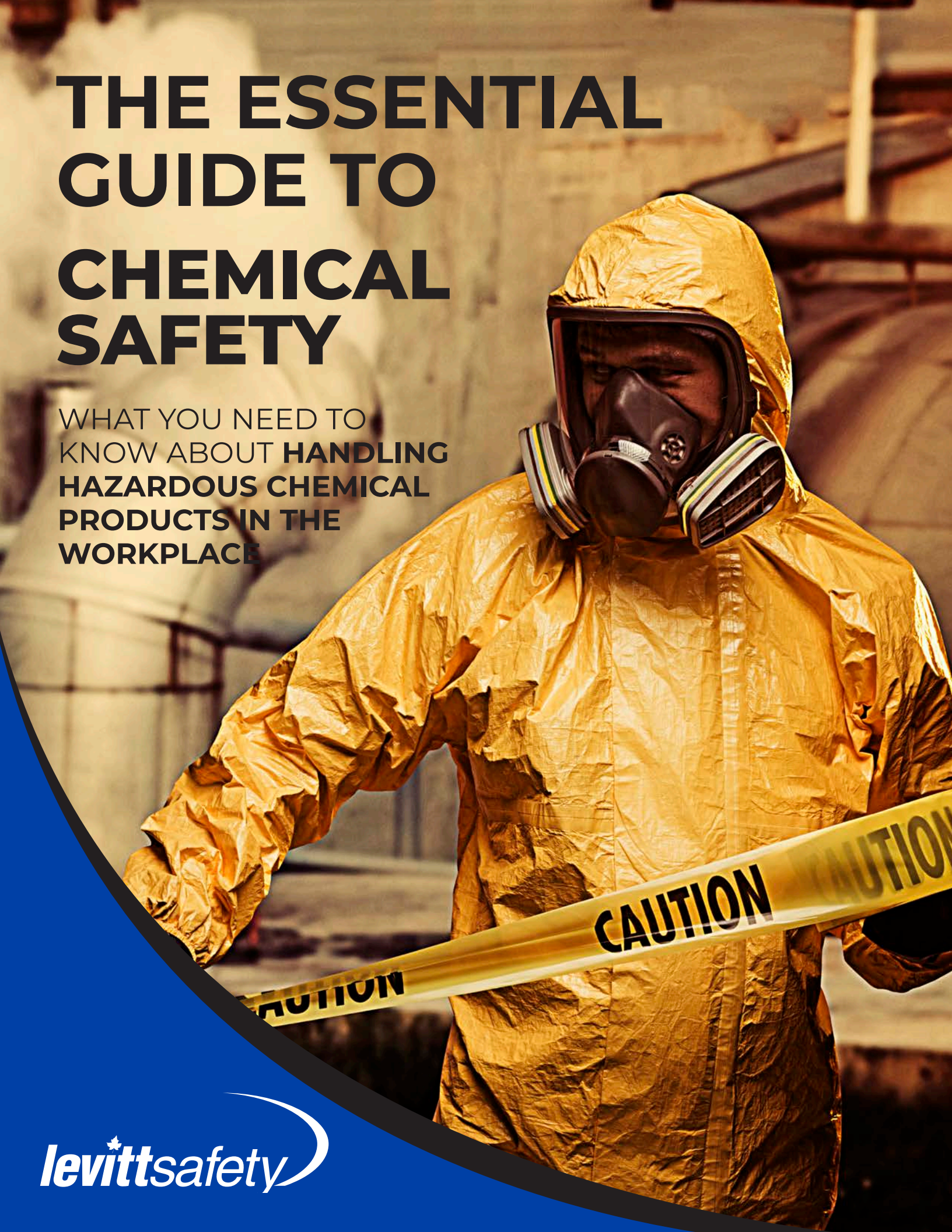
THE ESSENTIAL GUIDE TO CHEMICAL SAFETY

WHAT YOU NEED TO KNOW ABOUT **HANDLING HAZARDOUS CHEMICAL PRODUCTS IN THE WORKPLACE**



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OVERVIEW

Canada's chemical industry is one of the largest sectors, playing a vital role in the economy. In 2023, the total value of chemical shipments reached 74.9 billion dollars, and the industry employs approximately 93,300 people.

You can track nearly every manufactured good back to the chemical industry; for every one job in the chemical sector, it fuels five jobs everywhere else in the Canadian economy.

If you're employed in any of the following jobs, you're likely part of the chemical industry:

- Chemical production
- Oil and gas
- Petro chemical
- Agrochemical
- Pulp and paper
- Chemical transport
- Food
- Mining
- Automotive
- Fertilizer
- Metal
- Laboratory work
- Pharmaceutical
- General manufacturing

The chemical industry is unlike any other in Canada, which also extends to its hazards and risks. Chemical splash incidents are rare, but they're often traumatic, life-altering events. To put this into perspective, chemical injuries to the skin or eyes only represent a fraction of all recordable injuries, but they are responsible for approximately 30 per cent of all burn-related deaths.

This essential guide will give you a thorough overview of what you need to know to work safely and successfully with hazardous chemical products.

RESPONSIBILITIES

In every workplace, both the employer and the worker must understand and exercise their responsibilities to ensure everyone's safety. Here is a high-level overview of the duties for each:

Employer

- Must ensure that the appropriate control measures are in place to keep their workers safe.
- Must provide the proper tools needed for the job.
- Must educate and train their workers on the chemical hazards that are present and are used in their workplace.
- Must see that their workers are always compliant (both with their PPE and training).

- Must ensure that hazardous materials are properly labeled and that workers have access to up-to-date Safety Data Sheets (SDS).
- Must appoint a competent supervisor to ensure their workers are being managed and monitored.

