid and vapour
2	Pictogram	
	Signal word	Danger
	Hazard statement	Highly flammable liquid and vapour
3	Pictogram	
	Signal word	Warning
	Hazard statement	Flammable liquid and vapour
4	Pictogram	<i>No pictogram</i>
	Signal word	Warning
	Hazard statement	Combustible liquid

Key precautions

Handling precautions

- Check the label and SDS for information about the hazards and necessary precautions for the flammable liquid being used.
- Use the smallest amount of flammable liquid necessary for the job.
- Use flammable liquids only in well-ventilated areas. Minimize the risk of fire/explosion by preventing the release of the products into the workplace air. Keep containers tightly closed.
- Eliminate ignition sources and combustible materials (e.g., oily rags, cardboard boxes) from areas where flammable products are used. Make sure that there is no smoking on the premises. Keep work areas clean and tidy.
- Keep flammable liquids out of direct sunlight and away from incompatible materials (e.g., strong oxidizers). Do not heat containers containing flammable products.
- In some cases, non-sparking ventilation systems and equipment (such as non-sparking tools) may be necessary.
- Ground and bond containers during transfer operations to prevent buildup of static charge.
- Dispose of dirty rags or other waste contaminated by flammable liquids in approved flammable waste cans (not regular garbage). Empty these containers on a regular basis.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that appropriate fire extinguishers are available in the immediate work area (e.g., dry chemical or carbon dioxide). Flammable liquid fires require Class B type of extinguishers. Never use a solid stream of water to extinguish a flammable liquid fire, because it can cause the fuel to scatter, spreading the flames.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, non-sparking tools, etc.). Avoid using combustible materials such as paper towels or sawdust to clean up or absorb spills.
- If personal protective equipment is needed, be sure you have the correct training in its selection, use, fit and maintenance.

Storage precautions

- Use equipment designed for flammable liquid storage – e.g., flammable storage fridge, flammable storage cabinets or flammable safety cans. Make sure these devices are labelled and sealed or vented appropriately.
- Do not store with other types of products. Check SDS for incompatibles (such as oxidizing products).
- In general, avoid storing flammable liquids in basements. Ground floor storage is usually preferred as it provides easier access for emergency situations.
- Make sure that storage rooms have properly designed ventilation systems that are regularly maintained.
- Keep away from potential ignition sources such as heat, sparks or open flames. No smoking in the area. Post warning signs. Never store beside exits or in a way that blocks access.
- Inspect storage areas regularly for any deficiencies such as damaged or leaking containers. Provide drip trays and empty them often wherever recurring leakages occur.
- The local fire code will specify the quantity of flammable liquids that may be stored at the workplace in your jurisdiction.

Physical hazards - oxidizing liquids




Oxidizing liquids are a significant fire hazard. An oxidizing liquid is any liquid which can provide oxygen or contribute to the combustion of other material more than air does. Common oxidizing liquids include nitric acid, perchloric acid and hypochlorites.

Oxygen is a necessary component for a fire to burn. Oxidizers do not usually burn by themselves but they present a significant hazard because they will:

- Increase the intensity and speed of a fire by providing more oxygen.
- Cause materials that normally do not burn to suddenly catch on fire, sometimes even without an ignition source (e.g., spontaneous combustion).

Fires fuelled by oxidizing products are hard to extinguish and can spread quickly.

Table 14: Oxidizing liquids

Hazard category	Hazard communication elements	
1	Pictogram	
	Signal word	Danger
	Hazard statement	May cause fire or explosion; strong oxidizer
2	Pictogram	
	Signal word	Danger
	Hazard statement	May intensify fire; oxidizer
3	Pictogram	
	Signal word	Warning
	Hazard statement	May intensify fire; oxidizer

Key precautions


- Check the label and safety data sheet for information about the hazards and necessary precautions for the product being used.
- Use only in well-ventilated areas. Use the smallest amount necessary for the job. Keep the amount of these products in storage as low as possible.
- Minimize the risk of fire/explosion by preventing release into the workplace air. Keep containers closed when not in use.
- Keep away from incompatible materials. Check the SDS for specific information and recommendations.
- Keep away from heat and eliminate ignition sources such as sparks or open flames. Keep combustible materials away from area where the material is used (e.g., oily rags, cardboard boxes). No smoking.
- Keep work surfaces clean. Promptly and properly clean up spilled product using non-combustible materials. Avoid spilling product and contaminating the skin or clothing.
- Inspect containers and storage area regularly for signs of leakage or damage. Contain spills or leaks by storing in trays made from compatible materials.
- Be very cautious about mixing oxidizers with water. Follow the chemical supplier's directions. Some oxidizers will generate large amounts of heat when they are mixed with water.
- Never return unused product to the original container.
- Do not reuse empty containers – hazardous residue could remain inside.
- Keep in a cool and dry, in a well-ventilated area and away from direct sunlight and according to any other conditions that may be required.
- Do not use wooden pallets or other combustible pallets for storing containers of oxidizing products.
- Walls, floors, shelving, and fittings in storage areas should be constructed of non-combustible materials.
- Do not smoke, eat or drink in work areas. Wash hands thoroughly after handling.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that appropriate fire extinguishers are available.
 - Be aware of at least two different exit paths in the event of fire.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Have spill control procedures and equipment ready. Avoid using combustible materials (such as paper towels) to wipe or clean up spills.
- If personal protective equipment is needed, be sure you have the correct training in its selection, use, fit, and maintenance. Fire resistant or flame-retardant clothing may be recommended.



Physical hazards - corrosive to metals

This class covers products that are corrosive to metals (i.e., can damage or destroy metals such as steel and aluminum). Common corrosive products are nitric acid, hydrochloric acid and sodium hydroxide solutions. When a corrosive eats through a container, the contents may leak or spill and cause damage, or may injure workers in the area.

Table 21: Corrosive to metals

Hazard category	Hazard communication elements	
1	Pictogram	
	Signal word	Warning
	Hazard statement	May be corrosive to metals

Key precautions

- Understand all of the hazards associated with the product and how to use it safely. Check the SDS for information about the hazards and necessary precautions for the corrosive product you are using.
- Keep in original packaging. Inspect containers of corrosive product for damage or leaks before handling.
- Do not add water to corrosive products because this can cause a violent reaction. If it is absolutely necessary to mix a corrosive with water, do so slowly adding the corrosive to cold water, in small amounts, and stir frequently.
- Prevent the release of corrosive product (dust, mist, gas or vapour) into the workplace.
- Use only in well-ventilated areas. Use the smallest amount necessary. Keep the amount of these products in storage as small as possible.
- Dispense corrosives carefully and keep containers closed when not in use. Use corrosion-resistant equipment such as pumps, scoops or shovels to handle corrosive products. Clean up any spills and buildups of corrosives promptly and safely.
- Use only the types of resistant containers recommended by the manufacturer or supplier.
- Do not touch drums that are swollen or damaged. Report the condition to your supervisor immediately. Drums may need to be vented periodically by trained personnel in order to release pressure buildup. The SDS will indicate if and how often this procedure is required.
- Avoid direct contact with corrosive products. Wear appropriate personal protective equipment as specified by your employer for the job. This equipment may include respiratory protection, goggles, face shield and chemical protective clothing like an apron and gloves made from corrosion-resistant material.
- Wash hands before eating, drinking, smoking, or going to the toilet. Avoid touching your skin with contaminated hands. Clean your skin thoroughly.

- Remove and clean contaminated clothing before wearing it again, or discard it.
- Do not reuse empty containers - a hazardous corrosive residue could remain inside.
- Maintenance personnel need to know the possible hazards of the products they might be exposed to.
- Store away from incompatible materials and in a cool, dry, well-ventilated area and out of direct sunlight.
- Use corrosive storage cabinets for large quantities of corrosive materials. These units have corrosion-resistant interiors and hardware (e.g., door hinges and shelf brackets). Flammable storage cabinets are not corrosion-resistant.
- If the corrosive product is not stored in specific acid or base cabinets, store the product on shelves closest to floor level (avoid storage above eye level). Do not store corrosive products on high cabinets or shelves.






- Store containers in trays. This system provides a secondary containment and is recommended as backup in case of container failure or breakage. Ensure each containment device is compatible with the corrosive product and will contain the full volume of the containers it is holding.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that appropriate fire extinguishers are available.
 - Be aware of at least two different exit paths in the event of fire.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Know where the closest eyewash station and safety shower are located and how to use them. Flush contaminated eyes or skin with water for the time as recommended on the SDS or as directed by a medical professional. Call immediately for emergency medical assistance.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, etc.).
- If personal protective equipment is needed, be sure you have the correct training in its selection, use, fit and maintenance.