Worker

- Participate in WHMIS and other required chemical safety training programs.
- Must properly use the tools they are provided such as PPE, monitoring tools, spill control and decontamination kits.
- Do everything required to keep themselves and their coworkers safe

CHEMICAL ROUTES OF ENTRY

Chemicals can follow four major routes of entry:

- Inhalation - breathing
- Ingestion - eating
- Absorption - skin contact
- Injection

The most common way workplace chemicals enter the body is by inhalation. Other chemicals can be absorbed through the skin into the bloodstream. They can also be accidentally swallowed if hands or even cigarettes are contaminated. Contaminated cigarettes also pose an inhalation risk, which can be elevated since the cigarette is heating and/or vaporizing the chemical contaminant. For this reason, workers should never eat, drink or smoke in areas where they may be exposed to toxic chemicals.

Injection is another way that chemicals enter the body. Though less common in most workplaces, it can occur when a sharp object (e.g., a needle) punctures the skin and injects a chemical into the bloodstream. This can also occur when a chemical is sprayed at the body at high pressure.

Eyes are another route of entry, although fortunately only very small amounts of chemicals in the workplace enter through the eyes or mouth.

However a chemical enters the body, it is distributed throughout the body via the bloodstream, where it can attack and harm organs.

To prevent harmful health effects, take steps to eliminate or reduce the hazard. Control at the source, such as substitution with a less hazardous material or industrial process, is the best method. Bear in mind the specific hazards of the material and the extent and pattern of exposure.

EFFECTS OF CHEMICAL HAZARDS

Workplace hazards can have serious effects on the body, both immediate and long-term, including acute and chronic effects.

Acute

Acute effects appear immediately after exposure to high levels of a toxic substance and may be treatable. **The sudden collapse of a worker after being exposed to Ammonia, for example, is an acute effect.**

Chronic

Chronic effects become apparent only after prolonged exposure and, by and large, are not treatable. They can occur when the body attempts to repair itself or compensate for acute effects of a substance. For example, cancer is a chronic effect of exposure, as is lung scarring caused by silica dust or hearing damage caused by excessive noise. Chronic disease becomes evident only after severe damage has occurred.

Exposure limits have been developed for various hazardous substances to protect workers, but they should not be treated as a fine line between safe and unsafe workplaces. Not all individuals react in the same manner to the same amount of a harmful material. The levels of workers' exposures should be reduced to the lowest practical level achievable. Efforts to reduce workers' exposures should start at half the exposure limit.

IDENTIFICATION

The Workplace Hazardous Materials Information System (WHMIS) is a comprehensive system for providing Canadians with the information they need to ensure safe use of hazardous materials in the workplace. This extends to product labels, safety data sheets (SDS) and worker education. In December 2022, the WHMIS legislation (Hazardous Products Regulations) was amended to align with the 7th revised edition and certain provisions of the 8th revised edition of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

WHMIS

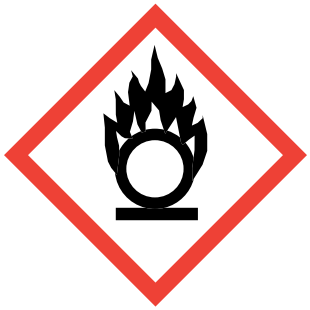
Hazard Classes

Pictograms are used to help users easily identify the different hazard classes and the potential risks associated with each hazardous product.

These images have a distinctive red border and contain a distinct symbol to illustrate the specific hazard, as well as its class or category.

EXPLODING BOMB
For explosion or reactivity hazards

FLAME
For fire hazards



FLAME OVER CIRCLE
For oxidizing hazards

GAS CYLINDER
For gases under pressure

CORROSION
For corrosive damage to metals, as well as skin, eyes

SKULL AND CROSSBONES
Can cause death or toxicity with short exposure to small amounts

HEALTH HAZARD
May cause or suspected of causing serious health effects

EXCLAMATION MARK
May cause less serious health effects or damage the ozone layer*

ENVIRONMENT
May cause damage to the aquatic environment

BIOHAZARDOUS INFECTIOUS MATERIAL
For organisms or toxins that can cause diseases in people or animals.

* The GHS system also defines an Environmental hazards group. This group (and its classes) was not adopted in WHMIS 2015. However, you may see the environmental classes listed on labels and Safety Data Sheets (SDSs). Including information about environmental hazards is allowed by WHMIS 2015.

Hazard Categories

A “category” is the name used to describe the sub-sections of classes. For example, Self-Reactive Chemicals have seven categories. Each category has rules or criteria to determine what chemicals are assigned to that category. Categories are assigned numbers (or letters) with category 1 (or A) being the most hazardous.

The **exploding bomb** pictogram is used for the following classes and categories:

- Self-reactive substances and mixtures (Types A and B*)
- Organic peroxides (Types A and B*)

The **flame** pictogram is used for the following classes and categories:

- Flammable gases (Category 1)
- Flammable aerosols (Category 1 and 2)
- Flammable liquids (Category 1, 2 and 3)
- Flammable solids (Category 1 and 2)
- Pyrophoric liquids (Category 1)
- Pyrophoric solids (Category 1)
- Pyrophoric gases (Category 1)
- Self-heating substances and mixtures (Category 1 and 2)
- Substances and mixtures which, in contact with water, emit flammable gases (Category 1, 2 and 3)
- Self-reactive substances and mixtures (Types B*, C, D, E and F)
- Organic peroxides (Types B*, C, D, E and F)

The **flame over circle** pictogram is used for the following classes and categories:

- Oxidizing gases (Category 1)
- Oxidizing liquids (Category 1, 2 and 3)
- Oxidizing solids (Category 1, 2 and 3)

The **gas cylinder** pictogram is used for the following classes and categories:

- Gases under pressure (Compressed gas, Liquefied gas, Refrigerated liquefied gas, and Dissolved gas)

The **corrosion** pictogram is used for the following classes and categories:

- Corrosive to metals (Category 1)
- Skin corrosion/irritation (Category 1, 1A, 1B and 1C)
- Serious eye damage/eye irritation (Category 1)

The **skull and crossbones** pictogram is used for the following classes and categories:

- Acute toxicity
  - Oral (Category 1, 2 and 3)
  - Dermal (Category 1, 2 and 3)
  - Inhalation (Category 1, 2 and 3)

The **health hazard** pictogram is used for the following classes and categories:

- Respiratory or skin sensitization (Category 1, 1A and 1B)
- Germ cell mutagenicity (Category 1, 1A, 1B and 2)
- Carcinogenicity (Category 1, 1A, 1B, and 2)
- Reproductive toxicity (Category 1, 1A, 1B and 2)
- Specific Target Organ Toxicity - single exposure (Category 1 and 2)
- Specific Target Organ Toxicity - repeated exposure (Category 1 and 2)
- Aspiration hazard (Category 1)

The **exclamation mark** pictogram is used for the following classes and categories:

- Acute toxicity – oral, dermal, inhalation (Category 4)
- Skin corrosion/irritation (Category 2)
- Serious eye damage/eye irritation (Category 2 and 2A)
- Respiratory or skin sensitization (Category 1, 1A and 1B)
- Specific target organ toxicity – single exposure (Category 3)

The **biohazardous infectious materials** pictogram is used for the following classes and categories:

- Acute toxicity – oral, dermal, inhalation (Category 4)
- Skin corrosion/irritation (Category 2)
- Serious eye damage/eye irritation (Category 2 and 2A)
- Respiratory or skin sensitization (Category 1, 1A and 1B)
- Specific target organ toxicity – single exposure (Category 3)

* Both the Flame and Explosive pictogram are used for self-reactive substances and mixtures (Type B) and organic peroxides (Type B)

NOTE: Physical Hazards Not Otherwise Classified and Health Hazards Not Otherwise Classified classes are required to have a GHS pictogram that is appropriate to the hazard identified.

[1] Canadian Centre for Occupational Health. "WHMIS 2015 - Safety Data Sheet (SDS)." https://www.ccohs.ca/oshanswers/chemicals/whmis_ghs/sds.html.

[2] Canadian Centre for Occupational Health. "WHMIS 2015 -Pictograms." https://www.ccohs.ca/oshanswers/chemicals/whmis_ghs/pictograms.html.

Hazard groups

WHMIS 2015 refers to two major groups of chemical hazards: physical and health. Physical hazards are based on the physical or chemical properties of a product such as flammability, reactivity or corrosivity. Health hazards are determined by a product's ability to cause health effects. This includes eye/skin irritation, respiratory sensitization (breathing difficulties if inhaled) and carcinogenicity (cancer-causing properties).[3]

SDS sheets

A Safety Data Sheet (SDS) is a document that contains information on potential hazards and instructions on how to work safely with a chemical product. It also provides important information on what personal protective equipment (PPE) should be worn while using the product, how to recognize symptoms of overexposure and what to do in the case that a dangerous exposure does occur. A SDS should not be confused with the label on a product; the safety data sheet contains much more information.

Before using any chemical product, it's essential to conduct a risk assessment by reading and fully understanding the SDS.

Key Challenges with SDS Management

Companies often manage critical SDS information across multiple, disconnected systems and spreadsheets. This fragmentation leads to:

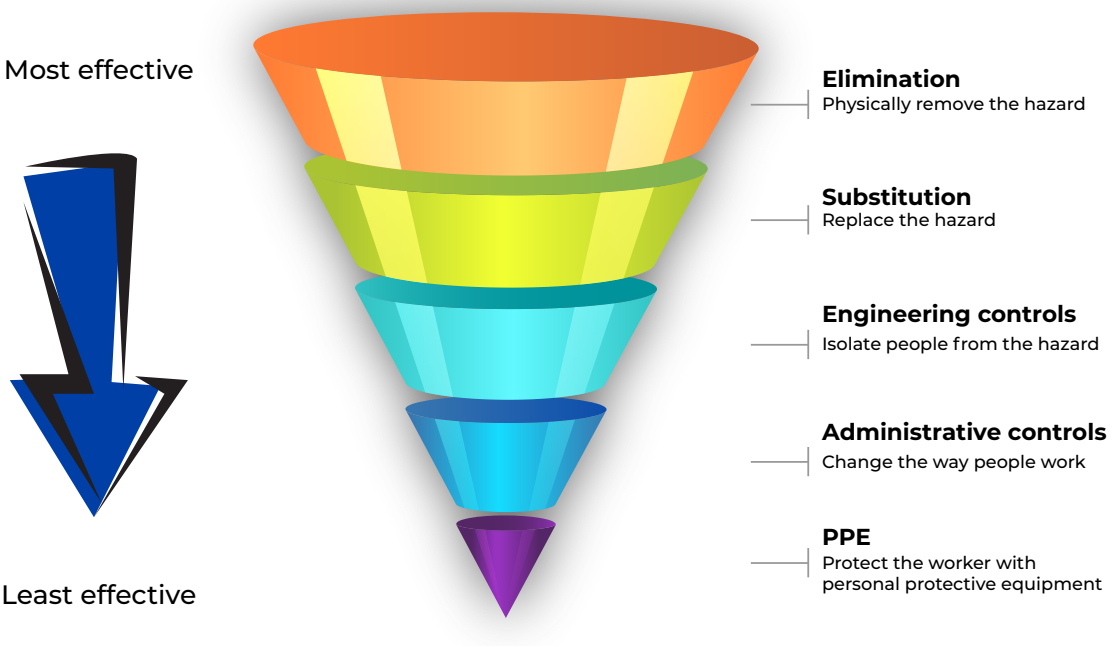
- Difficulty in ensuring all SDSs are current and accessible.
- Increased risk of outdated or missing documents, which can result in compliance violations and safety risks.
- Service inconsistencies and delays in providing accurate information to customers and employees

Best Practices to Address These Challenges

- Invest in integrated, cloud-based SDS management platforms that automate updates and ensure universal access.
- Standardize data entry and document control processes to reduce errors and improve compliance.
- Provide regular training and clear communication to ensure all staff understand their roles in SDS management.