Health hazards - acute toxicity

The acute toxicity class uses the skull and crossbones or the exclamation mark pictogram to indicate chemicals that can cause adverse health effects. These products are fatal, toxic or harmful if inhaled, following skin contact, or if swallowed. Acute toxicity refers to effects occurring following skin contact or ingestion exposure to a single dose, or multiple doses given within 24 hours, or an inhalation exposure of four hours. Acute toxicity could result from exposure to the product itself, or to a product that, upon contact with water, releases a gaseous substance that is able to cause acute toxicity.

The SDS and label will indicate if one or more routes of exposure is a concern. For some products, the primary concern may be inhalation. For others, skin contact and absorption may be more of an issue. For many products, there are multiple routes of exposure that are a concern. Read the SDS and label carefully to fully understand the true nature of the hazard.

Table 26: Acute toxicity

Hazard category	Hazard communication elements	
1	Pictogram	
	Signal word	Danger
	Hazard statement	Fatal if swallowed (oral) Fatal in contact with skin (dermal) Fatal if inhaled (inhalation)
2	Pictogram	
	Signal word	Danger
	Hazard statement	Fatal if swallowed (oral) Fatal in contact with skin (dermal) Fatal if inhaled (inhalation)
3	Pictogram	
	Signal word	Danger
	Hazard statement	Toxic if swallowed (oral) Toxic in contact with skin (dermal) Toxic if inhaled (inhalation)

Hazard category	Hazard communication elements	
4	Pictogram	
	Signal word	Warning
	Hazard statement	Harmful if swallowed (oral) Harmful in contact with skin (dermal) Harmful if inhaled (inhalation)

Key precautions

- Check the label and SDS for information about the hazards and potential routes of exposure and necessary precautions for the product you are using.
- Try to eliminate use of the product or substitute with a less hazardous one.
- Avoid generating or releasing product into the air (e.g., as vapours/mists/aerosols/dusts). Keep containers tightly closed when not in use.
- Use only in well-ventilated areas.
- Reduce the amount that is used and keep working quantities to a minimum – do not stockpile.
- Use the appropriate personal protective equipment, where necessary. If PPE is needed, be sure you have the correct training in its selection, use, fit and maintenance.
- Maintain good housekeeping (e.g., clean surfaces, no accumulation of dust). Avoid dry sweeping of solid materials. Use a pre-wetting technique or vacuum equipped with high efficiency filter(s) instead.
- Store in the original labelled shipping container. Inspect containers of toxic product for damage or leaks before handling. Inspect containers and storage area regularly for signs of leakage or damage. Secondary containment of toxic containers is recommended as backup in case of container failure or breakage.
- Store containers of toxic products in a secure location, away from process and production areas and away from incompatible materials.
- Empty containers may contain hazardous residue. Store separately. Keep closed.
- Store containers at a convenient height for handling, below eye level if possible.



- Open containers slowly and carefully to prevent spillage and dispersal into the air.
- Never eat, drink, smoke or chew gum in work areas where toxic products are used.
- Wash hands before eating, drinking, smoking or going to the toilet. Avoid touching your skin or eyes with contaminated hands. Clean thoroughly at the end of the work day. Remove and clean contaminated clothing before wearing it again, or discard it.
- Maintenance personnel need to know the possible hazards of the products they might be exposed to.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE etc.).
 - Be aware of the typical symptoms of an overexposure and appropriate first aid procedures. Any signs of illness should be reported immediately to the supervisor.
 - Ensure that appropriate medical response is available (e.g., antidotes, copy of SDS for emergency physician, firefighter, etc.)

Health hazards - skin corrosion/irritation

Materials that can cause irreversible (permanent) damage to exposed skin are considered to be a Category 1 (1A, 1B, or 1C) skin corrosion. Examples are strong acids and bases (e.g., pH less than 2) and pH greater than 11.5 (very strong alkali or basic). Category 2 materials are classed as skin irritation. Category 2 products can cause reversible skin damage.

Table 27: Skin corrosion/irritation

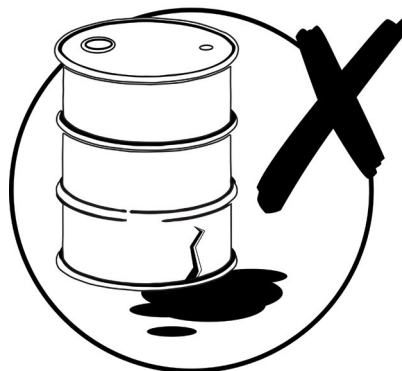
Hazard category	Hazard communication elements	
Skin corrosion 1, 1A to 1C	Pictogram	
	Signal word	Danger
	Hazard statement	Causes severe skin burns and eye damage
Skin irritation 2	Pictogram	
	Signal word	Warning
	Hazard statement	Causes skin irritation

Key precautions

- Understand all of the hazards associated with the product and how to use it safely. Check the label and SDS for information about the hazards and necessary precautions.
- Prevent uncontrolled release (e.g., liquid, dust, mist, vapour) into the workplace air.
- Use only in well-ventilated areas. Use the smallest amount necessary.
- Avoid direct contact, particularly with corrosive products.
- Wear appropriate personal protective equipment. This equipment may include respiratory protection, goggles, face shield and gloves. If PPE is needed, be sure you have the correct training in its selection, use, fit and maintenance.





- Avoid repeated or long-term skin contact with product, or with contaminated equipment or surfaces.
- Inspect containers for damage or leaks before handling.
- Open containers slowly and carefully. Dispense carefully and keep containers closed when not in use. Clean up any spills or dust buildup promptly and safely.
- Wash hands before eating, drinking, smoking, or going to the toilet. Avoid touching your skin or eyes with contaminated hands. Clean thoroughly at the end of the work day. Remove and clean contaminated clothing before wearing it again, or discard it.
- Maintenance personnel need to know the possible hazards of the product they might be exposed to.
- Store away from incompatible materials and in a cool, dry, well-ventilated area and out of direct sunlight.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Know where the closest eyewash station and safety shower are located and how to use them. Flush contaminated eyes or skin with water for the time as recommended on the SDS or as directed by a medical professional. Call immediately for emergency medical assistance.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, etc.).
 - Ensure that appropriate fire extinguishers are available.



Health hazards - serious eye damage/eye irritation

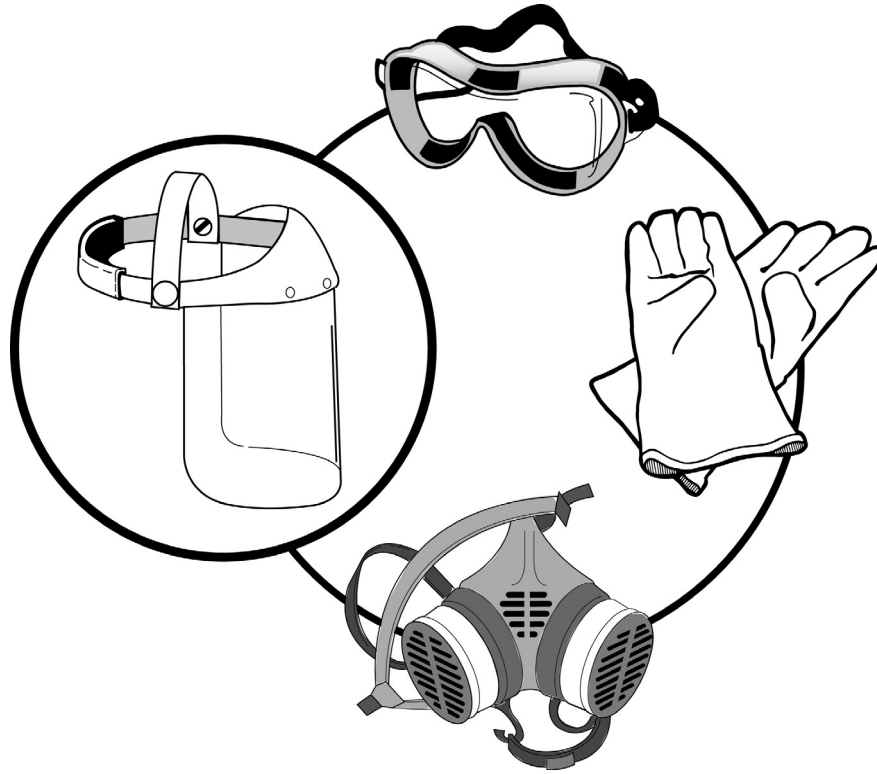
Products that can cause irreversible (permanent) damage to the eyes are category 1. Category 2A is for materials that are moderately irritating to the eyes but the damage is reversible. Category 2B is for mild irritants which cause less damage and reversible damage to the eyes.