Hierarchy of controls

The hierarchy of controls is designed to help guide users through the process of reducing chemical risks. It's essential to eliminate risks in this order (from the top down) rather than with the easiest solution (i.e., wearing PPE and ignoring the other factors).[5]



[3] Canadian Centre for Occupational Health. "Hazard Classes and Categories." https://www.ccohs.ca/oshanswers/chemicals/whmis_ghs/hazard_classes.html.

[4] Canadian Centre for Occupational Health. "WMHIS 1988 – Material Safety Data Sheets (MSDSs): General." https://www.ccohs.ca/oshanswers/legisl/msdss.html.

[5] "Controlling Risks." WorkSafeBC. https://www.worksafebc.com/en/health-safety/create-manage/managing-risk/controlling-risks.

[6] SDS Management https://www.hazmatsystems.com/
Overview video https://www.hazmatsystems.com/msds.aspx

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Elimination

Eliminating the hazard is always preferable. If you can get around working with a chemical hazard, be sure to do so.

Substitution

Consider whether any less-hazardous product can be used instead.

Engineering Controls

If you are unable to eliminate or substitute the chemical hazard, implementing engineering controls such as ventilation, lids and covers are the next best alternative.

Administrative Controls

Implementing procedures that will help you work safely with the chemical hazard is an important way to stay safe. An example of this is promptly closing and putting away the product as soon as you're finished using it, job sharing or only working with one chemical product at a time.

PPE

Using appropriate personal protective equipment is the last step. Always be sure that you're diligent in wearing the appropriate chemical suit, safety goggles, gloves and breathing apparatus while working with hazardous chemical products.

DETECTION

There are several methods used to detect the hazardous vapours and gases that chemical products emit. The following options are among the most popular in the chemical industry:

Colorimetric Detection Tubes

These gas-detector tubes are filled with a chemical reagent that produces a colour change when exposed to the gas in question. These tubes allow users to safely perform field screening and tests for the presence of hazardous and toxic gases and chemical vapours at a very low cost-per-sample.

Single-Gas Monitors

A single gas detector can be worn by a worker to detect the presence of a dangerous gas. This monitor can sound an alarm when it first senses unsafe exposure levels, allowing the worker enough time to safely exit the area. Single gas monitors can be used to detect combustible and toxic gases, as well as oxygen deficiency. This type of device is commonly used in chemical plants, oil rigs, refineries, confined space work, firefighting and more.

Multi-Gas Monitors

Alternatively, multi-gas monitors can continuously detect over five hazards simultaneously. Most versions are micro-processor controlled, with every manufacturer offering different features like data logging and a variety of sensors. Gas monitor technologies are evolving to include a connection to the cloud for monitor-to-monitor communications as well as “worker down” alarms.

Photoionization Detectors (PID)

PIDs can instantly measure volatile organic compounds (VOCs) in concentrations from sub parts per billion which make them an ideal solution for detecting solvents, fuels, plastic and other heat-transfer fluids during manufacturing and waste management. Their hand-held, battery-operated models are often used in military, confined space and industrial work environments.

Infrared (IR)

Infrared (IR) detectors measure the presence of a gas through sensor beams. This is done by comparing wavelengths where gases are present versus where they are not. The difference between the two ranges determines the concentration of the present gas. IR detectors can monitor large areas which makes them ideal for use in chemical plants, refineries, water treatment facilities and facilities where hazardous gases are present.

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Fourier Transform Infrared Spectroscopy (FTIR)

FTIR is a technique used to identify and characterize the chemical composition of materials by analyzing their absorption of infrared light. An FTIR gas analyzer provides an extremely powerful, accurate, and flexible tool for gas testing in various workplace and environmental applications.

FTIR instruments provide dual functionality by:

A) Quantifying “Known” gases & vapours

B) Identifying “Unknown” gases & vapours

Some common features of an FTIR multi-gas analyzer include:

- Ability to identify and quantify over 450 gases and measure multiple gases simultaneously.
- Measure VOC’s and inorganic gases with detection in the sub-ppm range.
- Continuous results for all gases updated at desired intervals.
- Results saved along with IR spectrum for post analysis.
- DC operation or AC power.
- Low maintenance and calibration requirements

PROTECTION

As discussed in the Hierarchy of Controls section, the best measure of protection is eliminating and controlling chemical hazards at their source. However, this isn't always possible. That's where personal protective equipment (PPE) comes in.

Respirators

Determining which airborne hazards exist in your workplace will help you select the most appropriate respiratory protection for your workers. It is essential that a qualified person carry out a detailed assessment of the workplace. This will determine if a respiratory hazard is present, and in what amount. Once you have identified the amount and type of hazard(s) in the air, it's time to select your respiratory protection using the following three steps:

1. **Select the type of respirator that is most appropriate for the given hazard(s).**
2. **Select the appropriate filter or cartridge for the contaminant(s) present.**
3. **Perform a respirator fit test to ensure that the wearer is both fully protected and comfortable.**

Selection

There are several different types of respirators on the market, but not all are meant for the same purpose. Here is an overview of the four most common types:

1. Self-Contained Breathing Apparatus (SCBA)

SCBAs are an ideal choice when dealing with an oxygen deficient atmosphere that is immediately dangerous to life or health (IDLH), or any environment that's unknown or has unknown levels of chemical contaminants in the air.

One of the most common uses for an SCBA is in confined space entry. Some other SCBA applications include working with liquid spills, gas exposure that produce (or could produce) IDLH conditions and many more, including:

- First response emergency rescue of people overcome by atmospheric hazards (e.g., firefighting).
- Hazmat response to any unknown – this does not have to be in a confined space working with liquids, gases, vapours or particulate in extreme concentrations.
- Working in large machinery housings.
- Working in truck or rail tank cars.
- Working in silos, storage tanks or pipelines.
- Working in sewers.

- Repair of gas lines or toxic chemical lines in trenches or pits.
- Tank or reactor entry for maintenance or cleaning.