Table 28: Serious eye damage/eye irritation

Hazard category	Hazard communication elements	
Serious eye damage 1	Pictogram	
	Signal word	Danger
	Hazard statement	Causes serious eye damage
Eye irritation 2, 2A	Pictogram	
	Signal word	Warning
	Hazard statement	Causes serious eye irritation
Eye irritation 2B	Pictogram	<i>No pictogram</i>
	Signal Word	Warning
	Hazard statement	Causes eye irritation

Key precautions

- Understand all of the hazards associated with the product and how to use it safely. Check the safety data sheet for information about the hazards and necessary precautions.
- Prevent uncontrolled release (e.g., dust, mist, vapour) into the workplace air.
- Use only in well-ventilated areas. Use the smallest amount necessary.
- Inspect containers for damage or leaks before handling.
- Wear appropriate eye protection or goggles to avoid contact with product. A face shield may be necessary. If PPE is needed, be sure you have the correct training in its selection, use, fit and maintenance.





- Open containers slowly and carefully. Dispense carefully and keep containers closed when not in use. Clean up any spills or dust buildup promptly and safely.
- Wash hands before eating, drinking, smoking, or going to the toilet. Avoid touching yourself with contaminated hands. Clean yourself thoroughly at the end of the workday.
- Maintenance personnel need to know the possible hazards of the products they might be exposed to.
- Store away from incompatible materials and in a cool, dry, well-ventilated area and out of direct sunlight.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Know where the closest eyewash station and safety shower are located and how to use them. Flush contaminated eyes or skin with water for the time as recommended on the SDS or as directed by a medical professional. Call immediately for emergency medical assistance.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, etc.).
 - Ensure that appropriate fire extinguishers are available.

Health hazards - carcinogenicity

Agents that cause cancer or increase the risk of cancer are called carcinogens. Carcinogens can enter the body through the skin, lungs, or the digestive system. They can interact with the body directly (i.e., at the site of contact) or indirectly (the body transports, or converts the chemical substance into a carcinogen, that may impact other sites of the body that did not have initial contact). Examples of direct carcinogens are the skin cancers associated with coke oven emissions or from ultraviolet light from unprotected sun exposure. Indirect carcinogens include solvents such as benzene (leukemia - blood cancer) and carbon tetrachloride (liver cancer).

The latency, or time for cancer to develop, can vary. But in all cases, the effects are not immediate. It may range from five to 20 years or more. There is no known safe level that a person can be exposed to for most carcinogens. People react differently and it cannot be predicted. For example, some people smoke multiple packs of cigarettes a day for 20 years but do not develop lung cancer. Yet others may smoke fewer cigarettes over a short time and develop cancer. Because of this variability, carcinogen exposure should be avoided or kept to the lowest level possible.

Table 32: Carcinogenicity

Hazard category	Hazard communication elements	
1, 1A, 1B	Pictogram	
	Signal word	Danger
	Hazard statement	May cause cancer
2	Pictogram	
	Signal word	Warning
	Hazard statement	Suspected of causing cancer

Key precautions

- Understand all of the hazards associated with the product and how to use it safely. Check the label and SDS for information about the hazards and necessary precautions.
- Avoid using potential carcinogens if possible. Use a less hazardous substitute.
- Prevent uncontrolled release (e.g., dust, mist, vapour) into the workplace air. Use appropriate engineering controls. Closed handling systems can prevent the release of the materials into the workplace. Use only in well-ventilated areas. Use the smallest amount necessary.
- Restrict access to areas where these products are used. Post warning signs.
- Wear appropriate personal protective equipment, if necessary, to avoid all contact. This equipment may include protective clothing, respiratory protection, goggles, face shield and gloves. If PPE is needed, be sure you have the correct training in its selection, use, fit and maintenance.
- Inspect containers for damage or leaks before handling. Open containers slowly and carefully. Dispense carefully and keep containers closed when not in use.
- Clean up any spills or dust buildup promptly and safely. Avoid dry mopping/dry sweeping if product can get airborne. Wet mopping or a vacuum cleaner equipped with a HEPA filter should be used.
- Wash hands before eating, drinking, smoking or going to the toilet. Avoid touching your skin with contaminated hands. Clean your skin thoroughly at the end of the work day. Remove contaminated clothing promptly and store in a closed container. Discard or decontaminate and launder contaminated clothing before rewearing.
- Report leaks, spills or ventilation failures immediately.
- Maintenance personnel need to know the possible hazards of the products they might be exposed to.
- Do not reuse empty containers. Empty containers may contain hazardous residues.
- Store away from incompatible materials and in a cool, dry, well-ventilated area and out of direct sunlight.
- Understand and practice emergency procedures so that you know what to do if it becomes necessary.
 - Ensure that eyewash and an emergency shower are readily available in the immediate work area. These devices must be tested regularly.
 - Know where the closest eyewash station and safety shower are located and how to use them. Flush contaminated eyes or skin with water for the time as recommended on the SDS or as directed by a medical professional. Call immediately for emergency medical assistance.
 - In the event of exposure, move to fresh air. Alert others of potential exposure.
 - Have spill control procedures and equipment ready (e.g., absorbent spill control materials, PPE, etc.)

6. Workplace-specific training

It is very important to be able to answer the following questions about each and every product you work with.

- What are the hazards of the product?
 - You should be able to read and understand the label and SDS, as well as be aware of any possible harmful effects of the product used.
- How are you protected from those hazards?
 - An understanding of the controls used in the workplace is necessary, whether these controls are accomplished by engineering controls, administration, or by using personal protective equipment.
- What do you do in case of an emergency?
 - Understanding the procedures to follow in the event of a spill, release, fire or poisoning involving a hazardous product is required. Included in the understanding is the use of PPE that may be necessary only in the case of emergency.
- Where can you get hazard information?
 - You should be able to show that you know how to get the information provided by the labels and SDSs. You should be able to look at a label (or other ways that products are identified) and know what the label means. You must also know how to find the SDS (either in a binder location, or by accessing a computer) so that you have a way to get this information when you need it.

The following activity will get you to look at the answers to these questions for products in your workplace.

According to Saskatchewan OH&S legislation, your employer must:

- Inform you about all hazard information concerning the specific hazardous products in your workplace.
- Educate and train you to be able to apply this hazard information to protect your health and safety.
- Consult with your OHC about this education and training program.
- Periodically test your knowledge in WHMIS.
- Annually review WHMIS education and training program with the OHC, or when changes occur in workplace conditions and/or hazard information.

This means you can expect to see in your site-specific WHMIS program at your workplace:

- An inventory of all hazardous products in your worksite. This means the employer should keep readily available to you a listing of all the hazardous products. Generally, this is kept in the front of an SDS binder or as a table of contents in an electronic folder. It is recommended, upon annual review, the inventory be updated and revised, if necessary.
- Education and training regarding the hazardous products specific to your workplace. It is essential workers receive training on the specific hazardous products they will be exposed to or come into contact with in the course of their daily work activities. While a generic WHMIS course will provide education for the worker about the general aspects of WHMIS, it cannot be substituted as site-specific WHMIS training, as performed by the employer.

- Documented procedure(s) to be followed in case of an emergency with a hazardous product. These emergency procedures should stem directly from emergency response information as listed within a hazardous product's SDS.
- A written test or sign-off of practical demonstration of your site-specific WHMIS knowledge performed on a periodic basis. Documentation indicating employees have received site-specific knowledge on the hazardous products in their workplace and can demonstrate this through a written test or practical demonstration or other means helps an employer's due diligence with the right to know.
- Appropriate SDSs be readily available to you by electronic and/or print at all times. Readily available is defined as present in an appropriate place, accessible to a worker at all times, and in the form of a physical copy or an electronic copy.

ACTIVITY: Workplace-specific worksheet

Workplace-specific worksheet	
Date of this review	
Company name	
Department	
Identification of hazards	
Product name	
How is the product used? (Does the usage match with the SDS?)	
Which hazard pictograms and hazard classes/categories are represented?	
What are the hazard statements?	
What types of precautions are required?	
Protection from hazards	
What control measures are used? Are controls necessary? (e.g., general or local ventilation? Enclosure? Job rotation? etc.)	
Are there work procedures in place to ensure safe handling and storage?	
Is personal protective equipment required?	
Have you received training for PPE? (e.g., how to properly fit, maintain, store, when to replace, etc.)	

Workplace-specific worksheet

Are you trained to respond to a spill or accidental release?

How is hazardous waste collected and disposed?

What do you do in an emergency? (e.g., fire, spill, first aid)

Where is the spill kit located?

What do you do if the spill or release is too large or too hazardous to deal with?

What is done with the waste from the spill?

Where is the first aid kit located?

Who are the designated first aid responders and how/where to contact them?

What is the procedure when someone needs medical attention?

Where are the eyewash or emergency showers?

Where are the fire extinguishers?

Do you know how to use the fire extinguisher? When not to use it?