2. Supplied Air Respirator (SAR)

The basic SAR is comprised of a respirator facepiece — which could be a tight-fitting half mask or full-face mask, or a loose-fitting hood or helmet assembly — connected via an air supply hose to a source of breathing air. The air supply could be either a low-pressure or high-pressure source.

A low-pressure source would be an ambient pump (an air compressor designed specifically for respiratory protection applications) located in, or drawing air from, a clean environment.

A high-pressure supply source would be either a cylinder or “cascaded” cylinders of breathing air, or the compressed air supply within a facility as long as it is filtered and monitored to ensure it meets

CSA purity requirements for breathing air.

Basic SARs are most commonly used in either one of two modes:

- **Continuous flow** - the breathing air flows into the facepiece at a standard, steady rate or
- **Pressure demand -** the facepiece is continually pressurized with breathing air, and additional air is drawn in based upon the wearer’s breathing requirements. Pressure-demand SARs require a high-pressure supply source due to their performance requirements.

3. Powered Air Purifying Respirator (PAPR)

Different kinds of PAPRs exist for all different kinds of working environments, but all PAPRs have these four things in common:

1. A hood, helmet, or facepiece
2. A powered fan, forcing incoming air through the filter
3. A filter to deliver clean air to the wearer
4. A power source or battery

PAPRs deliver cool air to the worker, making it much easier to breathe and significantly more comfortable to wear for a prolonged period. For workers with facial hair that impedes the fit of traditional respirators, a PAPR with a hood is a great alternative. Because the loose-fitting hoods and helmets of PAPRs only form a partial seal around the user’s shoulders or neck, they don’t require any fit testing.

4. Air-Purifying Respirators (APR)

Air-purifying respirators (APRs) can remove contaminants in the air that you breathe by filtering out particulates (e.g., dusts, metal fumes, mists, etc.). Other APRs purify air by adsorbing gases or vapours on a sorbent (adsorbing material) in a cartridge or canister. APRs are tight-fitting and are available in a few different styles:

- Mouth-bit respirator - fits in the mouth and comes with a nose clip to hold nostrils closed – for escape purposes only.
- Half-face mask - covering the face from the nose to below the chin.
- Full facepiece - covering the face from above the eyes to below the chin.

Filters and Cartridges

If you do opt for an air-purifying respirator, it's essential to select the right filter or cartridge for the chemical hazards in your work environment. Generally, these are categorized into two types[6]:

1. Particulate Filters

Filters only aerosols such as dust, mists, fumes, smoke, mould and bacteria.

2. Gas and Vapour Cartridges

Absorbs only gases and vapours. There are different kinds of cartridges for different kinds of gases and vapours.

[6] "Cartridge and Filter Guide." 3M.
https://multimedia.3m.com/mws/media/565214O/3m-cartridge-filter-guide-and-brochure.pdf.

CONTAMINATION	COLOUR CODING ON CARTRIDGE/CANISTER
Acid gases	White
Organic vapour	Black
Ammonia gas and Methylamine	Green
Acid gases and organic vapour	Yellow
Multi-Contaminant and CBRN agent	Olive
Mercury Vapor, Chlorine and Sulfur Dioxide	Orange
Particulates	Purple (Magenta)

Fit Testing

Any person who is required to wear a respirator during their normal day-to-day work duties, or any person who is required to wear a respirator for emergency response activities should be fit tested to ensure an effective seal.

The CAN/CSA-Z94.4 respiratory protection standard offers clarity on what is required prior to, during and after respirator fit testing.

What is fit testing?

There are two types of fit tests: qualitative and quantitative.

Qualitative fit testing (QLFT) is a pass/fail test method that uses your sense of taste or smell, or your reaction to an irritant to detect leakage into the respirator facepiece.

Quantitative fit testing (QNFT) uses an instrument to measure or quantify the fit of a respirator by comparing a particle count inside the respirator vs outside the respirator. A fit factor is then calculated based on the two values.

Why is fit testing important?

- The CSA standard is used to help keep all Canadian workers who are subject to respiratory hazards in the workplace safe.
- It's reviewed every five years.
- The Standard is based on requirements developed by the National Institute for Occupational Health and Safety (NIOSH), NFPA, ACGIH and others interested in respiratory protection.

Prior to the test:

Through observation, the fit tester shall confirm that the following criteria is met:

- Proper placement of chin.
- Proper fit and position of facepiece on nose.
- Position of eyes in full facepiece to allow for peripheral vision.
- Optimal strap tension.
- Accommodation of eye protection (if required) without affecting seal.
- Intelligible speech without breaking seal.
- Stability of the facepiece.
- Full contact of the sealing surface on the face.
- Proper positioning of additional equipment (PPE).
- Successful seal check followed by:
    - Sufficient time allowed (at least 5 minutes) for assessment of comfort, pressure points or other PPE like safety glasses, hoods and helmets.
    - Wearer should then nod head up and down, tilt head left and right, turn head side to side, shake head twice and perform facial expressions.
- The wearer must then verbally confirm whether he/she has adequate comfort based on the following criteria:
    - 0 – No Issues
    - 1 – Discomfort that can be ignored
    - 2 – Some discomfort but still able to function (redon/reposition respirator)
    - 3 – Unacceptable discomfort – not bearable (choose alternate respirator)

After passing the test:

The wearer shall be asked the following question: “Does this respirator provide you an acceptable comfort level for the scope of your work? Yes or no.” If no, an acceptable alternate respirator shall be made available.

The introduction of the comfort assessment to the CSA Z94.4 standard is a significant

addition. Including “comfort” as a formal consideration in selecting the right respiratory protection means that workers’ comfort is being taken seriously; the more comfortable a worker is in their protective equipment, the more likely they will be compliant while wearing it.