Workplace-specific worksheet
Where is the fire alarm pull station?
Name two exit paths from the work area.
In the event of a building evacuation, where do you meet outside the building?
Where do you get further information?
Are there labels on all hazardous products?
Where are the SDSs located? Is it accessible and easy to get a SDS if needed?
Are the SDSs available electronically (on computer) or in a binder (paper)?
Do you review the SDS for each product before use?
Who do you contact in the workplace if you have any questions about the SDS or other questions about the product?
Who is your health and safety worker co-chair, health and safety committee member, or representative, and what is their contact number/location?

Appendix A: Canadian government departments responsible for occupational health and safety

Canadian Centre for Occupational Health and Safety (CCOHS)

Inquiries & Client Services

(free answers to your OH&S questions)

135 Hunter St. E

Hamilton, ON L8N 1M5

Phone: 905.570.8094

(8:30 a.m. to 5:00 p.m. EST)

Toll-free: 1.800.668.4284 (Canada and US only)

Fax: 905.572.4500

Email: clientservices@ccohs.ca

OSH Answers website: ccohs.ca/oshanswers

Website: ccohs.ca

General contact

Phone: 905.572.2981

Fax: 905.572.2206

Alberta

Occupational Health and Safety

Alberta Job, Skills, Training and Labour

10th Floor Seventh Street Plaza, South Tower

10030-107 St.

Edmonton AB T5J 3E4

General inquiries: 780.415.8690; Fax: 780.422.3730

Workplace health and safety call centre: 1.866.415.8690

Website: humanservices.alberta.ca/working-in-alberta/53.html

British Columbia

WorkSafeBC

6951 Westminster Highway

P.O. Box 5350 STN Terminal

Richmond BC V6B 5L5

Health and safety questions 606.276.3100; 1.888.621.SAFE (7233)

General inquiries: 604.273.2266

After hours safety and health emergency reporting: 604.273.7711; 1.888.621.SAFE (7233)

Fax: 604.276.3247

Website: worksafebc.com

Manitoba

SAFE Manitoba

Website: safemanitoba.com

For more information on SAFE Work programs, materials or programming, call:
204.957-SAFE (957.7233) in Winnipeg or
1.866.929.SAFE (1.866.929.7233) outside Winnipeg

Workplace Safety and Health - Manitoba
1.866.888.8186 or 204.945.6848

To report serious workplace incidents, injuries or fatalities: 204.945.3446 or toll-free in Manitoba at
1.866.888.8186. After hours call 204.945.0581.

New Brunswick

WorkSafeNB

Saint John - Head Office

1 Portland St.

P.O. Box 160

Saint John, NB E2L 3X9

Phone: 506.632.2200 or 1.800.222.9775

Web Site: worksafenb.ca

Newfoundland and Labrador

Occupational Health and Safety Branch, Service NL

15 Dundee Ave.

Mount Pearl NL A1N 4R6

Phone: 1.800.563.5471

Occupational Health and Safety: gs.gov.nl.ca/ohs

Contact list/regional offices: gs.gov.nl.ca/department/contact.html#ohs

Northwest Territories and Nunavut

Workers' Safety and Compensation Commission of the Northwest Territories and Nunavut

P.O. Box 888

Yellowknife, NT X1A 2R3

Phone: 867.920.3888; 1.800.661.0792

Fax: 867.873.4596

Iqaluit Office: 867.979.8500; 1.877.404.4407

Fax: 867.979.8501

Website: wscc.nt.ca

Nova Scotia

Occupational Health & Safety Division
Nova Scotia Labour and Advanced Education
P.O. Box 697
5151 Terminal Rd.
Halifax, NS B3J 2T8
Occupational Health and Safety (all inquiries)
1.800.9LABOUR (1.800.952.2687)
Phone: 902.424.5400
Fax: 902.424.5640
Website: gov.ns.ca/lae/ohs

Ontario

Occupational Health and Safety Branch
Ministry of Labour
505 University Avenue, 19th Floor
Toronto, ON M7A 1T7
General Inquiries: 1.877.202.0008 (in Ontario only)
Fax: 416.326.7761
labour.gov.on.ca/english/hs
Regional offices: labour.gov.on.ca/english/about/reg_offices.php

Prince Edward Island

Safe Workplaces
Workers' Compensation Board
P.O. Box 757, 14 Weymouth St.
Charlottetown PE C1A 7L7
General Inquiries: (902) 368.5680; 1.800.237.5049 (in Atlantic Canada only)
Fax: 902.368.5696
Website: wcb.pe.ca

Quebec

Commission de la santé et de la sécurité du travail du Québec
(Occupational Health and Safety Commission)
C P 6056, Succursale Centre.ville
Montréal PQ H3C 4E1
General Inquiries: 1.866.302.CSST (2778)
CSST website: csst.qc.ca/en/Pages/all_english_content.aspx
Contact list/regional offices: csst.qc.ca/nous_joindre/Pages/repertoire_general.aspx

Saskatchewan

Occupational Health and Safety
Ministry of Labour Relations and Workplace Safety
1870 Albert St., 6th Floor
Regina SK S4P 3V7
General Inquiries: 306.787.4496; 1.800.567.7233
Fax: 306.787-2208
Website: saskatchewan.ca

Yukon

Occupational Health and Safety Branch
Yukon Workers' Compensation, Health and Safety Board
401 Strickland St.
Whitehorse YTY1A 5N8
General Inquiries 867.667.5645; 1.800.661.0443
Fax: 867.393-6279
Website: wcb.yk.ca

Appendix B: Sample SDS for group activity

SDS for Cleans SUPER Great

Sample Safety Data Sheet

(for illustrative purposes only)

Cleans SUPER Great

SECTION 1. IDENTIFICATION

Product Identifier	Cleans SUPER Great
Other Means of Identification	ID-999
Recommended Use	Concentrated cleaner.
Restrictions on Use	None.
Manufacturer / Supplier	ABZ Company, 123-5th Street, Anywhere, Ontario, N0N 0N0
Emergency Phone No.	E. Responder, 555-222-3333, 24/7
SDS No.	0164
Date of Preparation	February 02, 2014

SECTION 2. HAZARDS IDENTIFICATION

Classification

Flammable liquid - Category 2; Eye irritation - Category 2A; Skin sensitization - Category 1; Specific target organ toxicity single exposure - Category 3; Aspiration hazard - Category 1

Label Elements

Pictogram: Flame; Exclamation mark; Health hazard

Signal Word: Danger

Hazard Statement(s):

Highly flammable liquid and vapour.
 Causes serious eye irritation.
 May cause an allergic skin reaction.
 May cause drowsiness or dizziness.
 May be fatal if swallowed and enters airways.

Precautionary Statement(s):

Prevention:
 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
 Keep container tightly closed.
 Ground and bond container and receiving equipment.
 Use explosion-proof electrical, ventilating, lighting, and other equipment.
 Use non-sparking tools.
 Take action to prevent static discharges.
 Avoid breathing mist, vapours, spray.
 Wash hands and skin thoroughly after handling.
 Use only outdoors or in a well-ventilated area.
 Contaminated work clothing should not be allowed out of the workplace.
 Wear protective gloves, protective clothing, eye protection and face protection.

Response:

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTRE or doctor if you feel unwell.

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SDS for Cleans SUPER Great cont'd

IF ON SKIN (or hair): Take off immediately all contaminated clothing and wash it before re-use. Wash skin with plenty of water. If skin irritation or rash occurs: Get medical advice or attention.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention.

IF SWALLOWED: Immediately call a POISON CENTRE or doctor. Do NOT induce vomiting.

In case of fire: Use carbon dioxide, dry chemical powder, appropriate foam to extinguish.

Storage:
 Store locked up.
 Keep container tightly closed.
 Store in a well-ventilated place. Keep cool.

Disposal:
 Dispose of contents and container in accordance with local, regional, national and international regulations.

Other Hazards
 None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Concentration %
Acetone	67-64-1	35
Diethylene glycol monoethyl ether	111-90-0	25
Terpene	CBI*	5
Naphtha (petroleum), hydrotreated heavy	64742-48-9	5

Notes

*CBI, under review. CBI = Confidential Business Information. HMIRA Registration No.: 1234. Filing Date: January 04, 2012. (Terpene)
 Concentrations are expressed in % volume/volume.

SECTION 4. FIRST-AID MEASURES

First-aid Measures

Inhalation

Move to fresh air. Keep at rest in a position comfortable for breathing. Call a Poison Centre or doctor if you feel unwell or are concerned.

Skin Contact

Take off contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Immediately rinse with lukewarm, gently flowing water for 15-20 minutes. If skin irritation or a rash occurs, get medical advice/attention. Thoroughly clean clothing, shoes and leather goods before reuse or dispose of safely.

Eye Contact

Immediately rinse the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face. Remove contact lenses, if present and easy to do. If eye irritation persists, get medical advice/attention.

Ingestion

Immediately call a Poison Centre or doctor. Do not induce vomiting.

Most Important Symptoms and Effects, Acute and Delayed

If inhaled: at high concentrations symptoms may include headache, nausea, dizziness, drowsiness and confusion.
 If on skin: may cause an allergic skin reaction in some people. Symptoms include redness, rash, itching and swelling.

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SDS for Cleans SUPER Great cont'd

If in eyes: symptoms include sore, red eyes, and tearing.
If swallowed: may be drawn into the lungs if swallowed or vomited, causing severe lung damage. Symptoms may include coughing, shortness of breath, difficult breathing and tightness in the chest.

Immediate Medical Attention and Special Treatment

Special Instructions

Not applicable.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media

Carbon dioxide, dry chemical powder or appropriate foam. Use water to keep non-leaking, fire-exposed containers cool.

Unsuitable Extinguishing Media

Water is not effective for extinguishing a fire. It may not cool product below its flash point.

Specific Hazards Arising from the Chemical

Highly flammable liquid and vapour. Can ignite at room temperature. Releases vapour that can form explosive mixture with air. Can be ignited by static discharge.

May travel a considerable distance to a source of ignition and flash back to a leak or open container. May accumulate in hazardous amounts in low-lying areas especially inside confined spaces, resulting in a fire and/or health hazard.

Closed containers may rupture violently when heated releasing contents.

In a fire, the following hazardous materials may be generated: very toxic carbon monoxide, carbon dioxide. As well, other toxic and irritating compounds, such as formaldehyde, methanol, acetic acid, hydrogen peroxide, methane and ethylene oxide may be formed, depending on fire conditions.

Special Protective Equipment and Precautions for Fire-fighters

Evacuate area. Approach fire from upwind to avoid hazardous vapours or gases.

Stop leak before attempting to put out the fire. Product could form an explosive mixture and reignite. Keep containers cool to avoid bursting.

Before entry, especially into confined areas, use an appropriate monitor to check for: toxic gases or vapours, flammable or explosive atmosphere.

Dike and recover contaminated water for appropriate disposal.

Fire-fighters may enter the area if positive pressure SCBA and full Bunker Gear is worn. If there is potential for skin contact with concentrated cleaner: chemical protective clothing (e.g. chemical splash suit) and positive pressure SCBA may be necessary. See Skin Protection in Section 8 (Exposure Controls/Personal Protection) for advice on suitable chemical protective materials.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures

Concentrated product: evacuate the area immediately. Isolate the hazard area. Keep out unnecessary and unprotected personnel. Eliminate all ignition sources. Use grounded, explosion-proof equipment. Distant ignition and flashback are possible.

Increase ventilation to area or move leaking container to a well-ventilated and secure area. Do not touch damaged containers or spilled product unless wearing appropriate protective equipment. Use the personal protective equipment recommended in Section 8 of this safety data sheet.

Review Section 7 (Handling) of this safety data sheet before proceeding with clean-up.

Before entry, especially into confined areas, check atmosphere with an appropriate monitor. Monitor area for flammable or explosive atmosphere.

Product (diluted as directed): use the personal protective equipment recommended in Section 8 of this safety data sheet. No other special precautions are necessary.

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SDS for Cleans SUPER Great cont'd

Environmental Precautions

Concentrated product: do not allow into any sewer, on the ground or into any waterway. If the spill is inside a building, prevent product from entering drains, ventilation systems and confined areas.

Methods and Materials for Containment and Cleaning Up

Concentrated product: small spills or leaks: contain and soak up spill with absorbent that does not react with spilled product. Do NOT use combustible materials such as sawdust. Place used absorbent into suitable, covered, labelled containers for disposal.

Concentrated product: large spills or leaks: cover the spill surface with the appropriate type of foam to reduce the release of vapour. Dike spilled product to prevent runoff. Remove or recover liquid using pumps or vacuum equipment. Dike and recover contaminated water for appropriate disposal. Store recovered product in suitable containers that are tightly-covered.

Product (diluted as directed): no special clean-up methods are necessary.

Other Information

Report spills to local health, safety and environmental authorities, as required.

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling

When handling diluted product: no special handling precautions are necessary.

When handling concentrated product: only use where there is adequate ventilation. Avoid generating vapours or mists. Keep containers tightly closed when not in use or empty. Electrically bond and ground equipment. Ground clips must contact bare metal. Eliminate heat and ignition sources such as sparks, open flames, hot surfaces and static discharge. Post "No Smoking" signs. Use non-sparking tools. Wear personal protective equipment to avoid direct contact with this chemical.

Do NOT smoke in work areas. Wash hands thoroughly after handling this material. Immediately remove contaminated clothing using the method that minimizes exposure. Keep contaminated clothing under water, in closed containers. Launder clothes before re-wearing. Inform laundry personnel of product hazard(s). Do not take contaminated clothing home.

Conditions for Safe Storage

Concentrated product: store in an area that is: temperature-controlled, well-ventilated, out of direct sunlight and away from heat and ignition sources, an approved, fire-resistant area, separate from incompatible materials (see Section 10: Stability and Reactivity). Store in a closed container.

Protect from conditions listed in Conditions to Avoid in Section 10 (Stability and Reactivity). Keep amount in storage to a minimum. Avoid bulk storage indoors.

Comply with all applicable health and safety regulations, fire and building codes.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Chemical Name	ACGIH® TLV®		OSHA PEL		AIHA® WEEL™	
	TWA	STEL [C]	TWA	Ceiling	8-hr TWA	Short-term TWA [C]
Acetone	500 ppm A4	750 ppm	750 ppm		Not established	
Diethylene glycol monoethyl ether	Not established		Not established		25 ppm	
Terpene	Not established		Not established		30 ppm	

Product Identifier: Cleans SUPER Great

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SDS for Cleans SUPER Great cont'd

Naphtha (petroleum), hydrotreated heavy	Not established		Not established		Not established	
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Consult local authorities for provincial or state exposure limits.
 ACGIH® = American Conference of Governmental Industrial Hygienists. TLV® = Threshold Limit Value. TWA = Time-Weighted Average. STEL = Short-term Exposure Limit. A4 = Not classifiable as a human carcinogen.
 OSHA = US Occupational Safety and Health Administration. PEL = Permissible Exposure Limits. AIHA® = AIHA® Guideline Foundation. WEEL™ = Workplace Environmental Exposure Limit.

Appropriate Engineering Controls

General ventilation is usually adequate. Provide eyewash and safety shower if contact or splash hazard exists. When handling large quantities of concentrated product: use a local exhaust ventilation and enclosure, if necessary, to control amount in the air. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored.

Individual Protection Measures

Eye/Face Protection

Do not get in eyes. Wear chemical safety goggles.

Skin Protection

Prevent all skin contact. Wear chemical protective clothing e.g. gloves, aprons, boots.

Suitable materials are: Barrier® (PE/PA/PE), Silver Shield/4H® (PE/EVAL/PE), Tychem® Responder, Tychem® TK.

The following materials should NOT be used: neoprene rubber, nitrile rubber, polyvinyl alcohol.

Respiratory Protection

Not normally required if product is used as directed.

Concentrated product: wear a NIOSH approved air-purifying respirator with an organic vapour cartridge.

For non-routine or emergency situations: wear a NIOSH approved air-purifying respirator with an organic vapour cartridge, or, wear a NIOSH approved self-contained breathing apparatus (SCBA) or supplied air respirator.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Basic Physical and Chemical Properties

Appearance	Colourless liquid.
Odour	Citrus
Odour Threshold	Not available
pH	Not available
Melting Point/Freezing Point	-94.6 °C (estimated) (freezing)
Initial Boiling Point/Range	56 °C
Flash Point	< -18 °C (closed cup)
Evaporation Rate	Not available
Flammability (solid, gas)	Not applicable (liquid).
Upper/Lower Flammability or Explosive Limit	Not available (upper); Not available (lower)
Vapour Pressure	180 mm Hg at 20 °C (Acetone)
Vapour Density (air = 1)	> 3 (estimated)
Relative Density (water = 1)	0.86 at 20 °C
Solubility	Soluble in water
Partition Coefficient, n-Octanol/Water (Log Kow)	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Viscosity	14.2 mm ² /s at 40 °C (kinematic)

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Other Information

Physical State Liquid

SECTION 10. STABILITY AND REACTIVITY

Reactivity

Not reactive. Not sensitive to mechanical impact.

Chemical Stability

Normally stable.

Possibility of Hazardous Reactions

None expected under normal conditions of storage and use.

Conditions to Avoid

Open flames, sparks, static discharge, heat and other ignition sources.

Incompatible Materials

Oxidizing agents (e.g. peroxides), strong bases (e.g. sodium hydroxide), reducing agents (e.g. hydroquinone).
Not corrosive to metals.