Chemical Suits

The selection of chemical suits can seem rather daunting at first. With many terms like “chemical proof” used in the PPE market, it can be a challenge understanding which level of protection is right for you. Let’s break it down into three basic elements:

1. Determine personal exposures

How often do you interact with the chemicals you identified? Your hazard assessment should consider your exposure to each chemical product. You will want to note the potential of pressurized spray, the direction of the splash and the length of time you’d be exposed. All these factors will go into deciding which chemical suit will offer the best protection.

2. Select the fabric

It’s important to consider the different types of fabrics. While there are a lot of different options available on the market, not every type will be a good fit for your work environment.

Fabrics are graded by the amount of time it takes for a chemical to pass through its material at a molecular level. This is called **permeation.** Permeation times will vary depending on the chemical class and concentration. You should note that permeation is different than penetration.

In contrast, **penetration** happens when a chemical enters a suit through a pore, seam, defect or other opening in the barrier material. In some severe cases, it can even be caused when a chemical burns a hole through the suit.

The last thing to think about when considering fabrics is whether it should be flame resistant. If you’re exposed to flammable liquids at any time while on the job, ensure your suit has chemical and fire resistance.

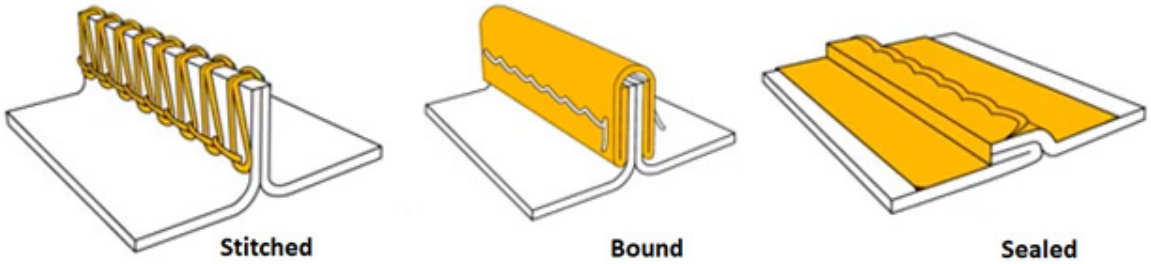
Consider the seams

Are the chemicals you're using solids, liquids or gases? Identifying this will make a big difference when selecting which type of seam your chemical suit should have.

If your hazards are mostly particulate, then choosing a serge or stitched seam is likely a perfect fit. These seams are constructed using a needle and thread. However, if you're dealing with liquid or microscopic chemicals, the tiny holes left behind from the stitching can allow chemical liquids to enter the suit. It's important to be aware of this.

If you're handling chemical liquids, opt for a bound seam. This type of stitching includes an additional layer of fabric that is bonded over the seam to increase the holdout of solids and liquids.

The highest level of protection offered by seams is either heat sealed or ultrasonically welded using tape that covers the stitched seams. This method is completely liquid proof and allows suits to become airtight, as the holes from any stitches are covered up. With these sealed seams, the suits can withstand pressurized spray from entering the suits through the seams. Premium chemical suits will also add another layer of this sealed tape to the inside of the seams allowing for even more protection.



Gloves

When working with corrosive chemicals, it's important to use hand and arm protection that will protect you from injury. Just as with chemical suits, there several considerations that go into finding the proper pair of protective work gloves or sleeves for your unique job. After determining your exposure, it's important to consider the following factors:

Chemical Resistance

Chemical protection can get incredibly tricky because the chemicals themselves can move directly through certain materials without showing any signs of damaging the material itself. Much like with chemical suits, the potential for permeation must be considered. When selecting your chemical gloves, ensure that you consult a permeation chart to determine the best material for the chemicals that you may encounter.

Sizing

If dexterity and feel is important in the type of work you are doing, then getting the correct size is of the upmost importance. The most popular gloves are typically made in sizes 6 through 12, although sizes outside this range can also be found. Having the correctly sized gloves will also increase comfort, making workers more likely to wear their assigned PPE.

Grip

Good grip on chemical-resistant gloves allows workers to securely handle tools, containers, and equipment, reducing the risk of spills, accidental contact, or dropped objects. It also decreases hand fatigue and improves dexterity, enabling safer and more efficient work in wet, oily, or slippery chemical environments.

Cut Resistance

Cut resistant gloves in chemical applications are crucial because they provide dual hazard protection—guarding against lacerations while maintaining chemical barrier integrity. A cut-resistant glove (especially one with a high-visibility liner) gives a worker a visible warning if the glove has been compromised.

Puncture Resistance

Puncture resistance in chemical resistant gloves is critical because it helps preserve the chemical barrier integrity under mechanical stress; if a puncture breaches the glove, the wearer can be exposed to hazardous chemicals, compromising safety.

Chemical Glove Materials

Latex is an inexpensive, natural product that is flexible, stretchy and provides a good grip. While this material is durable, it does not provide protection against punctures and cuts. Latex is commonly used in food and medical industries as it protects well against blood-borne pathogens. It's important to note that it does not stand up to oil (see Nitrile below as an alternative). One potential downside of using latex is allergic reactions. Latex gloves are available in powdered and powder-free.

PVC (Polyvinyl Chloride), also known as plastic or vinyl, stays flexible, resists punctures and provides a great grip. PVC gloves are great for maintenance, mining, fuel oil, mechanic work, construction and petrochemicals. PVC, however, does not work in high heat environments or environments that use certain organic chemicals, like acetone or alcohol.

PVA (Polyvinyl Alcohol) gloves are great when handling aromatics and chlorinated chemicals. However, PVA is water soluble, as they are made from a water solution meaning that they should not be used for humid environments.

Nitrile is a thin but strong material. It resists solvents, grease, certain acids and bases, and oils. Gloves made of nitrile are a good solution for workers who have latex allergies. In comparison to other chemical gloves, nitrile provides good chemical and puncture resistance.

Neoprene offers great protection against chemicals, acids and other harsh substances. Gloves made of neoprene provide good sensitivity and grip.