Hazardous Decomposition Products

During a fire, irritating/toxic gases, such as carbon monoxide, carbon dioxide and other toxic and irritating compounds, such as formaldehyde, methanol, acetic acid, hydrogen peroxide, methane and ethylene oxide may be formed, depending on fire conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Likely Routes of Exposure

Inhalation; skin contact; eye contact; ingestion.

Acute Toxicity

Chemical Name	LC50	LD50 (oral)	LD50 (dermal)
Acetone	30000 ppm (male rat) (4-hour exposure)	5800 mg/kg (female rat)	> 16000 mg/kg (rabbit)
Diethylene glycol monoethyl ether	Not available	1920 mg/kg (rat)	6000 mg/kg (rat)
Terpene	Not available	5300 mg/kg (rat)	> 5000 mg/kg (rabbit)
Naphtha (petroleum), hydrotreated heavy	Not available	Not available	Not available

Skin Corrosion/Irritation

May cause mild irritation based on information for closely related chemicals.

Serious Eye Damage/Irritation

Animal tests show serious eye irritation. (Acetone)

STOT (Specific Target Organ Toxicity) - Single Exposure

Inhalation

May cause depression of the central nervous system.

Aspiration Hazard

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May be drawn into the lungs (aspirated) if swallowed or vomited. Symptoms may include coughing, choking, shortness of breath, difficult or rapid breathing, and wheezing.

STOT (Specific Target Organ Toxicity) - Repeated Exposure

Following skin contact: may cause dermatitis.
May cause harmful effects on the kidneys, harmful effects on the liver.

Respiratory and/or Skin Sensitization

Not a respiratory sensitizer.
Skin sensitizer. May cause an allergic reaction (skin sensitization) based on information for closely related chemicals.

Carcinogenicity

Chemical Name	IARC	ACGIH®	NTP	OSHA
Acetone	Not evaluated	A4	Not Listed	Not Listed
Diethylene glycol monoethyl ether	Not evaluated	Not designated	Not Listed	Not Listed
Terpene	Not evaluated	Not designated	Not Listed	Not Listed
Naphtha (petroleum), hydrotreated heavy	Group 3	Not designated	Not Listed	Not Listed

Key to Abbreviations

IARC = International Agency for Research on Cancer. Group 3 = Not classifiable as to its carcinogenicity to humans.
ACGIH® = American Conference of Governmental Industrial Hygienists. A4 = Not classifiable as a human carcinogen.
NTP = National Toxicology Program.

Reproductive Toxicity

Development of Offspring

Animal studies show effects on the offspring. However, these effects are only seen with significant toxicity in the mothers. (Acetone)

Sexual Function and Fertility

Does not cause effects on sexual function or fertility.

Germ Cell Mutagenicity

Not mutagenic.

Interactive Effects

No information was located.

SECTION 12. ECOLOGICAL INFORMATION

This section is not required by WHMIS.
This section is not required by OSHA.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal Methods

Recommended disposal methods are for the product, as sold. (Used material may contain other hazardous contaminants). The required hazard evaluation of the waste and compliance with the applicable hazardous waste laws are the responsibility of the user.

Burn in an approved incinerator according to federal, provincial/state, and local regulations.
Empty containers retain product residue. Follow label warnings even if container appears to be empty. The container for this product can present explosion or fire hazards, even when emptied. Do not cut, puncture, or weld on or near this container.

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SECTION 14. TRANSPORT INFORMATION

Regulations	UN No.	Proper Shipping Name	Transport Hazard Class(es)	Packing Group
Canadian TDG	UN1993	Flammable Liquid N.O.S. (Acetone)	3	II

Special Precautions for User
Not applicable

Transport in Bulk According to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

SECTION 15. REGULATORY INFORMATION

Safety, Health and Environmental Regulations
Canada

Domestic Substances List (DSL) / Non-Domestic Substances List (NDSL)
All ingredients are listed on the DSL/NDSL.

CEPA - National Pollutant Release Inventory (NPRI)
Part 5. (Naphtha (petroleum), hydrotreated heavy)

USA

Toxic Substances Control Act (TSCA) Section 8(b)
All ingredients are listed on the TSCA Inventory.

SECTION 16. OTHER INFORMATION

SDS Prepared By Ima Expert

Phone No. 555-444-3333

Date of Preparation February 02, 2014

Revision Indicators The following SDS content was changed on May 07, 2013:
SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS.

References CHEMINFO database. Canadian Centre for Occupational Health and Safety (CCOHS).
HSDB® database. US National Library of Medicine. Available from Canadian Centre for Occupational Health and Safety (CCOHS).

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Appendix C: WHMIS crossword

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ACROSS

1. A _____ statement is a standardized phrase that describes the hazards of the product.
4. The _____ identifier indicates the name of the product.
6. GHS is the _____ harmonized system of classification and labelling.
8. A hazard _____ defines the degree of hazard within a hazard class.
11. _____ statements provide advice for handling and first aid.
14. One of the properties that defines flammable liquid hazards is the _____ point.
16. Hazard _____ define the type or nature of the hazard present.
18. This pictogram represents products that can cause health effects such as chronic (long term) health effects.

DOWN

2. Safety _____ sheets have 16 sections.
3. The pictogram for the _____ aerosols class is a fire pictogram in the square on a point shaped border.
5. The signal words used are _____ and warning.
6. Physical hazards and health hazards are hazard _____.
7. A pictogram with an O with flames represents an _____.
9. A _____ word is part of the hazard communication for hazard classes and categories.
10. Suppliers must provide a _____ and SDS for all hazardous products covered by the legislation.
12. Materials that can destroy metal containers are _____.
13. Which hazard communication system in Canada has been aligned with GHS?
15. The pictogram for acute toxicity is _____ and crossbones.
17. A health effect that occurs soon after an exposure is an _____ effect.

Appendix D: final test

Connect the pictogram with the appropriate hazard description.



Short exposure can cause death



Health hazard



May intensify fire



Gas under pressure



May be corrosive to metals



Fire hazard

Connect the term on the left with the most appropriate description.

Hazard group	The term used to describe the different hazards.
Hazard class	The number used to indicate the severity of the hazard.
Hazard category	Two major groups include physical and health.

Connect the term on the left with the most appropriate description.

Label element	Purpose
Hazard statement	Name that matches the SDS.
Precautionary statement	Alerts to the severity of the hazard.
Supplier identification	Name, address and telephone number of the supplier.
Signal word	Describes the nature of the hazard.
Product identifier	Describes measures to avoid or minimize the hazard.

Multiple choice

Select the best response:

If you see the flame pictogram, what does this pictogram indicate in most cases? Select the answer that is not correct.

- Always store the material according to the directions on the label and SDS.
- The material should be kept away from flames, heat, sparks, or hot surfaces.
- The material will catch fire easily at normal temperatures.
- Keep ignition sources and fuel sources together.

When you first see a product, what information on the label can you use to help understand what the hazards of a product are?

- Read the hazard statements.
- Understand the pictogram.
- Check which signal word is present (danger or warning).
- All of the above.

Benefits of aligning WHMIS with GHS include:

- Improved, consistent hazard information.
- Better emergency response.
- Easier trade between countries.
- Reducing costs for suppliers.
- All of the above.

You find a container of a product at work, but the label is missing. What should you do?

- Ignore it and walk away.
- Go get the supervisor, identify the product together, and replace the label.
- Smell it to see what the product is.
- All of the above.

Safe handling for gases under pressure includes:

- keeping the cylinders in a warm location above 52° C.
- keeping regulators functional using lubricants and greases.
- using in a well-ventilated area.
- moving the cylinder by rolling it.

Safe handling for flammable liquids includes:

- using the smallest amount possible for the job.
- grounding and bonding containers during dispensing operations.
- using flammable liquid safety cans for storing and transferring flammable liquids.
- avoid all ignition sources and keeping away from combustible materials.
- all of the above.

The pictogram, signal word, and hazard statements work together to tell you about:

- The colour and smell of the product.
- The cost of the product.
- How that product is hazardous.
- The three elements have no meaning when placed together.

Acute toxic materials:

- can cause health effect shortly after exposure.
- can take years to cause an affect.
- will burn your eyes or skin.
- all of the above.

If you were looking at a label, using the pictogram and hazard statement, which one is the most hazardous in terms of skin corrosion/irritation:

- Danger. Causes severe skin burns and eye damage.
- Warning. Causes skin irritation.
- Warning. Causes mild skin irritation.

A signal word is:

- a phrase that describes the hazard.
- a single word used to alert users about the degree of hazard.
- a pictogram that represents the hazard.
- a sub-category of a hazard class.

Regarding labels, when you work with a product, what should you do:

- Check for a label on the product.
- Ask the supervisor if unsure of any aspect of its use or storage.
- Ask for a new label when the old one cannot be seen or read properly.
- All of the above.