Polyurethane is a desirable coating for cut-resistant gloves. This material provides good grip without being sticky, and offers a soft, moderate puncture and abrasion resistance. It is resistant to oils, solvents, fats, greases and gasoline, but offers poor resistance against hot water. Polyurethane is not advisable for wet environments.

Polyethylene is a synthetic rubber material that is lightweight and loose fitting. It is used for light duty tasks that require frequent glove changes such as food service lines.

Butyl is good for those who work with gases. This material resists oxidation and is commonly used for processes with highly corrosive acids and toxic substances. Butyl is one of the more expensive glove materials.

Viton works where other gloves do not and therefore is the most expensive option. This material was developed for use in the aerospace industry as it has extreme resistance to chemicals and heat.

Eye and face protection

Depending on the job you are doing and the type of material you are handling, you may need various levels of eye protection (e.g., safety glasses, chemical safety goggles, a face shield or some combination of these).

Levels of protection:

In the context of **hazardous materials (HAZMAT)** response and **occupational safety,** protection levels A, B, C, and D refer to different levels of **personal protective equipment (PPE)** used depending on the type and severity of exposure risks.

Level A

Level A protection is required when the greatest potential for exposure to hazards exists, and when the greatest level of skin, respiratory, and eye protection is required. Examples of Level A clothing and equipment include:

- positive pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA
- totally encapsulated chemical- and vapour-protective suit
- inner and outer chemical-resistant gloves
- disposable protective suit, gloves, and boots

Level B

Level B protection is required under circumstances requiring the highest level of respiratory protection, with lesser level of skin protection. At most abandoned outdoor hazardous waste sites, ambient atmospheric vapours or gas levels have not approached sufficiently high concentrations to warrant level A protection. Examples of Level B protection include:

- positive pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA
- inner and outer chemical-resistant gloves
- face shield
- hooded chemical resistant clothing
- coveralls
- outer chemical-resistant boots

Level C

Level C protection is required when the concentration and type of airborne substances is known and the criteria for using air purifying respirators is met. Typical Level C equipment includes:

- full-face air purifying respirators
- inner and outer chemical-resistant gloves
- hard hat
- escape mask
- disposable chemical-resistant outer boots

Level D

Level D protection is the minimum protection required. Level D protection may be sufficient when no contaminants are present or work operations preclude splashes, immersion, or the potential for unexpected inhalation or contact with hazardous levels of chemicals. Appropriate Level D protective equipment may include:

- gloves
- coverall
- safety glasses
- face shield
- chemical-resistant, steel-toe boots or shoes

While these are general guidelines for typical equipment to be used in certain circumstances, other combinations of protective equipment may be more appropriate, depending upon specific site characteristics.

STORAGE

It's important to consider the best way to store your chemicals when they're not in use. Before storing corrosive materials, be sure to inspect all your containers to ensure that they are undamaged and properly labelled.[8]

Always follow the manufacturers' recommendations for proper storage procedures and keep these containers away from processing and handling areas. Ensure that storage containers are well ventilated, properly labelled and supplied with proper clean-up equipment in the case of a spill or leak.

WORKPLACE CHEMICAL EXPOSURES

Even with engineered controls in place, workplace chemical exposures to skin and eye tissue can still happen.

When chemical exposure happens in the workplace, employers in Canada must be prepared with the right tools and response measures.

- Emergency showers and eyewash stations provide immediate flushing to reduce the severity of injuries.
- Diphoterine® solution provides a targeted approach to managing workplace chemical exposures to skin and eye tissue. Diphoterine® solution is an active rinse that will help eliminate or dramatically reduce injuries caused by aggressive acidic and caustic chemical agents. It's portability and intuitive application allows organisations with chemical risks to go beyond passive water rinsing to improve outcomes and limit LTD's associated with chemical exposure injuries.

Diphoterine® solution by Prevor

Diphoterine® solution is a Health Canada class 2a medical device used to manage workplace chemical exposures to skin and eye tissue.

It outperforms passive water rinsing by:

- Providing the important mechanical removal effect from the tissue surface helping to limit chemical diffusion.
- Helping prevent further penetration of dangerous acidic/basic ions in corrosive chemicals.
- Restoring the safe physiological pH range to skin and eye tissue helping to manage pain.

ASK US ABOUT HEXFLUORINE® SOLUTION FOR MANAGING HYDROFLUORIC ACID EXPOSURES

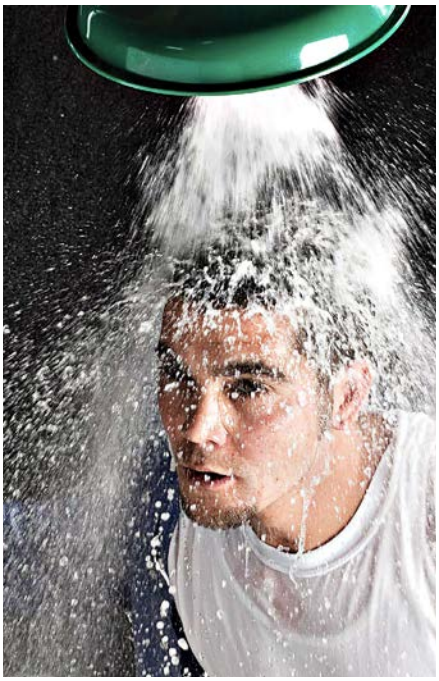
Emergency showers eye wash equipment

By immediately rinsing after a chemical exposure, you can vastly decrease injuries and improve your outcomes. Emergency showers and eyewash stations are generally considered the first line of relief from chemical exposures to the body. These plumbed and mobile solutions come in several styles, including::

1. **Eyewash:** used for wood shavings, dust and airborne particulates – must provide 1.5 liters (0.4 gallons) of water per minute.
2. **Eye/Facewash:** for minor incidents affecting only the eyes and face – must provide 11.4 liters (3 gallons) of water per minute.
3. **Drench shower:** to rinse hazardous contamination from PPE – must provide 75.7 liters (20 gallons) of water per minute.
4. **Combination unit:** features both an eye/facewash and shower unit to thoroughly wash away chemical exposure to the face and entire body.