The four important questions that are answered by the SDS are:

- Identity, supplier, hazards, and first aid.
- Identity, hazards, precautions, and emergency procedures.
- Precautions, emergency, environment, and storage.
- Hazards, transport, location, and supplier.

Reading the SDS before you work with a product is important because:

- It provides more information than the label.
- It is required by the employer.
- The label provides you with the product name and pictogram.
- The SDS provides medical advice.

The exclamation mark pictogram is used for a number of classes and/or categories. Which of the following uses the exclamation mark pictogram?

- Skin irritation (cat. 2).
- Skin sensitizer (cat. 1).
- Acute toxicity (oral) (cat. 4).
- All of the above.

Which is the better answer? SDSs must be:

- Available in paper form.
- Available in electronic form.
- Available in the supervisor's office.
- Available to all workers in the workplace.

Circle the proper response (True) or (False):

- True or False WHMIS stands for Workplace Hazardous Materials Information System.
- True or False Elements on a label tell you how hazardous a product is. Categories tell you the degree or severity of the hazard. The categories for flammable liquids are correctly showing most hazardous to least hazardous.
- extremely flammable liquid and vapour (cat 1);
 - highly flammable liquid and vapour (cat 2);
 - flammable liquid and vapour (cat 3); and
 - combustible liquid (cat 4)
- True or False The acute toxicity hazard information is shown from most hazardous to least hazardous.
- (no pictogram). Warning. May be harmful if inhaled.
 - Exclamation mark. Warning. Harmful if inhaled.
 - Skull and crossbones. Danger. Toxic if inhaled.
 - Skull and crossbones. Danger. Fatal if inhaled.
- True or False A product can be classified under more than one hazard class.
- True or False The pictogram has a bright yellow circle border.
- True or False In a hazard class, a category 2 is less hazardous than a category 1.
- True or False Danger and warning are signal words
- True or False The exclamation mark pictogram is used for flammable hazards.
- True or False A cancer-causing product will have the same hazard pictogram as a respiratory sensitizer, so it is important to read the label and SDS for more information.
- True or False The health hazard pictogram represents more serious health impacts than the exclamation mark pictogram.
- True or False The health hazard pictogram represents chronic toxicity hazards.



True or False Gases under pressure may be very cold and direct contact can cause frostbite.

True or False Corrosive materials do not cause health effects and only cause damage to metals.

Thank you.

Do you have any questions about WHMIS or the workplace-specific training in your workplace that were not answered? Please list, and the instructor and/or supervisor will discuss these concerns with you.

If you have questions about workplace health and safety, speak to your supervisor.

Appendix E: WHMIS glossary of terms

Please note: A more extensive or current version of these terms can be located at ccohs.ca or by searching “WHMIS glossary, Canadian Centre for Occupational Health & Safety”

Absorption – Intake of a substance through surface areas.

Accidental release measures – The steps to be taken in response to spills, leaks or releases of a hazardous product to prevent or minimize adverse effects.

ACGIH – American Conference of Governmental Industrial Hygienists.

Acid, Acidic – A chemical with a pH value less than seven.

Active Ingredient (A.I.) – The ingredient in a chemical formulation that produces the intended effect

Acute – Of short duration.

Acute toxicity – Can cause fatal, toxic or harmful effects if ingested, inhaled or comes into contact with skin.

Acute toxicity estimate (ATE) – A numerical value used to evaluate acute toxicity, for example LC50 or LD50 or a converted acute toxicity point estimate that is based on an experimentally obtained range or the classification category. For example, the ATE for a mixture is calculated for oral, dermal and inhalation toxicity based on the ATE values for all relevant ingredients and the percentage concentration in the product.

Aerosol – A dispersion of solid or liquid particles.

AIHA – American Industrial Hygiene Association.

Alkali, Alkaline – See Base, Basic.

ANSI – American National Standards Institute.

Antidote – A remedy used to counteract the effects of a poison.

Aqueous – A term used to indicate the presence of water in a solution.

Aromatic solvents – Derivatives of benzene have strong, pleasant odours. They penetrate the skin and may be inhalation hazards, for example toluene, xylene, phenol and cresol.

Asphyxiants – A vapour or gas that can cause unconsciousness or death by suffocation. Two types are:

1. *Simple asphyxiants* – physiologically inert gases which, if present in excess, may dilute oxygen in air to dangerously low levels. Common examples include methane, nitrogen and argon.
2. *Chemicals asphyxiants* – prevent normal delivery of oxygen to body tissues by interfering with the uptake of oxygen by the blood (e.g. carbon monoxide) or interfering with the ability of the cells to use oxygen (e.g. hydrogen cyanide).

ASTM – American Society for Testing and Materials.

Auto-ignition temperature – The lowest temperature at which a vapour from a liquid will ignite without a source of ignition.

Base / Basic – A chemical with a pH value greater than seven. Can also be called alkali or alkaline.

BEI – Biological Exposure Indices.

Bioaccumulative potential – The potential for the substance or certain components of a mixture to accumulate in animal or plant life and possibly pass through the food chain.

Biohazardous – A material that contains bacterial or viruses (germs) that can cause disease in humans.

Boiling point – The temperature at which a liquid changes to a vapour at a given pressure (usually sea level pressure of 760 mm Hg 101.3kPa).

Bonding – When transferring liquid from one container to another, refers to making an electrically conductive connection between the discharge container and receiving container to eliminate the possibility of an electrical spark due to static discharge.

“C” or ceiling – See “Exposure limit.”

CANUTEC – Canadian Transport Emergency Centre.

Carcinogen – A substance or agent capable of producing cancer in mammals.

Carcinogenicity – A hazard class whose products may cause cancer, suspected of causing cancer or increasing the incidence of cancer.

Carrier – A material mixed with active ingredients to make a formulation, for example finely ground clay, diatomaceous earth, water, gas propellant.

CAS registry number – The identification number to a chemical substance by the Chemical Abstracts Service Division of the American Chemical Society.

Caustic – A corrosive chemical with a pH value more than 7, which irritates the skin. May also be called “base” or “alkali.”

CCOHS – Canadian Centre for Occupational Health and Safety.

Chemical cartridge respirator – An air-purifying respirator provided with one or more cartridges specific to various gases or vapours.

Chemical family – The name given to groups of chemicals that have similar structures and often share similar chemical, physical and toxicological properties. For example, chemical name: xylene, chemical family: aromatic hydrocarbons.

Chemical formula – A combination of chemical symbols defining a chemical. It represents the proportions of the elements that will make it up. For example, H₂O is the formula for water.

Chronic – Of long duration.

Closed cup – A test procedure used to measure the flash point of a product using a closed cup which prevents the vapour from escaping; generally a lower flash point than an open cup measurement.

CNS – Central nervous system.

Combustible – Materials that will burn are called combustibles. A combustible liquid has a flashpoint greater than 37.6°C but less than 93.3°C. A flammable liquid has a flashpoint closer to or below room temperature (16°C to 25°C). Since flammable liquids have lower flashpoints, they are considered more hazardous than combustible liquids.

Combustible dusts – Products in this hazard class are in the form of finely divided solid particles that, upon ignition, are liable to catch fire or explode when dispersed in air.

Common chemical name – The simple chemical name of a chemical as opposed to its trade name or its technically precise name. For example, the pesticide with the common name carbaryl has a trade name of Sevin and the full scientific name of L-naphthyl-N-methyl carbamate.

Confidential business information (CBI) – See “Trade secret.”

Controlled product – see “Hazardous product.”

Corrosive – A material that causes visible destruction or reversible alterations in human skin tissue at the site of contact or that has a severe corrosion rate on steel or aluminum.

Critical temperature – The temperature above that a substance can exist only as a gas and cannot be converted to a liquid by pressure.

CSA – Canadian Standards Association.

Decomposition – Breakdown of a substance by heat, chemical reaction, biological decay or other processes into simpler compounds.

Density – The weight of a product for a given volume; usually measured in grams per millilitres (g/mL) or grams per cubic centimetre (g/cc).

Dermal – Used on or applied to the skin.

Dermatitis – Inflammation of the skin caused by an irritant substance.

Detoxify – To make harmless; to neutralize a poison; to remove a poisonous effect.

Dust – Solid airborne particles that are mechanically generated.

Embryotoxicity – Toxic effects to the embryo of a substance that crosses the placenta barrier.

Emulsion – A mixture of two or more immiscible liquids, such as oil and water, where one is suspended or dispersed in the other in the form of minute droplets and remains suspended or dispersed for a period of time. An emulsifier may be used to assist the dispersion.

EPA – Environmental Protection Agency.

Epidemiology – The science which deals with the study of disease in the general population.

Evaporation – The transformation of a liquid or solid into a vapour.

Exposure – Contact between a person and a hazardous substance. Contact may be oral, dermal or respiratory.