It's important to note that emergency showers and eyewashes come with a number of different requirements according to the ANSI Z358.1 standard. All units must:

- Be accessible within 10 seconds (or 55 feet).
- Be located on the same level as the hazard.
- Be free of obstructions (anything that is in the way of a clear path from the hazard to the unit).
- Go from "off" to "on" in one second or less and remain on without the use of the operator's hands.
- Deliver flushing fluid for a full 15 minutes.
- Provide a controlled flow of flushing fluid at a velocity low enough to be non-injurious to the user.
- Provide tepid water for the full duration.



[8]Canadian Centre for Occupational Health. "How Do I Work Safely With Corrosive Liquids and Solids." https://www.ccohs.ca/oshanswers/prevention/corrosi1.html.

ENVIRONMENTAL CHEMICAL SPILL MANAGEMENT

Chemical spills can result in contaminant exposures that put people at risk. Quickly, safely and effectively managing a chemical spill is critical to workplace safety. Choosing the right products depends on the size of the spill, the presence of incompatible materials and having adequate training and supplies.

Trivorex® Neutralizing Absorbent

Trivorex® is a universal neutralizing absorbent designed to tackle all types of liquid chemical spills, including acids, bases, oxidizing and reducing agents, solvents, and hydrocarbons (oils).

Trivorex® provides a simplified, single product response protocol for cleaning up chemical spills that makes cleanup a much safer – and more efficient – process.

What makes Trivorex ® unique?

- Built-in pH indicator
- Rapidly suppresses chemical vapours
- Declassifies corrosive chemicals into non-hazards
- Leaves surface dry and safe; eliminating the need for pads
- Eliminates the need for expensive environmental disposal costs
- 1kg of Trivorex will absorb and neutralize approximately .6 L of corrosive chemical

Safurex® Surface Decontamination

Safurex® is a decontamination solution designed to manage corrosive splashes to vertical surfaces such as walls and equipment where absorbent powders aren't practical to use.

Safurex® is an active decontaminant that neutralizes the pH of all types of liquid spills of corrosive acids or bases. It can also chelate the fluoride ions of hydrofluoric acid to limit the toxic effects of this chemical.

During maintenance or following a chemical incident, corrosive chemicals may contaminate work surfaces and PPE. This can cause damage to workers, equipment, PPE, the workplace.

Safurex® has built-in pH indicators that return to the original colour when the decontamination process is complete.

Safurex® is also suitable for incidents involving hydrofluoric acid and its derivatives as it will safely bind the fluoride ions, negating this chemical's toxic element.

Absorbents

Chemical spill absorbents are the best solution to ensure a thorough clean. But it's important to know that not all spill absorbents are made equal. In fact, a huge amount of spill control products on the market don't do a thorough job and leave lingering fumes and slippery residue behind, even after you think that the spill has been resolved. On top of that, there are often hefty backend environmental disposal costs charged to ensure the waste is properly disposed.

Pads

An alternative method for cleaning up hazardous spills is by using chemical pads. Pads can be placed directly over a chemical spill to help trap the liquids and fumes to easily contain the hazard. Often, pads come in a variety of different colours to help workers identify which one should be used for which type of chemical spill emergency.

Decontamination Solutions

Whether you use an absorbent or pad to clean up a chemical spill, it's vital to thoroughly clean the area afterwards. Using a decontamination solution is the best way ensure that no harmful residue is left over (which you or another unknowing worker could encounter).

Spill Kits

Chemical spill kits are an essential part of a safe workplace, helping protect workers, facilities, and the environment when accidental leaks or spills occur. Being prepared with the right kit minimizes downtime, reduces the risk of injuries or exposure, and ensures compliance with safety regulations.

A typical spill kit includes absorbent pads, socks, pillows, protective gloves, goggles, disposal bags, and instructions for safe cleanup. Kits are available in different types to match the hazard

- **Universal kits** for oils, coolants, and water-based fluids
- **Oil-only kits** that repel water and absorb hydrocarbons.
- **Chemical or hazmat kits designed** for aggressive acids, bases, and unknown substances. Having the right spill kit readily available not only provides peace of mind but also supports a proactive safety culture by ensuring workers can quickly and effectively respond to any spill event.

LOOKING FOR MORE INFORMATION?

Our team of safety specialists are always ready to assess your safety programs and provide guidance for your future safety needs. Contact us for product information, to set up a demo or training, or to book a service.

TOLL FREE: 888.453.8488 | MARKETING@LEVITT-SAFETY.COM

HOW LEVITT-SAFETY CAN HELP

At Levitt-Safety, we can help you navigate and manage your chemical hazards in the workplace. From assessment to education, our team is here to support you.

Levitt-Safety is a trusted Canadian company that has proudly served our customers from coast-to-coast-to-coast for over 90 years. As a national safety equipment and service supplier, we partner with leading manufacturers to bring you innovative products, services, training, and rental options.

Products

We offer numerous products that offer solutions to the hazards found in the chemical industry. Levitt-Safety offers the best chemical suits, emergency showers and eyewash stations, chemical storage and spill control products on the market to protect against chemical splashes and spills.

Services

Levitt-Safety offers a wide range of onsite services to ensure all your chemical PPE and equipment is up-to-code and ready to work not only in the case of an emergency, but for everyday use.

- Emergency shower and eyewash equipment assessments
- Gas monitor repair and calibration
- Respirator fit testing
- Chemical suit testing and repairs
- SCBA flow testing
- Hand protection assessments
- Fire extinguisher recharge and testing
- Fall protection inspection and recertification

Training and Education

Levitt-Safety offers the convenience of online and in-person training options for those working in the chemical industry.

- WHMIS dangerous goods training
- Respiratory Protection training
- Respiratory fit testing
- Live and simulator fire training
- Risk assessment
- Handling hazardous materials

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