Exposure limit – Restricts the amount and the length of time exposure to an air contaminant. Can be listed in mg/m³ or parts per million (ppm). Three types of limits in common use are:

1. **Exposure limit – TWA** – The time-weighted average concentration for a normal 8-hour workday or 40-hour work week to which nearly all workers can be repeatedly exposed without adverse.
2. **Exposure Limit – STEL** – The short-term exposure limit. It is 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 so as to increase accidental 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. The limit is applied to substances that are predominantly irritants or fast acting and for which the TWA is inappropriate.

Flammable – A flammable material will burn when it is heated or in contact with a source of ignition. By strict definition, a flammable liquid is one that has a flash point below 37.6oC (100oF).

Flammable limits – The upper and lower concentrations of a gas vapour in air between which an explosion or propagation of flame will occur when an ignition source is present. See also “LEL or LFL” and “UEL or UFL.”

Flammable range – The concentration range in which a gas or vapour is flammable in air between the flammable limits. See also “LEL or LFL” or “UEL or UFL.”

Flashpoint – The minimum temperature at which a liquid gives off enough vapour to ignite in the presence of an ignition source under specified test conditions. Flashpoints will vary for the same material depending on the method used.

Fugitive emission – A gas, liquid, solid, vapour, fume, mist, fog or dust that escapes from process equipment, emission control equipment or a product to which workers may be readily exposed.

Fumes – Solid particles in air that are generated by condensation of the vapour of a solid material (for example, from welding).

GHS – Global Harmonization System of classification and labelling of chemicals.

Gas – A substance that is in the gaseous state at an ordinary temperature and pressure.

Hazard – The potential for harmful effects; are evaluated by examining the properties of the product, such as toxicity, flammability and chemical reactivity.

Hazardous product – Any prohibited product, restricted product or controlled product.

IARC – International Agency for Research on Cancer.

IDLH – Immediately dangerous to life and health.

Ignition source – A condition such as flame, static discharge or heat capable of contributing to ignition of flammable or combustible.

Incompatibility – Some chemicals, when mixed together, can react violently or give off toxic vapours. For example, 2-ethoxy acetate reacts violently with strong acids and bases.

Ingestion – Intake of substance through the mouth.

Inhalation – The breathing in of a substance.

Inhibitor – A chemical, which is added to, another substance to prevent an unwanted chemical change from occurring.

Irritant – A substance which, with sufficient contact, will cause reversible inflammation of the eye, skin or respiratory system. The contact may be single or multiple.

Primary irritants – cause irritation at the site of contact, for example contact with many acids, caustics, amines, metallic salts and ketones.

Secondary irritants – can cause reactions and locations away from the site of contact. Dermatitis may be an outcome.

kPa – Kilopascals; a unit of pressure. 1 atmosphere = 101.3 kPas.

Label – Includes any mark, sign, device, stamp, seal, sticker, tag or wrapper.

LC – Lethal concentration

LC₅₀ – The amount of material in air, which causes death in 50 per cent or one half of a group of test animals when given over a period of specified time, usually four hours.

LD₅₀ – Lethal dose. It is a way of measuring the acute poisoning strength of a chemical when it is swallowed or rubbed on the skin. It is the dose of a material given in a single occasion which causes the death in 50 per cent or one half of a group of test animals. LD50 exposure can be for exposure by skin, through the mouth or by injection. The smaller the LD50, the more toxic the chemical.

LEL or LFL – Lower explosion limit or lower flammable limit of a vapour or a gas; the lowest concentration of the substance in air that will produce a flash of fire when an ignition source is present. At concentration lower than LEL, the mixture is too ‘lean’ to burn.

Mist – Liquid droplets suspended in air that are produced by dispersion of a liquid or by condensation of a vapourized liquid.

Mixture – A combination of two or more products, materials or substances that does not undergo a chemical change as a result of interaction between the products, materials or substances.

Mutagenicity – The capability of a substance to cause mutations in living cells. Mutations may occur in either germ (reproductive) cells or somatic (body) cells.

NFPA – National Fire Protection Agency.

NIOSH – National Institute for Occupational Safety and Health.

NOS – Not Otherwise Specified.

Normal atmospheric pressure – An absolute pressure of 101.325 kilopascals (1.00 atmosphere) at 200C (680F).

Odour threshold – The lower airborne concentration of a chemical that can be perceived by the sense of smell.

OSH - Occupational Health and Safety.

Oncogenic – The ability to create tumors in tissue.

Oral – Taken into the body through the mouth.

OSHA – Occupational Safety and Health Administration (USA).

Oxidation – A reaction in which a substance combines with oxygen provided by an oxidizer or an oxidizing agent.

PEL - Permissible exposure limit. OSHA PELs are based on an 8-hour TWA exposure.

Percent volatile (by volume) – A rating scale which describes the ability of a material to evaporate. At zero per cent, no evaporation will occur; at 100 per cent, all the material will evaporate over time. Materials with a high volatility are likely to contaminate air more rapidly than those with low volatilities.

Personal Protective Equipment (PPE) – Devices worn by workers to protect against hazard in the environment, for example respirators, gloves and face shields.

pH – An expression on a scale from zero to 14 of the extent of acidity (scale of 1) or alkalinity / causticness (scale of 14) of a substance. A pH of seven indicates a neutral solution.

Pictogram – Refers to the stylized graphical material within a hazard symbol, i.e. skull and crossbones, or to the hazard symbol itself, that is, health hazard symbol.

Polymerization – A chemical reaction in which one or more small molecules combine to form larger molecules. Hazardous polymerizations occur when large amounts of energy is released.

ppb – Parts per billion.

ppm – Parts per million.

Product Identification Number (PIN) – The number and letter, if any, specified in the Transportation of Dangerous Goods Regulations.

Reaction – A chemical transformation or change; the interaction of two or more substances to form new substances.

Reactivity – A description of the tendency of a substance to undergo chemical reaction with the release of energy. Because of reactivity due to heating, burning or direct contact, undesirable effects may include pressure build-up, temperature increase, formation of toxic or corrosive by-products.

Reducing agent – In a reduction reaction, the reducing agent is the substance which combines with oxygen or donates electrons to the reaction.

Reproductive toxicity – The effect of a product on the capability of persons or test animals to produce offspring.

Respirator – A personal protection device designed to protect the wearer from inhalation of a hazardous atmosphere.

Routes of entry – Before a chemical can cause a health effect, it must first contact and enter the body. The routes of entry are:

- Inhalation (major route).
- Ingestion (major route).
- Cutaneous / skin absorption.
- Eye absorption (minor route).

SDS – Safety Data Sheet.

Sensitizer – A substance, which on first exposure, causes little or no reaction on man or test animals, but which on repeated exposure may cause a marked response not necessarily limited to the contact site. Most common in industry, skin sensitization may occur, although respiratory sensitization also occurs.

Smoke – Aerosols, gases and vapours resulting from incomplete combustion.

Solubility in water – The weight in grams of material that will dissolve in a litre of water at 20°C. Materials which are highly soluble may be absorbed from the air through the moist membranes of the nose, eyes and mouth.

Solvent – A liquid which will dissolve another substance.

Specific gravity – The weight of material compared to the weight of an equal volume of water, for example specific gravity of less than 1.0 will float in water, while greater than 1.0 will sink.

TDG – Transportation of Dangerous Goods.

Teratogenicity – An agent that can produce congenital anomalies or birth defects or increase the incidence of an anomaly in the population.

TLV – Threshold Limit Value. A term used by the ACGIH to express the airborne concentration of a material to which nearly all persons can be exposed day after day, without adverse effect.

Toxicity – The adverse effects resulting from exposure to a material, generally by the mouth, skin or respiratory tract.

Trade secret – Product information withheld from labels and SDS.

TWA – Time Weight Average. The airborne concentration to which a person is exposed when calculated as a weighted average over a period of time.

UEL or UFL – Upper explosive limit or upper flammable limit of a vapour or gas; the highest concentration of the substance in air will produce a flash of fire when an ignition source is present. At higher concentrations, the mixture is too 'rich' to burn.

Unstable – Tending toward decomposition or other unwanted chemical change during normal handling or storage.

Vapour – The gaseous form of a substance that is found in a solid state at normal atmospheric pressure of 101.325 kPa at 20°C.

Vapour density – The density of a gas or vapour relative to air, where air = 1.

Volatility – The ease with which a material evaporates.

Warning properties – The capability of chemicals to be noticed by human senses at levels in the air below those which may cause ill health effects.

WHMIS – Workplace Hazardous Materials Information System.

Workplace Contamination Limit (WCL) – Enforceable limits on the amount of a hazardous substance that a worker can be exposed to on the job. In Saskatchewan, this can be found in Table 18 of *The Occupational Health & Safety Regulations, 2020*.

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